



International
Dialogue for
Environmental



LIVING CONSERVATION

RECOVERY OF THE LEOPARD IN AZERBAIJAN





International Dialogue for Environmental Action

In July 2011, Leyla Aliyeva launched the IDEA campaign (International Dialogue for Environmental Action) which aims to promote public awareness and action on environmental issues in Azerbaijan and around the world. IDEA focuses on young people and working with them to find solutions to the environmental problems that we face.



The Zoological Society of London

The Zoological Society of London (ZSL), a charity founded in 1826, is a world-renowned centre of excellence for conservation science and applied conservation. ZSL's mission is to promote and achieve the worldwide conservation of animals and their habitats. This is realised by carrying out field conservation and research in over 50 countries across the globe and through education and awareness at our two zoos, ZSL London Zoo and ZSL Whipsnade Zoo, inspiring people to take conservation action.

We strive to achieve our mission by:

- Conducting world-leading conservation science
- Implementing effective field conservation projects globally
- Providing decision-makers with the best possible conservation advice
- Building conservation capacity and inspiring people to connect with the natural world.

Authors: Urs Breitenmoser, Malini Pittet, Batur Avgan, Elshad Askerov, Christine Breitenmoser-Würsten and Chris Ransom.

Citation: Breitenmoser, U., Pittet, M., Avgan, B., Askerov, E., Breitenmoser-Würsten, C. and Ransom, C. (2014). Recovery of the Leopard in Azerbaijan. Zoological Society of London, United Kingdom.

Photo credits: Front cover - © Edo Schmidt
All other leopard photos - © Chris Godfrey Animalimagery.co.uk

Design: Kevin Hawkes - www.22creative.co.uk

Print: witherbysonline.co.uk

RECOVERY OF THE LEOPARD IN AZERBAIJAN

Urs Breitenmoser, Malini Pittet, Batur Avgan, Elshad Askerov,
Christine Breitenmoser-Würsten and Chris Ransom

CONTENTS

Acknowledgements	5
Executive Summary	6
1 Introduction	8
2 Biology and Ecology of the Caucasus leopard	10
3 Status of the leopard in the Caucasus and in Azerbaijan	16
3.1 Brief history of the leopard in the Caucasus	16
3.2 Present situation of the leopard in the Caucasus ecoregion	18
3.3 Conservation activities in the Caucasus region	25
4 A scenario for the recovery of the leopard in the Caucasus and in Azerbaijan	30
4.1 Restoring the leopard population in the Caucasus	30
4.2 A regional approach to leopard conservation in the Caucasus	32
4.3 The role of Azerbaijan in the conservation of the leopard in the Caucasus	35
5 Framework for the conservation of the leopard in Azerbaijan	36
5.1 Relevant legislation	36
5.2 The National Action Plan for the conservation of the leopard	37
5.3 Protection of leopards and their habitats	40
5.4 Prey: status, conservation and management of wild ungulates	43
5.5 Potential conflicts and peoples' attitudes	44
6 Conclusions and recommendations for the restoration of the leopard in Azerbaijan	46
References	52



ACKNOWLEDGEMENTS

We would like to thank Leyla Aliyeva and International Dialogue for Environmental Action (IDEA) for commissioning ZSL to carry out this feasibility study and to Yusuf Mammadaliyev providing us with considerable support during our scoping visits to Azerbaijan.

We are grateful to all the people and institutions who took the time to meet with us and provide us with information to assist us with this report, including, Minister Huseyngulu Baghirov, Ministry of Ecology and Natural Resources, Mr Hikmet Alizade, Deputy Director of biodiversity protection and special protected nature areas development department, Ministry of Ecology and Natural Resources, Director Nazim Ismayilov and colleagues at the Institute of the State Committee of Land and Cartography, all the staff at IDEA and Adrian Steirn from Gingko Agency.

We also wish to thank Sarah Christie, Jo Cook, Paul De Ornellas, Luke Hunter, David Mallon, Megan Stannard and Nugzar Zazanashvili for reviewing this report and providing valuable feedback.

Finally we would like to thank Tom Jennings, Arlo Brady, Hannah Pawlby and Claire Tarn at Freuds for all their assistance over the course of the preparation of this report.

EXECUTIVE SUMMARY

The Azerbaijan Republic lies at the heart of the Caucasus ecoregion, a biodiversity hotspot of global importance. Azerbaijan itself enjoys a rich and diverse range of landscapes and associated biodiversity graduating from lowland plains, semi desert, steppe, forest, alpine meadow to sub-nival alpine communities in the mountains. There are 623 species of vertebrates including 106 mammal species, 33% of which are listed in either the Azerbaijan Red Data Book or as globally threatened in the IUCN Red List.

The best known and most widely recognised species in Azerbaijan is the leopard *Panthera pardus saxicolor*. Once found throughout the forests and rugged mountains of the Greater and Lesser Caucasus, today the leopard is absent from most of its former range in the ecoregion and is on the brink of extinction. It has become a top priority species for conservation in Azerbaijan and the region, yet no reliable estimate of the remaining population exists.

Individual leopards have been reported from a small number of locations in the ecoregion in recent years, including Kiamaky Wildlife Refuge in Iran, Vashlovani Nature Reserve in Georgia and Kharakhinskoe Canyon in the Republic of Dagestan. The only sites in Azerbaijan in which leopard have been reported are Hirkan National Park and surrounding areas of the Talysh Mountains and the Zangezur Mountains in the Nakhchivan Autonomous Republic. There have been no reports in the Greater Caucasus region of Azerbaijan.

Three leopards – one male and two females – have been identified in the Zangezur Mountains raising hope of reproduction in this area. Meanwhile potentially two individuals, one of which is male, have been identified in Hirkan National Park.

The situation of the leopard in Azerbaijan and the Caucasus is so critical that solely protecting these remaining leopards will not be adequate to recover the population. A programme to restore the leopard population in Azerbaijan should therefore include three components: 1, the conservation of the remnant leopard populations in the south of Azerbaijan (Nakhchivan Autonomous Republic and Talysh Mountains); 2, maintaining connectivity with leopard source populations in Iran to enable recolonisation of the Lesser Caucasus and Talysh Mountains, and; 3, reintroduction of a leopard population in northern Azerbaijan (Greater Caucasus).

RECOMMENDATIONS:

1 Conduct baseline surveys across Azerbaijan.

Surveys are required across Azerbaijan to determine baseline estimates of leopard numbers, relative abundance of prey species, habitat use, human activities taking place and threats. These should commence with priority sites where leopards have been recorded in recent years – Hirkan National Park and surrounding areas in the Talysh Mountains and Zangezur National Park and neighbouring areas of Nakhchivan Autonomous Republic - and potential reintroduction sites in the Greater Caucasus like Shahdag National Park.

2 Establish permanent monitoring programmes in key sites.

Upon completion of baseline surveys in priority sites, permanent monitoring systems should be established to enable the detection of changes in leopard, prey or threat indices and appropriate management actions to be taken to address them.

3 Ensure effective management of protected areas.

Azerbaijan's protected areas must provide the core areas for the recovery of a leopard population. It is therefore important that the management systems in the protected areas are strengthened. This should include ensuring that they all have, and are implementing, up-to-date management plans and they are adequately resourced. Initial priority should be given to Hirkan National Park, Zangezur National Park and Shahdag National Park.

4 Ensure protection and law enforcement activities are carried out outside of protected areas.

The protected area network alone will not provide adequate habitat or prey for the restoration of the leopard population in Azerbaijan. It will also be necessary to ensure effective law enforcement outside of protected areas to prevent illegal activities taking place such as the hunting of leopards, overhunting of prey species and the illegal degradation of habitats.

5 Develop and implement a behaviour change campaign.

A major challenge for a programme to restore the leopard population in Azerbaijan will be changing the negative attitudes and perceptions of many people towards leopards in some areas and changing behaviours that have a negative impact on leopards. It will therefore be necessary to develop and implement an innovative communications and behaviour change strategy as part of the restoration programme. This strategy should be developed to positively shift knowledge, attitudes and behaviours related to unsustainable use of natural resources and leopard persecution.

6 Community Engagement.

In order to support a behaviour change campaign, local communities living in the same areas as leopards and dependent on many of the same natural resources, should be engaged with to assist them to mitigate 1, the threats posed to them and their livestock, and 2, the threats they pose to leopards. The actions required will depend on the issues in a specific area.

7 Establish a reintroduction programme.

The only realistic way to recover the leopard in the Greater Caucasus will be reintroduction. Leopards for this purpose must come from a captive breeding programme. The European Association of Zoos and Aquariums (EAZA) managed conservation breeding programme is the recommended source of animals. A reintroduction plan will need to be drawn up following the internationally recognised IUCN/SSC *Guidelines for Reintroductions and Other Conservation Translocations*. This should include the selection and preparation of a site, construction of breeding and release facilities, development of husbandry and veterinary protocols and breeding and release plans.

8 Cooperate with neighbouring countries on transborder conservation initiatives.

Azerbaijan will not be able to restore its leopard population without cooperation with neighbouring countries. Transborder cooperation with neighbouring countries, especially Iran, should be considered to promote new transboundary protected areas, cooperation between existing protected areas in proximity to each other, and establishing corridors between protected areas.

SECTION 1

INTRODUCTION

The Caucasus ecoregion covers an area of 580,000 km² on the isthmus between the Black Sea and the Caspian Sea spanning six countries - Azerbaijan, Georgia, Armenia, north-eastern Turkey, north-western Iran and part of the Russian Federation (Fig. 1.1). It is one of 25 global biodiversity hotspots recognised for its exceptional concentrations of endemic fauna and flora and is undergoing high levels of habitat loss^[1]. An estimated, 6300 plant species and 632 vertebrates occur in the region, of which 1600 and 59 respectively are endemic^[1]. Fifty seven of the vertebrate species and 5 subspecies are globally threatened, of which 20 species and 3 subspecies are mammals, including the leopard *Panthera pardus saxicolor*^[2]. The Caucasus ecoregion is biologically rich as it is located on the boundary of two climatic belts - temperate and moist temperate - as well as having marine and continental climatic conditions^[3]. It is characterised by greatly varying landscapes ranging from forested mountains to steppes, semi-deserts and deserts.

The Azerbaijan Republic is situated in the south-eastern part of the Caucasus on the western shores of the Caspian Sea. It has an area of 86,600 km². A separate, physically isolated, area of land – the Autonomous Republic of Nakhchivan – is situated in the southwest of the Lesser Caucasus and covers some 5,362 km². Due to its geographic location and topographic variations, Azerbaijan enjoys a rich and diverse range of landscapes and associated biodiversity graduating from lowland plains, semi desert, steppe, forest, alpine meadow to sub-nival alpine communities at the greatest heights of the mountains. Of the world's 11 climatic zones, 9 are found in Azerbaijan. There are approximately 4,500 recorded species of higher plants, which represent around 65% of the floral diversity of the Caucasus region, and 11% of the world's flora. Azerbaijan supports 623 species of vertebrates including: 89 fish species;

FIGURE 1.1



The Caucasus Ecoregion (within red boundaries) spans six countries, the Russian Federation, Georgia, Turkey, Armenia, Iran and Azerbaijan. Georgia and Azerbaijan both contain areas of the Greater Caucasus range in the north and the Lesser Caucasus range in the south and can therefore provide a bridge between leopard populations (source: Zazanashvili et al. 2007^[2]).

10 amphibians; 52 reptiles; 363 species of bird; and 106 species of mammals. Around 33% of the mammals in Azerbaijan are included on either the Azerbaijan Red Data Book or as globally threatened in the IUCN Red List^[4].

Perhaps the best known and most widely recognised species in Azerbaijan, and indeed the Caucasus, is the leopard *Panthera pardus saxicolor*. Once widespread throughout the Caucasus, the leopard is now on the brink of extinction and has become a top priority species for conservation in Azerbaijan and the region. Not only does the high profile of the leopard mean that it is a

flagship for conservation in the region but its ecological requirements – large areas of habitat and adequate prey – mean that efforts to restore the leopard will help conserve other threatened fauna and flora.

Leopard conservation in the region started in the first years of this century, when the WWF Caucasus Programme launched a series of field surveys to assess the status of the leopard populations in the Greater and Lesser Caucasus (see Chapter 3). The findings were summarised in 2007 in a Special Issue 2 of *Cat News* (the journal of the IUCN/SSC Cat Specialist Group) and formed the base for the development of the *Strategy for the Conservation of the Leopard in the Caucasus*⁶⁵. The *Strategy* was also the starting point for the development of national action plans. The *National Action Plan (2010–2014) for conservation of the leopard in the Azerbaijan Republic*⁶⁶ was developed in 2009. An *Ecoregion conservation plan for the Caucasus 2006*⁶⁷ consists of action plans for each biome and priority species and includes the leopard.

The government of the Azerbaijan Republic and the organisation International Dialogue for Environmental Action (IDEA) have the ambition of restoring the country's population of leopards. On 7th May they hosted the Caucasus Cat Summit in Baku which, for the first time, brought together a range of organisations and individuals from all over the world to share their experiences and discuss how they might be applied to the conservation of the leopard in Azerbaijan and the Caucasus. This was a great step forward for leopard conservation in the country and the region.

The Zoological Society London (ZSL) has been consulted regarding leopard conservation in Azerbaijan and commissioned to produce a feasibility study for the restoration of the Caucasus leopard in Azerbaijan. This report is the result of the feasibility study. The intention is for this report to provide recommendations which, if followed, will have the best chance of restoring the leopard in Azerbaijan and contributing to its restoration in the whole region.

The report is presented in 5 sections:

- 1 A brief overview of what is known about the biology and ecology of the Caucasus leopard, information it is important to understand in order to be able to define appropriate conservation measures.
- 2 A review of the history and present status of the leopard in the Caucasus region and Azerbaijan, and relevant conservation activities at the regional scale, in order to understand what has happened to the leopard population in the past and the starting point for a restoration programme.
- 3 A discussion of scenarios for the recovery of a viable leopard population in the Caucasus and the specific role of Azerbaijan in this process.
- 4 A review of the framework for the conservation of the leopard in Azerbaijan in order to understand enabling conditions and challenges.
- 5 Recommendations for actions to be taken in Azerbaijan for the implementation of a comprehensive and lasting leopard conservation programme in Azerbaijan.



▲ The Lesser Caucasus in Azerbaijan (© David Mallon)

SECTION 2

BIOLOGY AND ECOLOGY OF THE CAUCASUS LEOPARD

In order to design appropriate and effective conservation measures for the restoration of the leopard, it is important to understand aspects of their biology and ecology such as their social and spatial organisation, diet and habitat use.

The leopard *Panthera pardus* is the most widespread big cat in the world, found across Africa, the Middle East and Asia (Box 2.1). They are best known as animals from tropical and subtropical areas, but in Asia they are also present in cooler climatic zones. The Caucasus is the north-westernmost edge of the leopard's distribution. The leopards in the Caucasus are considered to belong to the *Panthera pardus saxicolor* subspecies, which is also found in eastern Anatolia, Iran, Turkmenistan and east into Afghanistan and Pakistan (for more information on taxonomy see Box 2.2).

There is little information on the biology and ecology of the *Panthera pardus saxicolor* subspecies in the wild. They are believed to be the largest of the leopard subspecies and have been reported to weigh up to 90kg, although 60 kg is more likely^[8]. Males are larger than females. Their colour is usually light and pale. In captivity they have between 1 and 4 kittens in a litter but in the wild no litters of more than two kittens have been reported^[9]. Their social and spatial organisation is likely to reflect that of other subspecies (Box 2.3).

The diet of the leopard varies depending on the prey species present in an area and its availability. They are however known to rely on a few species of small to medium sized ungulates (30-50kg). Wild ungulates such as bezoar goat *Capra aegagrus*, East Caucasian tur *Capra cylindricornis*, mouflon *Ovis orientalis*, chamois *Rupicapra rupicapra*, roe deer *Capreolus capreolus*, red

deer *Cervus elaphus* and wild boar *Sus scrofa* are their main prey species in the Caucasus and Trans-Caucasus with European hare *Lepus europaeus*, pheasant *Phasianus colchicus*, rock partridge *Alectoris chukar*, Caucasian black grouse *Tetrao mlokosiewiczzi*, snowcock *Tetraogallus* spp. and Indian crested porcupine *Hystrix indica* secondary prey species taken less frequently^[9]. Where wild prey populations are low predation on domestic animals is more frequently reported.

Other studies from Iran and Armenia have found bezoar goat, mouflon and wild boar to be key prey species, with roe deer, Indian crested porcupine, badger *Meles meles* and livestock also preyed upon^[10, 11, 12, 13].

The choice of a leopard's habitat is dependent on prey availability^[14]. Leopards have been known to disappear from an area if prey hunting by humans is high^[15]. Leopards can survive in a diverse range of habitats if adequate prey is available. They are ambush hunters so they prefer habitats which provide some cover when hunting. They generally live near slopes and rocky outcrops and can inhabit mountains and foothills covered with forests^[9] as well as dry rugged terrain^[16]. The choice of habitat is also dependant on the duration of snow cover with snow negatively affecting the distribution of prey and leopard^[8]. We can assume that all habitats, with the exception of arid regions such as open steppes and semi-desert areas, can be occupied by leopards.

BOX 2.1 THE LEOPARD

Scientific name: *Panthera pardus*

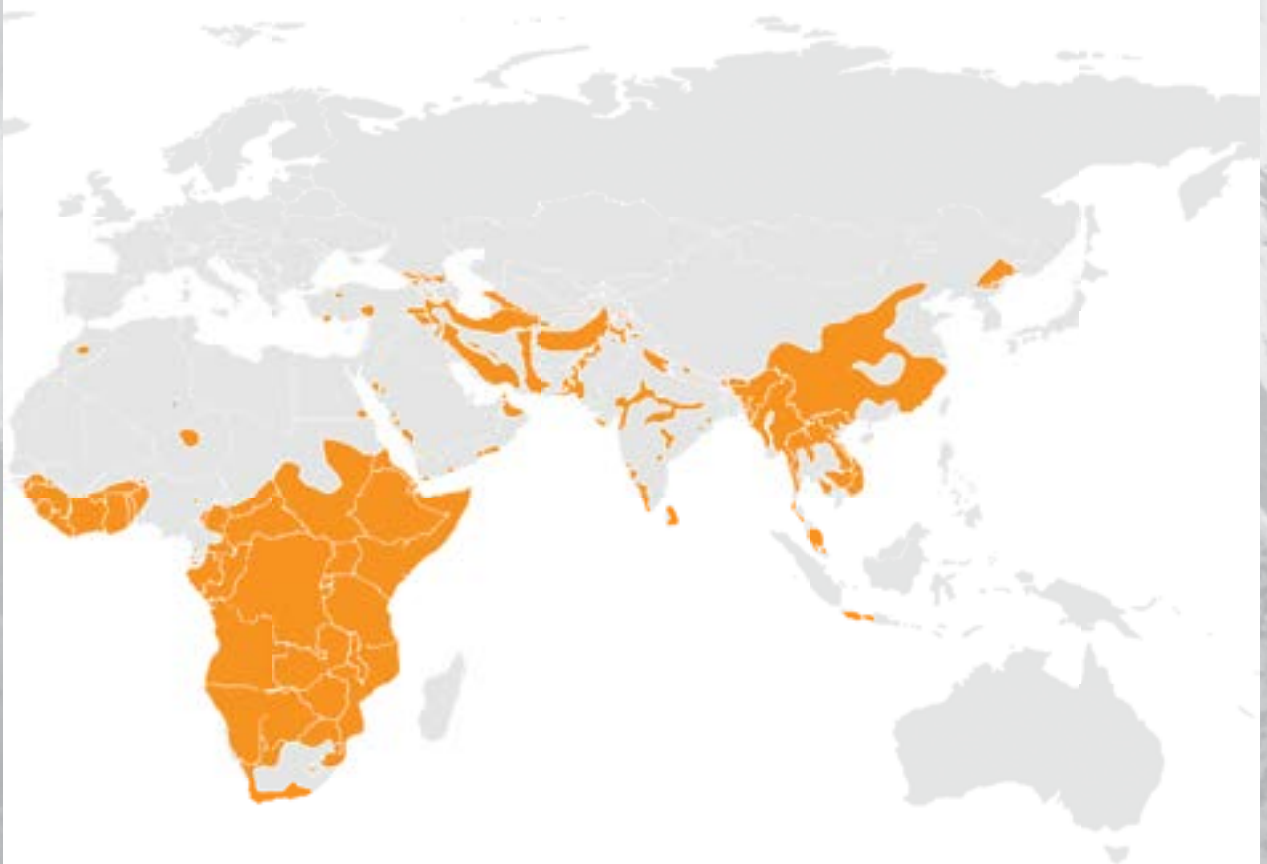
IUCN Red List Status: Near Threatened (NT)

Certain sub-species such as the Arabian *P.p.nimr* and Amur leopard *P.p.orientalis* are Critically Endangered (CR) while the Persian leopard *P.p.saxicolor* is Endangered (EN).

The leopard is a widespread species, found in 76 countries spread across Africa, Asia, Arabian Peninsula, Russian Far East and the Caucasus region (see map below). It is regionally extinct in six countries: parts of China, Kuwait, Libya, Singapore, Syrian Arab Republic, and Tunisia.

Leopards are fascinating animals as they are highly adaptable and capable of surviving in very different habitats ranging from tropical rain forest, woodland, grassland savannah, temperate forest, coastal scrub, swampland, scrubland to semi-desert and desert. Throughout their range, leopards rely on ungulates but they can also prey on insects, reptiles, birds and mammals weighing as much as 900 kg. It is a solitary species, with males and females living separately in individual home ranges. The home range of a male can overlap with that of several females. Females most commonly give birth to 2-4 cubs, but have been known to have 6 cubs in captivity, which stay with their mother until 12-18 months.

The global population trend is decreasing and major threats include habitat alteration, fragmentation and destruction as well as retaliatory killing due to livestock depredation, unsustainable quotas for legal trophy hunting in Africa and poaching for wildlife trade.



 Global Leopard territories

BOX 2.2 WHAT IS THE „CAUCASUS LEOPARD“? – A TAXONOMIC NOTE

Several subspecies of leopards have been described from south-west Asia and the Middle East based on morphometric differences (see reviews in ^[8, 57]). The names most often used are :

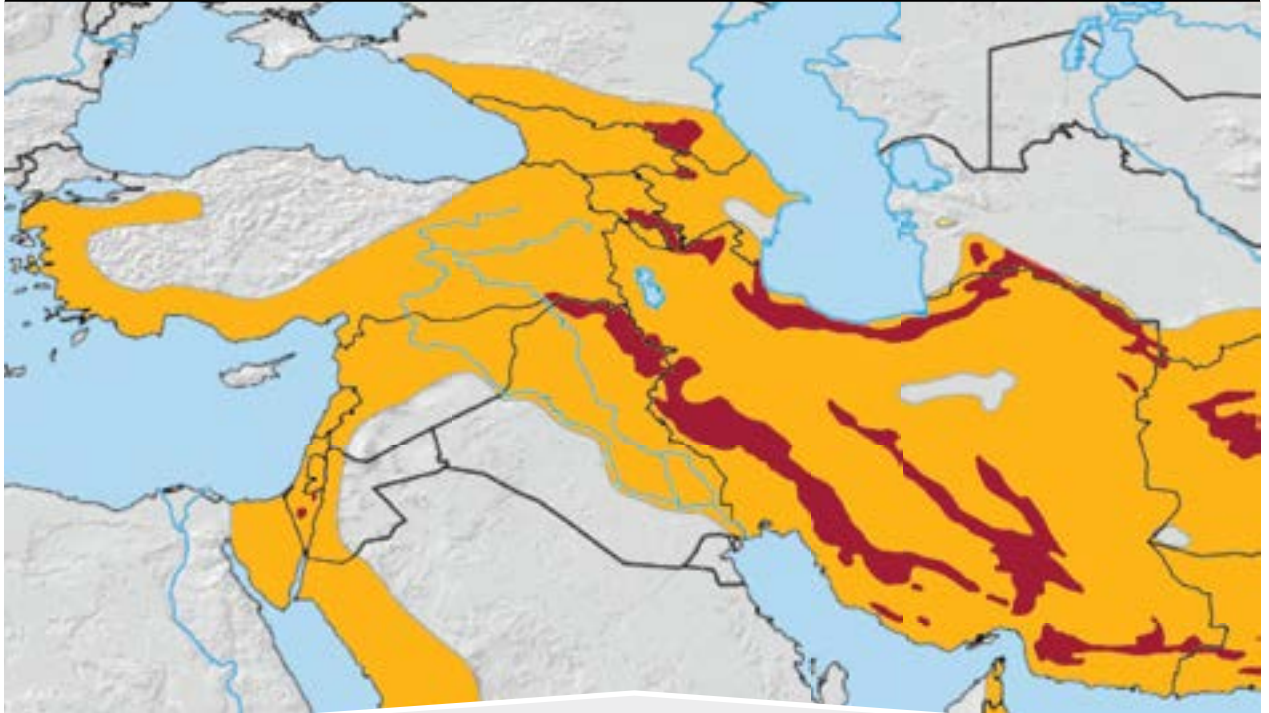
- *Panthera pardus tulliana* (Valenciennes 1856), formerly widely distributed in Asia Minor,
- *P. p. ciscaucasica* (Satunin 1914) in the Caucasus and northern Iran, and
- *P. p. saxicolor* (Pocock 1927), which was later considered a synonym of *ciscaucasica*^[58].

Newer research based on genetic identification^[59, 60] has united several south-east Asian subspecies, with the exception of the clearly distinct leopards from the Arabian Peninsula, under the scientific name *saxicolor*. However, Anatolian leopards have not yet been genetically analysed, so this conclusion is currently provisional, but highly probable on biogeographical grounds. A study in 2006 analysed the skull morphometrics of southwest Asian leopards, and concluded that *saxicolor* and *ciscaucasica* were consubspecific, but retained *tulliana* and *millardi* as distinct^[57]. However, sample sizes were very small for some of these putative subspecies. Another study examined sequences of mtDNA (NADH5) and 11 microsatellites from southwest Asian leopards and concluded that all specimens from Afghanistan through Iran to the Caucasus were consubspecific^[61]; however western Turkish specimens (*tulliana*) were not analysed. The Cat Classification Task Force of the IUCN/SSC Cat Specialist Group is currently reviewing the intraspecific taxonomy of leopards globally and provisionally unites the leopards from the Middle East and Central Asia, including the leopards from Anatolia, into a single subspecies.

According to the rules for scientific nomenclature, the first description is valid in the case of synonyms, and hence the leopard in the entire region should probably correctly be called *Panthera pardus tulliana*^[62].

The authenticity of the “Caucasus leopard” has been discussed at length. While the question of the scientifically correct name of the leopard in the Caucasus is not relevant for the topic of this report the phylogenetic history of a taxon must be considered for any recovery programme, and it is hence important to reflect on which leopard to conserve or recover, especially with regard to the discussion of an optional reintroduction and suitable sources of founder animals. In historic times and up to the early 20th century, the leopard was widespread in south-west Asia. Nowadays, the leopard is no longer found in a considerable part of the historic range, and the remnant populations are small and fragmented (Fig. 2.1). Many of these subpopulations may face problems of inbreeding in the future as a consequence of their small size and isolation. It is therefore important to re-connect these population fragments and to enlarge the distributional range of the leopard in the entire region. Although the phylogenetic status of the (extinct) leopards in the south and west of the Anatolian peninsula is not understood yet, the present knowledge suggests that the leopards from the Caucasus, eastern Anatolia, Iran, Turkmenistan and east into Afghanistan and Pakistan all belong to the same subspecies^[62]. Consequently, the remnant leopard populations of all Caucasus countries should be deemed one conservation unit, and the “Caucasus leopard” should be considered as belonging to the same meta-population as the leopards in the Zagros Mountains and the Alborz Range.

FIGURE 2.1



Leopard distribution and population fragmentation in the Caucasus and surroundings. ■ = historical range, ■ = current range.
 (source: Peter Gerngross)



▲ Snow-capped mountain tops in the Nakhchivan Autonomous Republic of Azerbaijan (© KORA/WWF)

BOX 2.3 THE SOCIAL AND SPATIAL ORGANISATION OF LEOPARDS

Females reside in permanent and exclusive territories, which are adjacent to each other with little or no overlap. Males occupy home ranges that may embrace one or several female ranges and may also marginally overlap with territories of other resident males. They can cover large distances to look for prey and to patrol their territory. The individual territories can be large and the population density consequently relatively low. There is no home range size or density estimate yet for the Caucasus. Territory size and therefore densities are determined by habitat quality and density and distribution of prey and therefore may vary greatly (Table 2.1).

During the breeding season, males and females find each other by communicating through a series of olfactory and visual signals placed at well-selected points such as urine sprays and scrape marks, and the resident male is increasingly protective of his partner, trying to meet her at the right time and to keep possible intruding competitors away.

After birth, the female raises the cubs alone until they are grown up and leave the parents' territories. But the resident male plays an important role by keeping other leopards away that could pose a threat to the young or compete for prey with the female. Such a socio-spatial arrangement of neighbouring and overlapping home ranges of resident individuals is a prerequisite for mating and successfully raising cubs.

Hypothetical structure of a large solitary felid species with home ranges of males in blue and those of females in red.

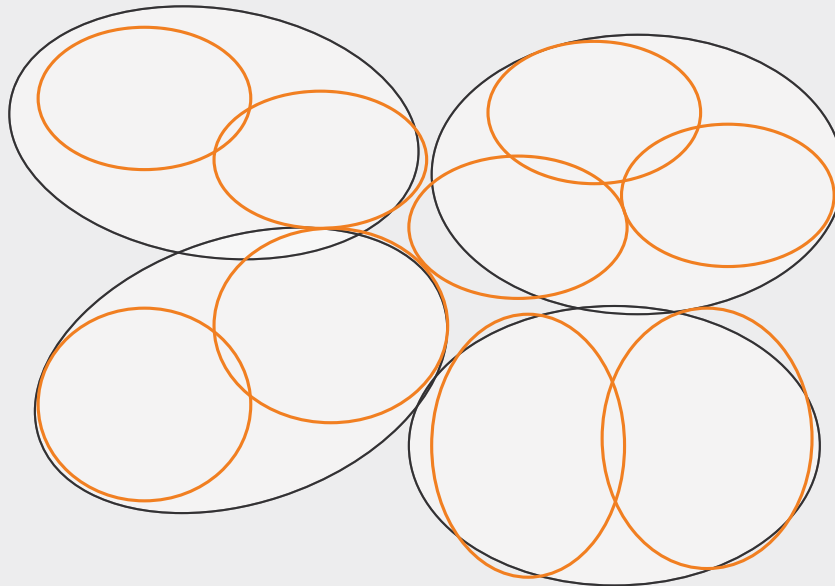


TABLE 2.1: LEOPARD DENSITY ESTIMATES IN DIFFERENT REGIONS BASED ON TELEMETRY AND CAMERA TRAPPING DATA

Country	Leopard density
Iran	1.8 adults / 100 km ² [63]
India	4.8 adults / 100 km ² [64]
Bhutan	1.04 adults / 100 km ² [65]
South Africa	6.97 adults / 100 km ² [66]
South Africa	11.11 adults / 100 km ² [67]
South Africa	12.7 adults / 100 km ² [68]

(Source of information in parentheses)



SECTION 3

STATUS OF THE LEOPARD IN THE CAUCASUS AND IN AZERBAIJAN

An assessment of the situation of the leopard in the Caucasus was published in 2007 as a Special Issue of *Cat News*^[17], compiling seven articles determining the conservation status of the leopard population and their future in the region, from various perspectives. These papers combined semi-historic and recent information, and reviewed the data and information collected from 2000 – 2006. Presented here is a summary of this information and new information collated for this report.

Assessment of the situation of the leopard in the Caucasus can be divided into three phases: (1) views prior to 2000 (summarised in Chapter 3.1), which were all “qualified guesses” at best, (2) conclusions from surveys commissioned by WWF from 1999–2005, mainly based on field sign surveys and interviews with local people, and (3) the years since 2007, when camera trapping has increasingly been used for the surveying of leopards ((2) and (3) are summarised in Chapter 3.2).

3.1 BRIEF HISTORY OF THE LEOPARD IN THE CAUCASUS

In historic times, the Caucasus leopard was found throughout the forests and rugged mountains of the Greater and Lesser Caucasus and even on the plateau between the two ranges. The only areas they avoided were the most arid areas^[8, 9]. Today, the leopard is absent from most of its former range in the ecoregion (Fig. 2.1). The decline has not been a steady process, and it is important to understand this history to be able to plan for its recovery.

Man has persecuted large carnivores for centuries as they posed a threat to domestic animals and even humans, and also because they were considered competitors to the hunters of large game. Only when the leopard in the Caucasus was close to extinction was it granted legal protection: in 1972 in the Soviet Union^[18] and in 1999 in Iran^[19]. In Turkey, the hunting of leopards was banned in the 1990s, and the species has been legally protected since 2003^[20].

The leopard population in the Caucasus was already low by the 1930s and at this time it was restricted to two areas in the Greater Caucasus and parts of Azerbaijan and eastern Georgia. The decline continued until the late 1960s: “By the 1950s to the 1960s the range of leopards in the Caucasus had shrunk greatly, the population of the animal became negligible, and actually on the brink of total extinction”^[19]. Observations continued to decrease; reports of leopards killed include three in Georgia between 1959 and 1960 and one in Azerbaijan in 1958. The predicted total eradication was however averted, and with legal protection in the Soviet Union, the population seemed even to recover and an increasing number of anecdotal observations gave hope^[21]. The leopard was included as a species under the threat of extinction in the Red Data Book of the Russian Federation (1983, 2001), Georgia (1982), Armenia (1987), and Azerbaijan (1989). Although the listing alone is not believed to have had much of a conservation effect^[22], the situation for the leopard probably improved in the late 1960s to the 1980s as a consequence of an increasing awareness for nature conservation and wildlife preservation in general and the establishing of new protected areas in the Soviet Union, and also in Iran. Of the five leopard priority protected areas in the Caucasus provinces of Iran, four (Marakan Protected Area, Kiamaky Wildlife Refuge, Arasbaran Biosphere

Reserve, and Lisar Protected Area) were founded between 1967 and 1973. Only Agh Dagh Protected Area was established later, in 1999^[23, 24].

After the Islamic revolution in Iran in 1979 and the dissolution of the Soviet Union in 1991, there was a period of unrest and even war in the Caucasus, and the decline of the leopard continued. Although this period is poorly documented with regard to wildlife, it is clear that the lack of law enforcement led to an upsurge in the illegal killing of leopards and another decline in their numbers, as well as the devastation of forests and poaching of wild ungulates, hence affecting the habitat and prey base of the leopard.

It was long debated whether the few and scattered leopard observations in the Caucasus indicated a persisting population or whether the observed animals were immigrants from the south, from source populations in Iran. The question cannot be answered, because the records up to the end of the 20th century were not collated into one comprehensive dataset. The very low number of mortality reports and the lack of any confirmed evidence of reproduction in most regions of the Caucasus suggest

that no self-sustaining reproducing population has remained in the Caucasus since the 1960s, when its immediate extinction was predicted^[9]. However, there remained two exceptional areas where the leopard persisted longer than anywhere else. The first is the Republic of Dagestan in the Greater Caucasus, where leopards are known to have been killed in 1981, 1985 and 1995^[25, 26], bordering parts of Georgia where a leopard was killed in the mid-1990s in the Khevsureti region^[27] and Russia (Chechnya and Ingushetia) where a leopard was caught on a video camera by Russian border guards in North Osetia^[28] but the present situation remains unclear. The second area is the south-eastern edge of the Lesser Caucasus, including areas in Azerbaijan, Iran, and Armenia. In Azerbaijan, the Talysh Mountains were always a stronghold for the leopard population and at least four leopards were killed in retaliatory killings between 1946 and 1952^[25]. Similarly the Nakhchivan Autonomous Republic has been a key site for Azerbaijan, with the majority of leopard trophies shot in this region. These areas play an important role in leopard conservation even now.



3.2 PRESENT SITUATION OF THE LEOPARD IN THE CAUCASUS ECOREGION

Estimations of numbers of leopards in the different regions of the Caucasus based on surveys carried out since 2002 are summarised in Table 3.1. The interpretation of the various surveys and anecdotal reports differ between sources, leading to ambiguous estimations and confusing numbers. However, none of these 'guestimates' were based on scientifically sound methods allowing a quantitative assessment of the population. They were obviously too optimistic, as subsequent surveys (increasingly based on camera trapping) have not been able to confirm the presence of such assumed "remnant populations".

The surveys carried out between 1999 and 2005 (up to 2010 in Republic of Dagestan) covered areas in Azerbaijan, Georgia and Armenia in 2001 with follow-up surveys in Azerbaijan and Armenia in 2003^[12]. Subsequent surveys were carried out in Iran, the Republic of

Dagestan^[12, 25, 29], Nakhchivan Autonomous Republic and southern Armenia^[25]. These surveys resulted in estimates of 40 leopards remaining in the Lesser Caucasus and 8–10 individuals surviving in the eastern part of the Greater Caucasus^[30].

Greater Caucasus: Leopard presence in the northern Caucasus range has for a long time been much less than in the south, and hard facts or confirmed observations were extremely rare. Still, a tentative population of 15 leopards was estimated for the Greater Caucasus in the *Strategy for the Conservation of the Leopard in the Caucasus*^[5]. All areas believed to still host leopards were in the eastern part of the Greater Caucasus - the Andiyskoye Koysu River in Tushetia (Georgia), the Assa River valley in Inghushetia, the Armkhi River valley in Ossetia and possibly the Sharoargun and Argun River valleys in Chechnya (Russia)^[18].

The Andiyskoye Koysu and Avarskoye Koysu headwaters in the Republic of Dagestan is a difficult area to assess: reports of poached leopards date from 1981, 1985 and the last confirmed observation of a female was an animal killed in 1995^[26]. Towards the end of the past century,

TABLE 3.1: LEOPARD ESTIMATES FOR THE CAUCASUS ECOREGION PER COUNTRY AND REGION BASED ON SURVEYS AND ASSESSMENTS SINCE 2002

Country	Location	Leopard estimate
Armenia	Khosrov Forest State Reserve and Nyuvadi	10-15 ^[69]
Armenia	Khosrov Forest State Reserve	2-3 ^[12]
Armenia	Bargushat-Mergrini Mountains	3-5 ^[12]
Armenia	Khosrov Forest State Reserve	4 ^[30]
Armenia	Aitsdzori range	2-3 ^[12]
Armenia	Whole country	7-11 ^[30]
Azerbaijan	Talysh Mountains	2-3 ^[12]
Azerbaijan	Nakhchivan- Zangezur mountains	4-5 ^[12]
Azerbaijan	Nagorno-Karabakh	5-7 ^[12]
Azerbaijan	Nagorno-Karabakh	3-4 ^[30]
Azerbaijan	Whole country	17 ^[6]
Azerbaijan	Whole country	12-17 ^[30]
Iran	Whole country	550-850 ^[70]
Iran	North-western Iran	19-25 ^[30]
Georgia	Whole country	Difficult to estimate ^[30]
Russia	Dagestan, Russian Caucasus	5-7 ^[29]
Russia	Dagestan, Russian Caucasus	Less than 10 ^[30]
Turkey	Caucasus region	Possible extinction ^[30]

(Source of information in parentheses)

a population of 10 leopards was estimated to remain in the area^[31]. On 15 April 2009, a local hunter took a blurry picture of a leopard (Fig. 3.1) with his cell phone in the Kharakhinskoe Canyon (Fig 3.2). A camera trap survey was carried out in 2009–2010 in the same region. Although no leopard pictures were obtained, it was concluded, based on reports from local people, that a group of 5–7 leopards was still persisting in the Republic of Dagestan, namely in Andiysko-Bogos and Dultydag-Samur, and it assumed the presence of two females^[29]. These estimates are rather speculative, considering the fact that for almost 20 years, there has been no evidence for the presence of female leopards or reproduction in the entire Greater Caucasus, and one could also assume that the few confirmed leopard observations in recent years were long-range dispersers from the south. Nevertheless, the Republic of Dagestan is the only area in the Russian Caucasus where further surveys seem to be justified.



FIGURE 3.1

Picture of a leopard taken by a local hunter with his cell phone on the 15th of April 2009 in the Kharakhinskoe Canyon, Khunzakhskiy Rayon in Dagestan, Russia (source: Yarovenko 2012 ^[29])



Location of leopard photo in Kharakhinskoe Canyon in Republic of Dagestan (source: Yarovenko 2012 ^[29])

Lesser Caucasus and north-eastern Turkey. In 2004 the leopard population in the Lesser Caucasus was estimated at 18–23 individuals, mainly in southern Armenia and southern Azerbaijan^[12]. Country specific estimates were: a population of 5–8 leopards in Armenia; 10–12 in Azerbaijan; 2–3 in the Nakhchivan Autonomous Republic (counted separately from Azerbaijan); and 5–7 individuals in the Nagorno-Karabakh region (Table 3.1). The numbers in the Nagorno-Karabakh region were tentative at best as surveys in this zone were impossible; the numbers were provided by hunters in this area.

A later publication in 2007 estimated a population of about 50 leopards in the Lesser Caucasus which included the Iranian population^[18]. Although the number may be questioned because the estimation was not based on a robust method, the continued presence of the leopard in the Lesser Caucasus is well documented. The southern Zangezur and Meghri ridge, and the Khosrov Forest State Reserve have repeatedly been found to be important areas for leopards in Armenia^[8]. Indications of leopard presence in Azerbaijan have been found in the Talysh Mountains, Akhar-Bakhar Branch of Ilisu Reserve, Nagorno-Karabakh and Murov-Dagh Mountains and the Zangezur ridge in the Nakhchivan Autonomous Republic^[18].

In Georgia, signs of leopard presence were found in the Vashlovani Nature Reserve between the two Caucasus ranges^[5]. The leopard, a male, was repeatedly pictured between 2004 and 2009^[32] (Fig 3.3). Footprints, most likely from this same leopard were also found in Azerbaijan indicating that he roamed into adjacent areas^[33].

However, in all the years of surveys and the increased awareness of recent times, no confirmed case of reproduction has ever been reported from any of these three countries.

The only area with certain leopard reproduction in the Caucasus for the past twenty years was the Kiamaky Wildlife Refuge in Iran. A female with two cubs was photographed in the refuge in 2009^[34] (Fig. 3.4).

Reproduction in the Kiamaky Wildlife Refuge seems to be consistent; the tracks of a female with two cubs and of a female with one cub in a different part of the wildlife refuge were found by staff of the Department of Environment in winter 2012/13^[35]. It is likely that recent observations further north, in the Nakhchivan Autonomous Republic, Nagorno-Karabakh and in adjacent areas in Armenia were of animals dispersing



Male leopard photographed by a camera trap in Vashlovani Nature Reserve, Georgia (source: NACRES).

FIGURE 3.4



Two leopard cubs photographed by a camera trap in Kiamaky Wildlife Refuge, Iran in 2008. Kiamaky Wildlife Refuge is the only location in the Caucasus with confirmed reproduction. (source: A.Masoud).

FIGURE 3.5



Female leopard camera trapped at an altitude of 1310 m in Nakhchivan Autonomous Republic, 9 September 2012. (source: Avgan et al. 2012^[37]).

from the Kiamaky nucleus. However the status of leopard and wildlife in north-western Iran seems to be generally deteriorating. Surveys in five “leopard priority protected areas” in the Caucasus provinces of Iran confirmed leopard presence in only one, the Kiamaky Wildlife Refuge, where leopard presence was already known from before^[24]. A camera trap study carried out in the Gorkhod and Bekahdeh Reserve resulted in the capture of an adult leopard^[11] but in the Agh Dagh Protected Area, Lisar Protected Area, Arasbaran Biosphere Reserve, and Marakan protected areas no sign of leopard presence was found. However, the surveys in this north-western extension of the Alborz Range have so far not been exhaustive. In some of these parks, wild ungulate populations are declining^[36]. They seem to be under strong pressure from competition with livestock and suffer from dwindling protection from park rangers because of financial problems of the park administration as a consequence of the critical economic situation of the country.

Based on the confirmed presence of leopard in the protected areas in north-western Iran, a survey by means of camera trapping was initiated in Zangezur Mountains in the Nakhchivan Autonomous Republic of Azerbaijan in 2012^[37]. On 9 September 2012, a female leopard was pictured (Fig. 3.5), and since then, many more leopard pictures and video clips have been taken in this region, both in Nakhchivan Autonomous Republic and adjacent southern Armenia^[33]. Three leopards – one male and two females – have been identified from the photos, with these individuals being photographed in both the Zangezur National Park in Nakhchivan Autonomous Republic and in the Arevik National Park in southern

Armenia, confirming that they are moving between the two areas^[38]. These are most likely leopards dispersing from the Kiamaky nucleus in Iran. The confirmed presence of female leopards in the Zangezur Mountains gives hope that these areas will soon see reproduction and a new population nucleus.

The second area with confirmed leopard presence in Azerbaijan is the Hirkan National Park in the Talysh Mountains where several camera trap photos and videos have been taken in recent years and a number of other events have also been reported in the national park and surrounding area (Box 3.1). These pictures showed potentially two different animals, one of which was a male^[33, 39].

While the leopards discovered in the Nakhchivan Autonomous Republic and southern Armenia obviously came from Kiamaky Wildlife Refuge, the leopard in the Hirkan National Park in the Talysh Mountains, is most likely to be the northernmost individual belonging to the Alborz population in Iran. This population stretches along the south shores of the Caspian Sea and east into the Koped-Dag Range between Iran and Turkmenistan. It is currently not known whether leopard migration between the Talysh Mountains and the Kiamaky-Garadagh-Nakhchivan nuclei to the west along a habitat corridor is still possible. The connection between the last reproducing group in the Lesser Caucasus in Kiamaky Wildlife Refuge and the southern population in the Zagros Mountains is however most likely interrupted; there is no recent evidence for leopards immigrating from the south into the Caucasus through corridors.

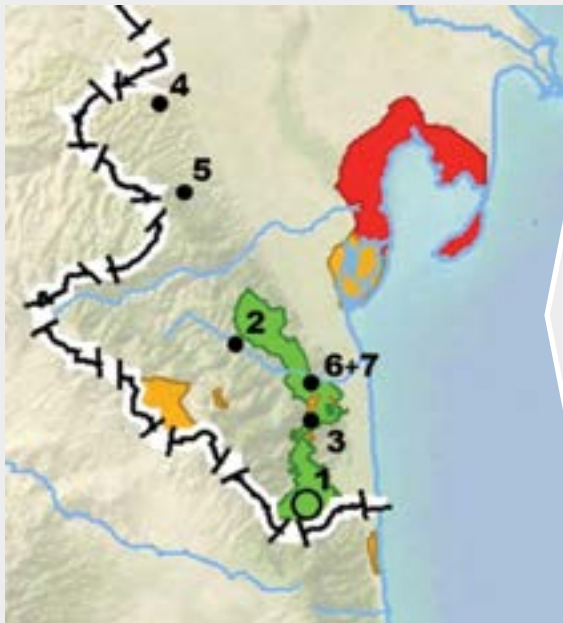


The status of the source populations in Iran is not well known. The most recent status assessment of the leopard in Iran was a nationwide survey in the protected areas^[19]. Over 500 confirmed leopard reports were made between 2007 and 2011, with leopard presence detected in 64 protected areas. In addition a large number of confirmed observations were found outside protected areas, demonstrating the importance of non-protected lands for the presence of leopards. The survey revealed the present distribution of the leopard in Iran, but did not allow for an estimation of the population or an assessment of the trend.

The historic distribution of the leopard includes the north-eastern mountain regions of Turkey^[18]. There have been claims of leopard presence in the Kaçkar Mountains and the eastern Karadeniz Mountains^[40, 41], however they were never confirmed and the presence of leopards nowadays in the Turkish parts of the Lesser Caucasus is unlikely.

BOX 3.1 LEOPARDS AND PEOPLE IN THE TALYSH MOUNTAINS

The spectacular photos and videos recently taken in the Hirkan National Park^[33, 39] have raised the awareness for the leopard in the Caucasus far beyond Azerbaijan. Although recent pictures have only shown the same male leopard, and potentially a second individual, the Talysh Mountains are an interesting region for leopard beyond the national park. Several partly confirmed, partly unconfirmed events in the past years reveal the importance of the Talysh Mountains for leopard conservation:



- 1 Southern Hirkan National Park: Photos and videos of leopards in recent years.
- 2 Hamarmeşe village, Lerik, 2013: Girl allegedly attacked by a leopard^[71]. Case not confirmed.
- 3 Hirkan NP, 2010: Leopard killed by poacher; carcass photographed^[33].
- 4 Gülməmmədli, Jalilabad, April 2009: 17 year old boy injured by leopard^[72].
- 5 Axtaxana, November 2006: Leopard killed by local person who was sentenced^[53].
- 6 Əşlə, Lankaran, 2003: Skeleton of a recently killed leopard found^[33].
- 7 Əşlə, Lankaran, 2002 (?): Skin of a juvenile leopard detected^[33].

In 2010, the tracks of a female with two cubs were found in Hirkan National Park. However, several camera trap pictures taken afterwards showed a male and provided no evidence for the presence of young leopards. Additionally, there were rumours of another leopard killed in Hirkan National Park in 2010, but the case could not be confirmed^[33]. However, there have been many reports indicating that leopards may be more common in the Talysh Mountains than indicated by the pictures taken in the southern part of the national park. The events presented here however also suggest that there is a conflict between people and leopard. A more in depth investigation of people's knowledge and attitudes could help to learn more about the presence of leopard and on how to gain the support of local communities for its conservation.

BOX 3.2 PAST CONSERVATION ACTIVITIES

- 2002 WWF establish leopard conservation programme for the south Caucasus and initiate surveys;
- 2007 Publication of a comprehensive review of the status and conservation needs of the leopard in the Caucasus (7 articles in *Cat News* Special Issue No. 2);
- 2007 Development of the *Strategy for the Conservation of the Leopard in the Caucasus Ecoregion*;
- 2008 Development of the *National Action Plan for Leopard Conservation in Armenia*;
- 2009 Development of the *National Action Plan (2010–2014) for Conservation of the Leopard in the Azerbaijan Republic*;
- 2010 Development of the *National Action Plan for the Conservation of Leopard in Georgia (2010–2014)*;
- 2010 Meeting of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) on “Large carnivores in the Caucasus” with special emphasis on the leopard (Tbilisi, Georgia, 18 May 2010) (Directorate of Culture and Cultural and Natural Heritage 2010);
- 2011 CBC and WWF Workshop Conservation of the Leopard in the Caucasus (Istanbul, Turkey, 7–8 March 2011);
- 2011 Workshop and course on the *Monitoring for the Conservation of the Leopard in the Caucasus Ecoregion* (Tbilisi, Georgia, 16–19 May 2011)
- 2014 IDEA Caucasus Cat Summit (Baku, Azerbaijan, 7/8 May 2014).



▲ Working group during the Regional Conservation Strategy workshop in Tbilisi, Georgia 2007

3.3 CONSERVATION ACTIVITIES IN THE CAUCASUS REGION

Since the leopard was made a flagship species for conservation in the Caucasus in the early 2000s^[7, 42, 43], a number of specific activities and meetings have marked the milestones in leopard conservation (Box 3.2). These began with the WWF Caucasus Programme launching field surveys to assess the status of the leopard populations in the Greater and Lesser Caucasus. The findings of these surveys were summarised in 2007 in a Special Issue 2 of *Cat News* (the journal of the IUCN/SSC Cat Specialist Group) dedicated to the conservation of the leopard in the Caucasus. This review formed the base for the development of the *Strategy for the Conservation of the Leopard in the Caucasus*^[6]. This *Strategy* was the starting point for the development of national action plans for the Caucasus countries.

The *Strategy 2007* presents a long list of threats to the survival of the leopard and obstacles or challenges for the implementation of sensible conservation activities, which are condensed in Box 3.3. Many of the points listed have been addressed in the past years, but it is difficult to gain a complete overview of the conservation activities and of their effectiveness, because there is no common reporting or shared leopard database. Table 3.2 provides an overview of actions carried out in recent years in relation to the objectives identified in the *Strategy*.

Many of the conservation activities proposed in the *Strategy for the Conservation of the Leopard in the Caucasus Ecoregion* are yet to be completed. Most progress has been made on the surveying of sites across the region to determine leopard presence and obtaining information on individual animals to determine their sex and help understand their movements. Progress has also been made on the expansion of the protected area network with new protected areas being created and some existing protected areas expanded. Progress has also been made towards the creation of a new leopard population in the Kavkazsky State Biosphere Reserve north-east of Sochi in the Russian Federation with the creation of a captive breeding and reintroduction programme.

BOX 3.3 MAJOR THREATS TO LEOPARD AND CHALLENGES TO LEOPARD CONSERVATION

1 Threats

- 1.1. Poaching of leopards and prey;
- 1.2. Decline of prey base (poaching, unsustainable harvest);
- 1.3. Deforestation and habitat deterioration (e.g. overgrazing);
- 1.4. Increasing habitat fragmentation through infrastructure development and fortification of international borders;
- 1.5. Conflicts with livestock breeding and agriculture.

2 Challenges

- 2.1. Lack of adequate (ecological) knowledge and monitoring of leopard and prey;
- 2.2. Shortage of local expertise and capacity in wildlife research and wildlife management;
- 2.3. Limited understanding of people's attitudes, leopard-human conflicts;
- 2.4. Lack of public awareness and involvement of local people and stakeholder groups;
- 2.5. Lack of adequate policy and legislation;
- 2.6. Poor law enforcement;
- 2.7. Low international cooperation.

TABLE 3.2: OBJECTIVES AND TARGETS IDENTIFIED BY THE STRATEGY FOR THE CONSERVATION OF THE LEOPARD IN THE CAUCASUS ECOREGION^[6] AND AN ASSESSMENT OF THEIR PROGRESS.

Objectives	Target	Assessment of progress
1. Increase the viability of the known leopard and prey populations in the ecoregion	1.1. Existing leopard and its wild prey populations are secured and stabilized by 2014 in the ecoregion	Generally, wildlife management or protection measures seem to be weakly implemented in protected areas and mostly lacking outside protected areas.
	1.2. Corridors and stepping stones for leopards are secured by 2014 in the ecoregion.	No significant progress in this regard.
	1.3. The existing leopard population in the Caucasus is expanding significantly – by at least 1/3 – by 2017	
2. Complete survey for leopards and wild prey of the entire ecoregion and establish a joint, standardized monitoring system and research programme and central database	2.1. Survey of leopards in the ecoregion is completed by 2010	No systematic surveys have been conducted. However much effort has been spent searching for the leopard in locations across the region primarily with the use of camera traps. These camera trap deployments have confirmed records of leopards in a number of locations and are enabling the identification and sexing of individuals animals and documentation of their movements. Data were collected by questionnaires to leopard experts from each country for a leopard conservation workshop during the Caucasus Biodiversity Council meeting in Istanbul, Turkey, 7-8 March 2011.
	2.2. A joint, standardized monitoring system is completed and launched by 2010	No standardized monitoring system has been developed as yet. Camera trap surveys have been carried out in some locations but most of these have not been done in a systematic way and study design parameters have not been disseminated, therefore effort (number of trap nights) and success rate (number of leopard pictures) cannot be assessed. The state of knowledge of wild ungulates, the main prey base of the leopard, is poor. None of the Caucasus countries have established a reliable monitoring system for wild ungulates, and hence all assessments of the situation of the leopard's prey population are based on assumptions. A joint research programme on leopards and its wild prey is yet to be launched.
	2.3. A joint research programme on leopards and its wild prey is launched by 2010	
3. Promote the creation of new leopard populations through reintroduction where feasible	3.1. The feasibility of reintroducing leopards is assessed according to IUCN standards by 2010	A proposed workshop to “critically review possible approaches to enhance leopard populations” has not taken place. However, the Ministry of Natural Resources and Environment of the Russian Federation and partners have launched a programme to reintroduce the leopard into the Kavkazsky State Biosphere Reserve north-east of Sochi (Russia) ^[73] , an IUCN Category I-a reserve consisting of over 6,500 km ² of pristine landscape and along with other neighbouring reserves comprising some 10,000 km ² of protected lands. This is one of the last strongholds for the leopard identified in the 1950s ^[9] . The project aims to do a soft release of leopards which are born, raised and allowed to develop natural behaviours in a special breeding centre. The breeding pairs will come from both the wild and from zoos. To date, the centre has received four wild leopards (two males from Turkmenistan and two females from Iran) and a pair from Lisbon Zoo as part of the European Zoo and Aquarium Association's (EAZA) breeding programme. The two first litters of kittens were born in 2013. No leopards have been released to the wild as yet.

Objectives	Target	Assessment of progress
4. Establish an effectively managed network of protected areas and corridors for the conservation of leopard throughout the ecoregion	4.1. Regional plan of PA and corridors network for leopard conservation is prepared and adopted by relevant governmental organisations of ecoregion countries by the end of 2009	No regional plan for protected areas and corridors has been prepared, but some new protected areas have been created in the ecoregion countries.
	4.2. At least one new PA per ecoregion country for leopard conservation is established or expanded by 2010	Since 2000, the number and size of protected areas have expanded considerably. New protected areas in Azerbaijan since 2000 include Hirkan National Park (2003, expanded 2008), Shirvan National Park (2003), Ordubad National Park (2003) in Nakhchivan Autonomous Republic which was expanded and renamed Zangezur National Park in 2009, and Shahdagh National Park (2006, expanded 2010).
	4.3. At least one corridor per ecoregion country for the leopard conservation is legally protected by 2010	Georgia has created the Pshav-Khevsureti Protected Areas with total area of more than 100,000ha in potential leopard habitat in the Greater Caucasus bordering Tusheti National Park and the Degestan-Chechenia-Ingushetia section of Russia, expanded Lagodekhi Nature Reserve and Tusheti National Park in the Greater Caucasus Range and Vashlovani Nature Reserve in the central part of the plateau, and Mtirala and Javakheti national parks in the Lesser Caucasus. Armenia has newly established the Lake Arpi National Park in the north and Arevik National Park and Zangezur Sanctuary in the south. In the latter two, leopards have recently been observed. In Russia, the Caucasus State Biosphere Reserve and the Teberda Biosphere Reserve east of Sochi are planned to be merged, giving rise to the largest contiguous protected area in the ecoregion. In the east, the Erzi reserve was considerably expanded. Turkey has established two new national parks in the Caucasus region in 2004, Agri Dagh National Park and Sarıkamı Allahuekber Daglari National Park.
	4.4. Key Protected Areas in leopard habitats are effectively managed by 2010	No specific management guidelines for leopard conservation have been prepared as yet. The maintenance and management of protected areas in the central Caucasus countries is presently supported by the Caucasus Nature Fund established through an initiative of the German Government, KfW Entwicklungsbank (Germany), WWF and Conservation International. These organisations are supported by several other international and national financial institutes. The CNF supports many PAs which are important for the leopard and its future recovery.
5. Improve management of leopard habitats outside of protected areas	5.1. Most important areas of leopard distribution outside Protected Areas are sustainably managed by the end of 2010	Little information is available to assess this. However it appears that wildlife management and protection outside of protected areas is weakly implemented or lacking.
	5.2. Knowledge of local communities and officials on leopard and its habitats are increased for sustainable use of natural resources in their surroundings in collaboration with relevant stakeholders by 2010	
	5.3. Model projects for sustainable use of natural resources and alternative income generation are in action by 2009	
6. Ensure long term support to and from local communities for the leopard and wildlife conservation	6.1. By 2012 social-economic programmes elaborated and implemented at least in 50% of groups of communities in and around leopard habitats	Little information is available to assess this. However it appears that wildlife management and protection outside of protected areas is weakly implemented or lacking.

Objectives	Target	Assessment of progress
7. Endogenous conservation of natural resources and sustainable livelihoods are complementing each other	7.1. Vibrant and effective customary institutions are capable of conserving natural resources and supporting sustainable livelihoods	The activities listed under this objective have not yet been implemented.
	7.2. Traditional knowledge for biodiversity conservation is revived in at least 50% of the community clusters identified in 6.1.1 and in the service of conservation and sustainable livelihoods by 2012	
	7.3. Sustainable livelihoods ensured for at least 30% of the clusters of communities defined in 6.1.1. in and around leopard habitats by 2012.	
	7.4. Equitable compensation mechanisms for loss of livelihood due to human-leopard conflict for the communities in and around the key habitat of the leopard are in place by 2012	
8. Awareness on the conservation of the leopard in the Caucasus is improved in all stakeholder/rightholder groups at all levels	8.1. By 2011 at least 80% of decision makers and authorities are aware and actively supporting the conservation of the leopard in each country of the Caucasus	The activities listed under this objective have not yet been implemented.
	8.2. By 2011 at least 50% of communities in the leopard habitat area identified in 6.1.1. are aware and actively supporting the conservation of the leopard in each country of the Caucasus	
	8.3. By 2011 at least 30% of mass media representatives, NGOs, scientific institutions, universities and other groups of civil society are aware and actively supporting the conservation of the leopard in each country of the Caucasus	
9. Strengthen international cooperation in leopard conservation	9.1. Illegal trans-border trade of leopards and derivatives is stopped	Cooperation on biodiversity issues among the six countries is coordinated by the Caucasus Biodiversity Council (CBC), a body created in 2004, initiated and assisted by the WWF Caucasus Programme Office. The CBC consists of officially nominated governmental representatives and NGO delegates (mainly from the national WWF offices) from all six countries. The CBC has specifically discussed leopard conservation at several meetings (e.g. during the meeting in Istanbul in March 2011), but have so far had little influence on the national policy in wildlife conservation. The governmental involvement (or interest) in the CBC appears rather weak, and NGOs with the exception of the WWF do not play a major role. Most international cooperation (e.g. in regard to transboundary protected areas) in the Caucasus are based on bilateral rather than multilateral approaches. The Bern Convention, ratified by four of the six Caucasus countries, has initiated a workshop on large carnivore conservation and financially supported a monitoring course.
	9.2. International memorandum(s) on leopard conservation in the Caucasus ecoregion is signed as feasible considering current political situations	
	9.3. Expert group for coordination of conservation and research work on leopards in the Caucasus form	
10. Optimize existing legislation and if necessary develop new legislation	10.1. Existing legal frameworks analyzed by 2010	The activities listed under this objective have not yet been implemented.
11. Secure funding for all conservation activities for the leopard in the Caucasus	11.1. Funds secured from international and national organizations for financing work on the conservation of the leopard	Whilst some funds have been obtained for some activities there is still a substantial funding gap.



SECTION 4

A SCENARIO FOR THE RECOVERY OF THE LEOPARD IN THE CAUCASUS AND IN AZERBAIJAN

4.1 RESTORING THE LEOPARD POPULATION IN THE CAUCASUS

Long-term goal of the leopard conservation programme

The leopard conservation programme in the Caucasus must ultimately lead to re-establishing viable leopard populations in the Lesser and the Greater Caucasus, linked to each other and connected to the source populations further south (Zagros Mountains) and south-east (Alborz Mountains). The *Strategy for the Conservation of the Leopard in the Caucasus Ecoregion*⁵¹ has defined the following overarching Goal:

“Ensure the conservation and sustainable management of viable meta-populations of leopard and wild prey and their habitats, and build sustainable coexistence mechanisms with local communities across the Caucasus ecoregion.”

However, the situation of the leopard in the Caucasus is presently so critical that the conservation programme can no longer solely concentrate on maintaining the leopard population, but must consider ways to bring the leopard back. With exception of the “Kiamaky nucleus” at the southern edge of the Lesser Caucasus, all survey efforts during the past two decades have failed to confirm any leopard reproduction in the Caucasus. Long-range dispersers have the potential to show up at almost any point of the Caucasus, as was demonstrated by the male in Vashlovani Nature Reserve in Georgia. Such isolated leopards are important because they provide information about corridors and suitable living space. What is however ultimately needed is the presence of resident reproducing females at the centre of thriving population nuclei. As females of cat species are much more conservative dispersers than males, they may not be able to reach isolated patches of suitable habitat even if male leopards show up there from time to time. In such cases, assisted recolonisation by means of translocations and reintroductions needs to be considered. A first leopard reintroduction programme has been launched in the Kavkazsky State Biosphere Reserve north-east of Sochi (Russia; see Table 3.2; Figure 4.1). The project is still in its early stage, but will, if it succeeds, provide a new tool for the recovery of the leopard in the entire ecoregion.

FIGURE 4.1



The leopard breeding centre near Sochi, Russia. The centre consists of several breeding pens and four large enclosures (left side of the photo) where young leopards will be trained to live in the wild (source: WWF Russia).

General approach and programme phases

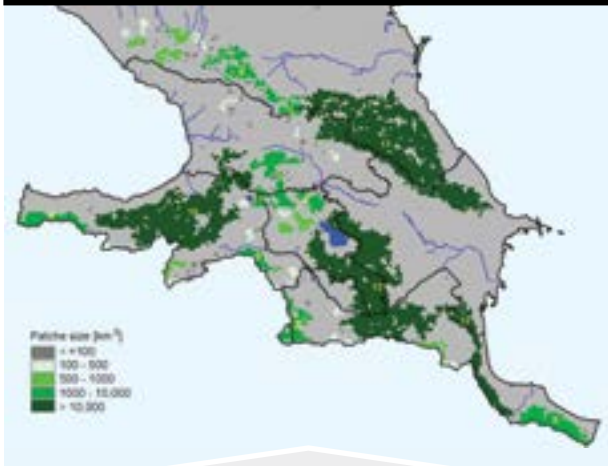
Restoring a leopard meta-population in the Caucasus will require a long-term programme consisting of several components. First, the survival of the remnant nuclei along the southern rim of the ecoregion needs to be secured in order to prevent the extinction of the leopard in the ecoregion. Recent findings especially in the Nakhchivan Autonomous Republic and the Zangezur Mountains gives hope that this will be possible. Second, the leopard population in the Caucasus must be restored. While this might be possible by means of natural recolonisation in the Lesser Caucasus, assisted recolonisation through reintroduction projects will be required in the Greater Caucasus. Third, the source populations in the Alborz Mountains (Iran) and the Zagros Mountains (Iran, Iraq and Turkey) and their connectivity with the Caucasus must be maintained. This will ensure leopards can immigrate into the Caucasus population from the south and the east and maintain gene flow between these areas.

These tasks need to be tackled simultaneously and hence need to be coordinated and all parties need to work towards commonly agreed goals. The implementation of such an ambitious and long-term conservation programme requires a constructive cooperation between all countries of the ecoregion. It is currently the responsibility of Azerbaijan and Iran to save the last remaining leopards in the Caucasus. This requires cross-border cooperation both in the Talysh Mountains and in the Kiamaky-Zangezur region. The Sochi reintroduction project in the north-western Caucasus will hopefully create a new leopard population at the edge of the ecoregion and hence start the recolonisation from the north-west. All other countries sharing the Caucasus need to prepare the ground for the return of the leopard by maintaining or recovering habitat and prey populations, securing the connectivity between habitat patches, addressing threats and ensuring the support of local people for these efforts.

4.2 A REGIONAL APPROACH TO LEOPARD CONSERVATION IN THE CAUCASUS

The meta-population concept implies that the whole Caucasus leopard population is split in several subpopulations which may be connected to each other through corridors. A habitat suitability modelling exercise identified 12 patches of suitable habitat larger than 1,000 km² that could host leopard subpopulations^[44] (Fig. 4.2).

FIGURE 4.2

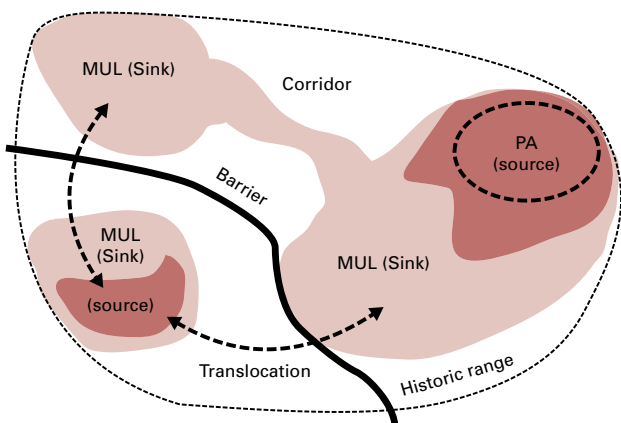


Patches of suitable habitat for leopards as identified by Zimmermann et al. 2007^[44]. 12 patches are >1,000 km² and can be considered potential subpopulations, whereas smaller patches may act as “stepping stones” and facilitate the migration of leopards between subpopulations.

If we suppose a modest average leopard density of 1 resident individual per 100 km² (Table 2.1), these 12 habitat clusters could together host roughly 1,200 leopards, with subpopulation size ranging from 10–330 individuals^[44]. With scattered habitat patches acting as “stepping stones” between the large clusters, the total meta-population could consist of more than 1,200 leopards. This is a conservative estimation, as the assumed density of 1 leopard/100 km² may be higher if habitat and prey base are adequate. Moreover, the habitat model may be too pessimistic in the north-western Caucasus because leopard presence data were mainly from the eastern and southern parts^[44]. Another habitat model published in 2008^[16] predicts a higher share of suitable habitat in the western part of the Greater Caucasus, but this model is too general for the Caucasus ecoregion as it modelled leopard distribution for all south-western Asia including the Arabian Peninsula.

The *Caucasus Ecoregional Conservation Plan* defines as a long-term target to establish “an effectively managed leopard conservation landscape consisting of protected areas and connecting corridors”^[7]. Most protected areas are however too small for even a leopard subpopulation. Hence a “conservation landscape” concept must also take into consideration suitable habitat in the multi-use areas outside protected areas, which may still host leopards, although not at the same density as inside protected areas^[45] (Fig. 4.3).

FIGURE 4.3



A spatial concept for the conservation of species requiring large areas to maintain viable populations. Strongholds, or source populations, are found in protected areas (PA, dark red). The species is also present in suitable habitat in the multi-use landscape (MUL, light red) outside of protected areas but at a lower density because, for example, the prey supply is not as good as in the protected areas. Subpopulations are separated by unsuitable habitat (white) and barriers, but connected through corridors. If two subpopulations cannot be connected through a corridor, assisted dispersal and recolonization (translocations, broken arrows) should be considered. Adapted from Breitenmoser et al. 2012^[45].

Considering the present status of the leopard (Chapter 3), ongoing conservation projects, models and the potential for its recovery, we can outline a broad approach for the long-term conservation programme of the leopard in the Caucasus. Fig. 4.4 explains this concept in a semi-explicit spatial model; known population nuclei in the south-east and the reintroduction project in the north-west are correctly located, corridors shown and new population nuclei proposed are consistent with the wildlife corridors and the priority conservation areas presented in the *Ecoregional Conservation Plan for the Caucasus*⁷¹.

A recovery and conservation programme for the leopard in the Caucasus should contain the following elements:

- a) The first priority is the strict protection of the remnant population nuclei in the Kiamaky-Zangezur region (number [1] in Fig 4.4) and in the Talysh Mountains [2]. Maintaining these local populations is of utmost priority, as they are currently the only sources for a natural recolonisation of the Caucasus. While reproduction was confirmed in Kiamaky Wildlife Refuge (Iran), the status of the regional population in the Talysh Mountains is not known. Leopard presence was confirmed for the Hirkan National Park (Azerbaijan), but the situation on the Iranian side needs to be surveyed.

FIGURE 4.4



Spatial model for the recovery of the leopard in the Caucasus. Solid circles indicate specific locations, or spatially explicit actions, broken line circles indicate tentative or spatially not explicit areas for conservation actions. Numbers indicate: 1 = reproducing nucleus in Kiamaky Wildlife Refuge/Zangezur range in Nakhchivan (AZ) and southern Armenia; 2 = Talysh Mountains (Hirkan National Park) with confirmed leopard presence; 3 = areas for potential natural recolonisation; 4 = reintroduction in Kavkazsky Biosphere Reserve (Sochi); 5 = tentative reintroduction areas ("stepping stones"); 6 = Alborz Mountains population; 7 = Zagros Mountains population. The circle with the question mark indicates the area in Dagestan where the situation is unclear. Solid line corridors adapted from the *Ecoregional Conservation Plan for the Caucasus*. (source: Williams et al. 2006⁷¹)

- b) A revitalised population nuclei in Kiamaky Wildlife Refuge has the potential to expand into neighbouring areas, such as into the Marakan Protected Area (Iran), the Zangezur National Park (Nakhchivan Autonomous Republic, Azerbaijan) and along the Zangezur Mountains further north to the Khosrov Forest State Reserve and the Yeghegnadzor Sanctuary in Armenia [3]. It is also important to secure the connectivity between the Kiamaky-Zangezur nucleus and the Talysh Mountain nucleus which will require the maintenance of a corridor through Arasbaran Biosphere Reserve in Iran (tentative corridor between [1] and [2]) to the Hirkan National Park in Azerbaijan or further south to Lisar Protected Area in Iran. Marakan Protected Area, Arasbaran Biosphere Reserve and Lisar Protected Area are priority leopard protected areas in Iran, but leopard presence has not been confirmed in these areas in recent years^[24].
- c) The spontaneous recovery of the leopard population in the entire Caucasus under the current circumstances is unlikely. The reintroduction project in the Kavkazsky State Nature Biosphere Reserve north-east of Sochi [4] is therefore of prime importance. It will create a new population nucleus in the north-west that could be the starting point for the recolonisation of the Greater Caucasus. It is also testing a new approach in leopard conservation from which lessons can be taken and applied to other reintroduction programmes.
- d) When bridgeheads in the south-east (Kiamaky-Zangezur region and the Talysh Mountains) and north-west (Kavkazsky State Nature Biosphere Reserve) of the Caucasus region are established, the spread of the leopard across the Lesser and the Greater Caucasus has to be facilitated by creating additional population nuclei as stepping stones through translocations or reintroductions. Such stepping stones [5] should be at junctions of possible wildlife corridors, to make sure that dispersing animals meet conspecifics. The sites of further reintroductions or translocations will need to consider the up-to-date progress of the recolonisation, and above all the suitability of the site. A potential site for leopard reintroduction needs to guarantee (1) adequate habitat and sufficient prey, (2) backing from local people, and (3) connectivity to neighbouring extant or potential population nuclei. Favourable conditions may need to be created, hence conservation work in a possible reintroduction site will need to start long before the first leopards are released.
- e) Finally, the success of the recovery of the leopard in the Caucasus depends on the strength of the source populations in the Alborz Range [6] and in the Zagros Mountains [7] and Iran as a whole. Without a constant flow of dispersers from the south, the weak nuclei in the south-eastern Lesser Caucasus is not likely to survive. While the Alborz population seems to be still healthy in the east (e.g. Golestan National Park^[46]), its status is less certain in the regions adjacent to the Talysh Mountains. Conservation efforts in the Caucasus provinces in Iran and in the Alborz Mountains are of high significance for the Caucasus leopard recovery. The situation in the Zagros Mountains is even less known. Information is scarce especially from Iraq and Turkey, but the connection to the Caucasus is most likely broken.



▲ Landscape in Nakhchivan Autonomous Republic (© KORA/WWF)

4.3 THE ROLE OF AZERBAIJAN IN THE CONSERVATION OF THE LEOPARD IN THE CAUCASUS

Azerbaijan's contribution to the recovery of the leopard in the Caucasus is three-fold: (1) securing the survival of the remnant population nuclei in the Lesser Caucasus and facilitating their natural expansion, (2) supporting the recolonisation of the Greater Caucasus, and (3) establishing a wildlife corridor between the Lesser and the Greater Caucasus.

- 1) The presence of leopards was recently confirmed in Nakhchivan Autonomous Republic (number [1] in Fig. 4.5) and Hirkan National Park in the Talysh Mountains^[3]. Nakhchivan, with relatively well-protected prey populations, has the potential for a breeding leopard population in Zangezur National Park (formerly Ordubad National Park) along the western slopes of the Zangezur Mountains. Nakhchivan has, according to the habitat model^[44] some 1,565 km² of suitable habitat, and hence offers living space for a small but important group of resident leopards. From there, the animals could eventually spread into the suitable habitats of Nagorno-Karabakh, which has the largest cluster of suitable leopard habitat in Azerbaijan (more than 8,000 km²; number [2] in Fig. 4.5). The Talysh Mountains have about 1,800 km² of suitable habitat for leopards in the Hirkan National Park, the Zuvand Sanctuary and beyond^[44] and would hence offer space for about 20 resident leopards. If this nucleus can be strengthened, it would provide an important stronghold able to secure the connectivity towards the south into the Alborz population and westwards to the Kiamaky-Zangezur nucleus. In both situations, Azerbaijan would need to cooperate closely with Iran. The information currently available (see also Chapter 3) suggests that through a well-designed cross-border conservation programme in these two nuclei, the survival of the leopard in the south-eastern region of the Caucasus could be secured.
- 2) Another large area of suitable habitat of almost 6,500 km² stretches along the Basqafqaz and Qaytarqoca Mountains [4] along the southern foothills of the Greater Caucasus. This habitat patch is the south-eastern extension of the large area of suitable habitat in the Republic of Dagestan. There is no evidence for any leopard presence in the Azeri part of the Greater Caucasus, and the probability of a natural recolonisation of this area is extremely low. Hence this is the site in Azerbaijan where a reintroduction project would be most appropriate. Such a reintroduction should and must work very closely with the European breeding

programme as a long term source of leopards for breeding. The information presently available on suitable habitat, prey density, human impacts and attitudes does not allow an assessment of the suitability of the area for a reintroduction project and further in depth investigations are needed to produce a detailed plan for the reintroduction of the leopard in the northern ranges of Azerbaijan.

- 3) A major challenge is the connectivity between the Greater and the Lesser Caucasus. The main wildlife corridors connecting the two ranges, identified in the *Ecoregional Conservation Plan for the Caucasus*^[7], pass through Georgia, inclusive of the Vashlovani Nature Reserve. There is a long and narrow corridor in Azerbaijan along the Varvara-Barda and the Sarybash–Alazani–Ganykh Corridor, but this is unlikely to be functional for leopards and most probably inadequate for a natural recolonisation of the northern range. At the moment, a more realistic scenario is that conservation efforts in Azerbaijan should concentrate on recovering and maintaining two separate leopard populations, one in the south and one in the north. Once these populations are demographically viable, occasional dispersing animals between the two populations may secure the genetic viability. Nevertheless, a more detailed habitat model for the leopard in Azerbaijan is needed to be able to make a more definite prediction of dispersal routes and for recommendation regarding habitat protection.

FIGURE 4.5



Distribution of suitable leopard habitats (green) in Azerbaijan (source: Zimmermann et al. 2007^[44]). The regions concerned are **1** Nakhchivan Autonomous Republic (suitable habitat 1565 km²), **2** Nagorno-Karabakh (8070 km²), **3** Talysh Mountains (1804 km²), and **4** Basqafqaz/Qaytarqoca Range in the Greater Caucasus (6449 km²). Yellow polygons show protected areas.

SECTION 5

FRAMEWORK FOR THE CONSERVATION OF THE LEOPARD IN AZERBAIJAN

In order to determine the feasibility of the restoration of the leopard in Azerbaijan it is necessary to understand the situation in the country as pertaining to leopard conservation. The key aspects considered here are whether relevant legislation to support wildlife protection exists, ongoing wildlife and habitat protection programmes, including activities specific to leopards, the status of leopard prey species in the country and attitudes of local people to leopards.

5.1 RELEVANT LEGISLATION

The leopard, listed as Endangered in the IUCN Red List of Threatened Species at the subspecies level (*Panthera pardus saxicolor*), is also listed in *The Red Data Book of Azerbaijan*^[47]. The hunting of leopards in Azerbaijan was formally prohibited in 1967.

All environment-related legislation within Azerbaijan is implemented by the Ministry of Environment and Natural Resources (MENR). The country has a suite of relevant legislation to support the protection of the environment, much having come into force in the last few years^[48]. These include: “Concerning environmental protection” (June 8, 1999), “Concerning the protection of animals” (June 4, 1999), “Concerning ecological education and public awareness” (January 27, 2003), and “Concerning the hunting” (April 20, 2009).

Legislation specific to leopards also exist. In 1999, legislation was passed to protect the genetic diversity of captive and free living leopards (Law of the Azerbaijan Republic No. 675-IQ of June 4, 1999). In 2000, the “Implementation of the Law of Fauna” was signed (Law of the Azerbaijan Republic No. 294 of March 6, 2000). In 2004, the penalties for hunting leopards were formalised (Article 3.1 of the Decree of the Azerbaijan Republic Cabinet of Ministers No. 176 of November 6, 2004), describing types, degrees and rules of payments for animal life use and illegal hunting^[6]. Decree No. 176 within Law No. 94 states that the hunting of leopards is banned and can result in a penalty of 3,300 AZN (ca. €3,110) and if killed in a PA, the fine is doubled or tripled to 6,600 – 9,900 AZN^[33].

A national programme for the restoration and extension of forests came into force in 2002 and the National Biodiversity Strategy and Action Plan (NBSAP) was accepted in 2006^[46]. Other protective measures at the national level include the establishment of a protected area network and corridors linking these protected areas^[6].

Azerbaijan is party to a number of international treaties related to the conservation of biodiversity and the environment, most of which were signed between 1998 and 2001, e.g. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; 1998), Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention; 1999) and the Convention on Biological Diversity (CBD; 2000)^[49] (Box 5.1). Azerbaijan is also a signatory of the Convention on the Conservation of Migratory Species of Wild Animals for the Siberian Crane *Leucogeranus leucogeranus* (CMS; 1998).

BOX 5.1 INTERNATIONAL TREATIES

Azerbaijan is party to a number of international treaties on the conservation of biodiversity and the environment:

CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) ensures that the international trade in specimens of wild animals and plants does not threaten their survival. It contributes to the conservation and sustainable use of wildlife species. Azerbaijan became a signatory state in 1998.

Bern Convention

Convention on the Conservation of European Wildlife and Natural Habitats. The Bern Convention is a binding international legal instrument in the field of nature, aiming to conserve wild flora and fauna and their natural habitats and to promote European co-operation in that field. Azerbaijan signed the Berne Convention in 1999.

CBD - Convention on Biological Diversity

The Convention on Biological Diversity (CBD) has 3 main objectives: (1) the conservation of biological diversity, (2) the sustainable use of the components of biological diversity and (3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Azerbaijan became a Party in 2000.



5.2 THE NATIONAL ACTION PLAN FOR THE CONSERVATION OF THE LEOPARD

The *National Action Plan (NAP; 2010–2014) for Conservation of the Leopard in the Azerbaijan Republic*⁶¹ was developed in 2009 to implement the aims and objectives of the *Strategy for the Conservation of the Leopard in the Caucasus Ecoregion*⁶¹ at the national level and in cooperation with local and international governmental organisations, non-governmental organisations, scientific and local communities and all other relevant stakeholders in Azerbaijan. The NAP addresses all aspects of leopard conservation: monitoring (leopard and prey species); legislation, protected areas network; involvement of local communities; and funding.

Whilst some progress has been made on the implementation of the NAP, especially with regards to surveying areas for leopard signs, many of the activities proposed in the NAP have not yet been implemented apparently due to a combination of a lack of capacity and available funds. Table 5.1 summarises the objectives and targets in the NAP and the status of their implementation.

TABLE 5.1: PRIORITY ACTIONS IDENTIFIED IN THE NATIONAL ACTION PLAN FOR THE CONSERVATION OF LEOPARD IN AZERBAIJAN^[6] AND AN ASSESSMENT OF THEIR PROGRESS.

Purpose	Activity	Status
1. Investigation and monitoring of leopard and its wild prey populations – different herbivores (i.e., red deer, bezoar goat, mouflon, wild boar, roe deer, tur, chamois and etc.) in leopard's habitats	1.1 Analyze both leopard and wild prey populations statuses in the country	Regular camera trapping surveys have been established in three key areas of Azerbaijan supported by the Ministry for Ecology and Natural Resources and WWF: Zangezur National Park, Nakhchivan Autonomous Republic, (by the Institute of Bioresources), Hirkan National Park in the Talysh Mountains (with support of locals) and Akhar-Bakhar Branch of Illisu reserve (by PA staff).
	1.2. Develop a standardized methodology for leopard monitoring	Four biologists from the Institute of Bioresources, Nakhchivan Branch of the Azerbaijan National Academy of Sciences were trained in camera trapping in 2011 in a joint WWF, KORA and the IUCN/SSC Cat Specialist Group project ^[37] . These biologists are currently carrying out surveys in Nakhchivan Autonomous Republic for WWF-Azerbaijan.
	1.3 Train specialist from Protected Areas (PA) to carry out monitoring activities and involve volunteers from scientific institution in leopard monitoring and conserving activities	Although the pictures taken have increased the national and international awareness and much data has been gathered on the presence of other species as well as leopards, the pictures so far only allow for a “minimum count” i.e. the number of individually identified leopards. So far, no standardised and repeatedly applied protocol for systematic monitoring of these areas has been established.
	1.4. Implement a long-term monitoring program for leopard and its wild prey populations in relevant areas (i.e., Hirkan and Ordubad National Parks, Alazan-Mingechaur zone, etc.)	Annual ungulate surveys are carried out in the Zangazur National Park (formerly Ordubad National Park), Hirkan National Park, in other protected areas and in principle also outside protected areas, but the results have not been published.
	1.5. Create a baseline for monitoring leopard populations based on information collected from countries of the Caucasus Ecoregion	A conservation monitoring course for conservation managers and scientists from all Caucasus countries was delivered in 2011, and a manual on monitoring methods of ungulates was prepared by P. Weinberg on behalf of WWF and GIZ in 2013 ^[74] . However MENR staff responsible for monitoring in protected areas have not yet implemented these protocols. In the protected areas, the monitoring is in principle carried out every year while it is done once every 2–3 years outside protected areas together with other types of monitoring, e.g. air pollution, water pollution, waste, but information to assess the methods or the results is not available ^[33] .
2. Development of legal basis for protecting leopard and its habitats	2.1. Develop amendments and addendums to the legislation in order to increase the effectiveness of leopard conservation	Amendments to the current legislation as proposed in the NAP have not yet been made. For example, a legal basis for implementing the conservation of corridors has not yet been put in place.
	2.2. Create the legal basis for implementing conservation corridors	
3. Ensure protection of leopard and its wild prey in areas of their distribution (Hirkan and Ordubad National Parks, Alazan-Mingechaur areas and etc.)	3.1. Establish, training and equip anti-poaching brigades in Hirkan and Ordubad National Parks, Alazan-Mingechaur areas, etc.	Anti-poaching brigades have not yet been trained or posted in the different PAs due to the current law (which states that only police and armed forces are allowed to take part in such actions). MENR has instructed related departments to ban the use of toxic chemicals not only in the PAs but also within the buffer zones around them.
	3.2. Prevent and prohibit the use of toxic chemical substances, fertilizers, etc. in habitats (especially in the forests) where leopard and its wild prey live	Management plans have so far only been prepared for some protected areas with national park status in Azerbaijan. Therefore protected areas of other categories such as Illisu State Reserve, and Turyan-chay State Reserve do not yet have management plans, and Zangezur National Park (formerly Ordubad National Park) is still lacking a management plan.
	3.3. Develop and update Management Plans for PA where leopard populations live	Ranger stations for anti-poaching activities have been built but other forms of infrastructure and equipment are still lacking in most protected areas.
	3.4. Develop infrastructure and equipment in PA according to their Management Plans	

Purpose	Activity	Status
4. Restore and increase the numbers of leopard and its wild prey	4.1. Conduct a feasibility study for the reintroduction of leopards into historical ranges with the involvement of International Union for Conservation of Nature (IUCN) cat specialists' group	The MENR has stated that the reintroduction of leopard is no longer on their agenda. This activity was included in the NAP because in 2009 (when this plan was prepared), it was believed to be necessary because MENR was not aware of remnant populations of leopards in Azerbaijan. In 2010, the tracks of a female with two cubs were found at Hirkan National Park, suggesting that reproduction may occur in the area; due to this new evidence MENR has decided to put the leopard reintroduction program on hold. However, camera-trap photos taken since this time provide no evidence for the presence of young animals.
	4.2. Develop reintroduction programs, when necessary, of leopards and its wild prey into historical ranges with participation of the SSI/ IUCN, Cat, Reintroduction Groups	IDEA, MENR, WWF and the Heydar Aliyev Foundation, have launched a reintroduction programme of Goitered gazelle <i>Gazella subgutturosa</i> from Shirvan National Park to north-eastern Azerbaijan (Akhar-Bakhar section of Illisu reserve, Gakh Sanktuary and Korchay reserve) and Vashlovani National Park (Georgia), all potential leopard habitats.
	4.3. Starting implementation of reintroduction programs	
5. Establishment of the PA Network, including the enlargement of existing PAs, for improving leopard conservation in Azerbaijan	5.1. Develop a PA system plan in leopard's range for planning the PA Network of the Republic of Azerbaijan	Some of Azerbaijan's protected areas are in (potentially) important leopard habitats, but they are not yet connected through corridors so a fully functional network of protected areas does not yet exist. Hirkan National Park in the Talysh Mountains and Zangezur National Park in Nakhchivan Autonomous Republic, both areas where leopards have recently been recorded, have been increased in size.
	5.2. Increase the territory of the PA system to maximize the covering area of identified and potential leopard habitats and migration ways (e.g., corridors, stepping stones, etc.)	Azerbaijan and Iran have been discussing establishing an UNESCO World Heritage site in the Talysh and Alborz Mountains by protecting a new area of 800 km ² on the Iranian side, making it into a cross-border protected area of about 1,600 km ² .
	5.3. Start works for creating a transboundary PA network	
6. Involvement of local communities in conservation activities for leopards	6.1. Identify target groups and develop special programs for involving local people in conservation activities for leopards	Activities involving local communities in leopard conservation have not yet been developed or implemented.
	6.2. Implement activities, identified in the special program	
7. Acquirement of required financial recourse for implementing the National Action Plan	7.1. Involve local and international organizations, as well as business sector for financing leopard conservation activities	WWF and IDEA are supporting the implementation of the NAP in Azerbaijan. However the feasibility study for the creation of a National Fund for leopard conservation has not yet been carried out.
	7.2. Conduct a feasibility study for creating the National Fund for leopard conservation (with participation of the international experts)	

5.3 PROTECTION OF LEOPARDS AND THEIR HABITATS

Economic problems following the fall of the Soviet Union led to uncontrolled logging and poaching as well as grazing livestock inside and outside of protected areas. The Government of Azerbaijan and the MENR have, over the past years, increasingly addressed the loss and fragmentation of suitable habitats for wildlife. The implementation of these measures will improve the conditions for leopard conservation so it is important that the protected area network is functional.

Suitable leopard habitat in Azerbaijan is found both within protected areas and outside. Whilst protected areas provide the cornerstone of conservation activities, due to the large territories required by leopards, they alone are not adequate to protect a viable population of leopard so protection of leopards and their habitat must take place across the whole landscape and not just in isolated protected areas.

A number of protected areas have been established across Azerbaijan, the oldest one established in 1928, with the purpose of protecting the flora and fauna of the region^[48] (Fig 5.1). There are several types of protected areas with different purposes in Azerbaijan⁴⁹ (Box 5.2).

Today, 11.3% of the Azerbaijani territory is under protection as national parks (9), nature reserves (11) and sanctuaries (24). Ordubad National Park and the Qakh Sanctuary were established in 2003 and Hirkan National Park in 2004. The most recently declared protected area in leopard habitats was Arpachay Wildlife Sanctuary

in 2009. The area under protection in Azerbaijan has considerably increased since 2000 and is now approximately 8,320 km² (Fig. 5.2; Table 5.2).

Some of the protected areas are in (potentially) important leopard habitats, but they are not yet connected through corridors, hence a functional network of protected areas does not yet exist. In the area of recent leopard presence, Hirkan National Park was enlarged from 210 km² to 403 km² in 2008 and Ordubad National Park in Nakhchivan Autonomous Republic was expanded to 428 km² and renamed Zangezur National Park in 2009.

Cross-border protected areas could play an important role in leopard conservation, as they are often located in areas also important for the dispersal of leopards. Azerbaijan and Iran have been discussing establishing an UNESCO World Heritage site in the Talysh and Alborz Mountains through the protection of a new area of 800 km² on the Iranian side, making it into a cross-border protected area of about 1,600 km². A well-managed UNESCO World Heritage site of 1,200 km² at this important point for leopard conservation would be most welcome, but the plans have not yet been endorsed.

A number of important protected areas of neighbouring countries are located at or near the borders with Azerbaijan and Nakhchivan Autonomous Republic (Fig 5.1). The leopard priority areas Kiamaky Wildlife Refuge, Marakan Protected Area, and Arasbaran Biosphere Reserve, all in Iran and Zangezur State Sanctuary and Arevik National Park, both in Armenia are all located adjacent to Nakhchivan Autonomous Republic and share the same leopards with Zangezur National Park. Vashlovani Nature Reserve in Georgia borders Ilisu State

BOX 5.2 PROTECT AREAS IN AZERBAIJAN

There are several categorises of protected area in Azerbaijan^[49]:

- **Strict Nature Reserves** (SNR; IUCN Category Ia) are state owned and are designated to protect nature and promote scientific research.
- **Wildlife Sanctuaries** (WS; IUCN Category IV) are meant to protect wildlife but also to allow a defined amount and type of human activity within their boundaries.
- **National Parks** (NP; IUCN Category II) are designated for the protection of nature, wildlife and for scientific and cultural purposes. They also serve to raise awareness about ecology and conservation among the general public.
- **Natural monuments** are protected "objects" ranging from individual trees to stretches of forests to whole landscapes. They are strictly protected and no damage/destruction is allowed.
- **Zoological parks and gardens** have an educational purpose and can play an important role in ex-situ conservation programs.

Nature Reserve in Azerbaijan at an important corridor, and Zagatala State Reserve, Azerbaijan, Lagodekhi Nature Reserve, Georgia, and the Charodinsky and Kosovsko-Kelebsky Zoological Sanctuaries in Dagestan are a potentially important habitat block of the Greater Caucasus.

The strict protection and proper management of these areas would not only provide strongholds for source nuclei of leopards, but would also allow leopards to disperse across the region and help to expand the population and improve connectivity. Cross-border cooperation is necessary to make these protected areas as efficient as possible. Cooperation between Azerbaijan and Iran is most urgent, as these countries share the last reproducing leopard nuclei.

FIGURE 5.1

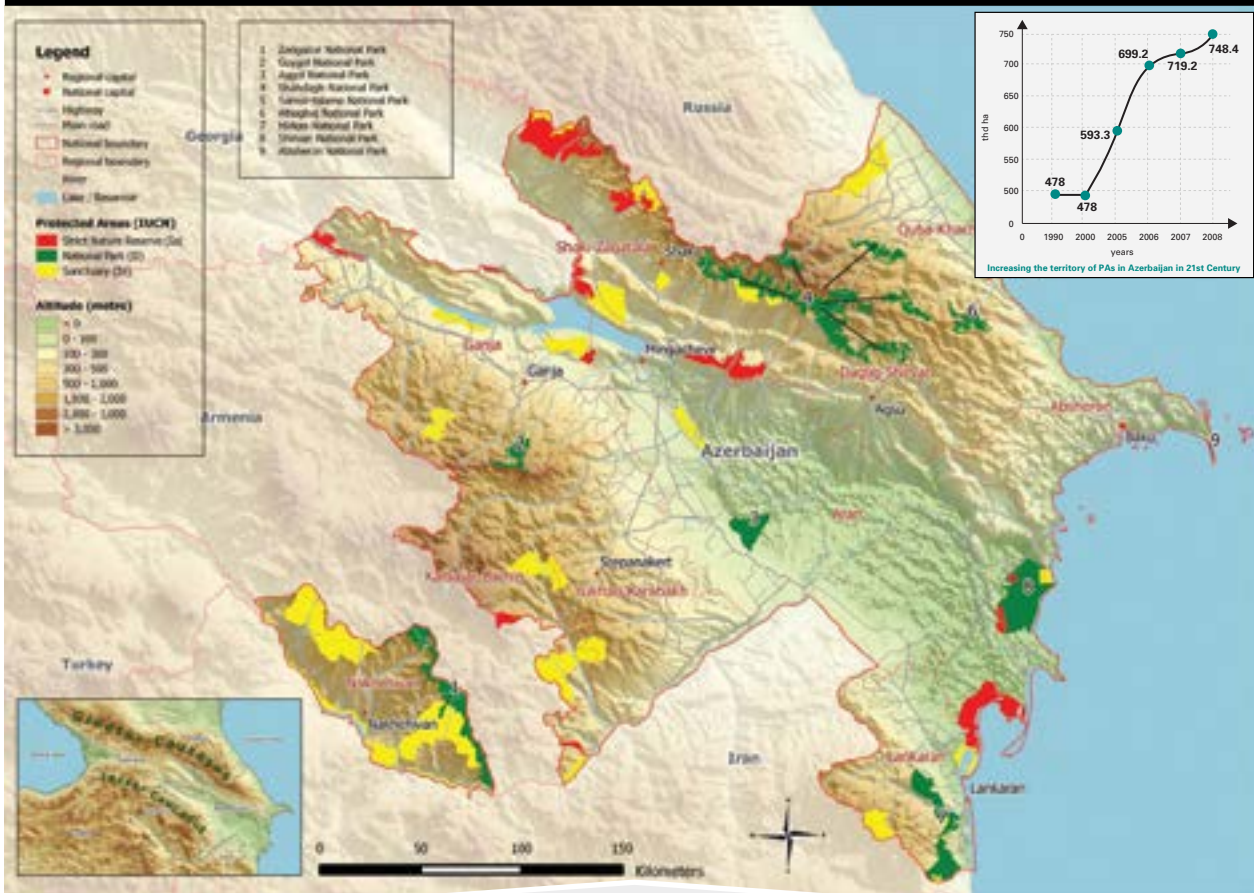


Protected areas important for leopard conservation near the international borders with Azerbaijan:

- | | | |
|--------------------------------------|--|--|
| 1 Lisar Protected Area | 9 Bastichay State Reserve | 17 Vashlovani Nature Reserve |
| 2 Hirkan National Park | 10 Gubadly Sanctuary | 18 Ilisu State Reserve |
| 3 Arasbaran Biosphere Reserve | 11 Shikagoh State Reserve | 19 Zagatala State Reserve |
| 4 Kiamaky Wildlife Reserve | 12 Shrivani National Park | 20 Gora Dulydag region (Kosovsko-Kelebsky & Charodinsky ZS) |
| 5 Marakan Protected Area | 13 Murov Dagh ridge and Nagorno-Karabakh region | 21 Lagodekhi Nature Reserve |
| 6 Arevik National Park | 14 Khosrov Forest State Reserve | 22 Tusheti National Park. |
| 7 Zangezur State Sanctuary | 15 Agri Dagri Milli Protected Area | |
| 8 Zangezur National Park | 16 Shahdag National Park | |

(source: WWF Caucasus 2014)

FIGURE 5.2



Distribution of protected areas in Azerbaijan (source: WWF Caucasus Programme).

TABLE 5.2: PROTECTED AREAS (NATIONAL PARKS, STATE NATURAL RESERVES AND WILDLIFE REFUGES) IN AZERBAIJAN AND THEIR SIZE BETWEEN 2006 AND 2013^[76].

	2006	2008	2009	2010	2011	2012	2013
Number of national parks	6	7	8	8	8	8	9
Area (km ²)	1178	2336	2653	2959	3105	3105	3223
Number of state natural reserves	13	12	12	11	11	11	11
Area (km ²)	2009	1793	1774	2168	2091	2091	2091
Number of state natural wildlife refuges	21	21	22	24	24	24	24
Area (km ²)	2852	2865	2917	3634	3612	3612	3612

A key aspect for the recovery of the leopard in Azerbaijan will be the availability of suitable habitat in the landscape outside and between protected areas. Although such areas may not directly benefit from government protection and prey density may be lower than inside protected areas, these areas are still important for maintaining viable leopard and prey populations (Fig. 4.3). There is, for example, some evidence of human-leopard conflict in the Talysh Mountains outside the Hirkan National Park (Box 3.1), which might have consequences for the conservation of the leopard both in the national park and in the wider landscape. Such conflicts and people's attitude in general has to be addressed in order to efficiently protect the leopard through the protected area network and beyond. The MENR has initiated reforestation outside protected areas to reduce the risk of desertification^[49]. By restoring habitats and areas outside protected areas, wildlife and leopards in particular could re-establish natural corridors between the protected areas. Corridors are an important component of landscape conservation and serve to link meta-populations in fragmented habitats. A high degree of connectivity between protected areas is necessary to allow leopards to disperse and migrate into different areas of the Caucasus^[17]. Leopards are versatile and can adapt to a range of different habitats inside and outside protected areas, however, it can be assumed that leopards living outside protected areas where they have to share their habitat with humans and livestock come into conflict with local people more often, for example, through attacks on livestock. Such problems must be addressed in order to gain the acceptance of local people for leopard conservation measures.

5.4 PREY: STATUS, CONSERVATION AND MANAGEMENT OF WILD UNGULATES

Leopards in the Caucasus prey on wild ungulates (see Chapter 2) and without adequate populations of these species it will not be possible to restore the leopard in Azerbaijan. Few studies assessing prey populations within protected areas are available and even fewer have been carried out beyond protected areas.

The most common ungulates in Azerbaijan which are important as leopard prey include: wild boar with a population estimated at around 1,200 individuals^[50]; bezoar goat in the Zangezur range, estimated at approximately 1,000 individuals^[51]; and mouflon in the Nakhchivan Autonomous Republic at around 450 individuals^[50]. The tur population in the Greater Caucasus part of Azerbaijan was studied in 2009 and the population was estimated at 5,300 individuals^[52]. Together with the population on the Russian side, they may number 12,000 altogether. In 2006, the red deer population was estimated at only 600 individuals^[7]. The decrease in the red deer population is believed to have been caused by poaching, habitat loss and long term isolation leading to inbreeding depression in some populations^[7]. Red deer populations seem to be recovering slowly, at least according to figures provided by the MENR who estimated 1,692 red deer in 2014 (Table 5.3). Roe deer are known to be present in the forested parts of the country, but they seem to be rare. The numbers provided by the MENR, however indicate an increase (Table 5.3).

TABLE 5.3: POPULATION ESTIMATIONS FOR WILD UNGULATES IN AZERBAIJAN WHICH ARE POTENTIALLY IMPORTANT AS PREY FOR THE LEOPARD.

Species		MENR survey results		Alternative estimates	
Common Name	Latin Name	2013	2014	Number	Year
Mouflon	<i>Ovis o. gmelinii</i>	1446	1191	450 ^[50]	2011
Bezoar goat	<i>Capra a. aegagrus</i>	1600	1554	1000 ^[51]	2008
Chamois	<i>Rupicapra r. caucasica</i>	859	1574	650- 700 ^[51]	2008
Goitered gazelle	<i>Gazella subgutturosa</i>	10299	10729	5000 ^[7]	2006
Red deer	<i>Cervus elaphus</i>	1224	1692	650 ^[7]	2006
Roe deer	<i>Capreolus capreolus</i>	2566	3952	n/a	n/a
East Caucasian Tur	<i>Capra caucasica cylindricornis</i>	11322	17501	2000 ^[75]	2007
Wild boar	<i>Sus scrofa</i>	8405	11921	1200 ^[50]	2011

(Source of information in parentheses)

Each protected area has a scientific team that arranges monitoring surveys which are done each year for all species and their results are given in their annual report. The MENR supervises all species surveys every year and compiles population estimates for most protected areas as well as the whole country. National population figures for 2013 and 2014 for species potentially important as prey for leopards are summarised in Table 5.3. The 2013-2014 trends for all species are positive with the exception of mouflon and bezoar goat. However, the accuracy of these estimations cannot be assessed, as information on the census methods is not available. Moreover, producing reliable wildlife population estimates is difficult to achieve as most surveyors have little experience and training to carry out such assessments.

Habitat degradation and reduced food availability as a consequence of competition from livestock are threats to wild herbivore populations resulting in a reduced carrying capacity of a site. Wildlife living alongside livestock may also be at threat from the transmission of diseases from livestock.

Only a few species are legally allowed to be hunted in Azerbaijan by local and international hunters. These include wild boar and East Caucasian tur, which are reported to be quite abundant (Table 5.3). The price of hunting permits for local people is lower than for international hunters. Trophy hunting is a considerable source of income for local organisations as well as the MENR, which issues the permits.

Sustainable hunting could potentially add value to wildlife outside protected areas and help to gain the support of local communities for wildlife conservation. However, without law enforcement or sustainable management plans, wild ungulate populations are vulnerable to over-hunting and poaching.

5.5. POTENTIAL CONFLICTS AND PEOPLES' ATTITUDES

With the collapse of the Soviet Union, a considerable part of the rural population fell into poverty, resulting in an increased pressure on the natural landscape and wildlife such as wild goats and deer. These species are important prey for the leopard, and their diminution probably lead to an increase in attacks on livestock. With privatisation, land and livestock ownership and practices changed, probably resulting in a changing attitude of rural communities to nature and wildlife conservation in general and to large carnivores including the leopard in particular. Not surprisingly, retaliation killing is considered the most important direct threat to leopard^[6]. The local population in the Talysh Mountains appears to be unfavourable to leopard presence (most likely as a result of the events summarised in Box 3.1) while people in the Nakhchivan Autonomous Republic are thought to be more favourable to the presence of leopards in the area^[33]. However, no genuine research or data are available to assess this assumption.

The major source of conflict between humans and leopards is attacks on livestock. Livestock husbandry is an important activity and an integral part of the rural economy in Azerbaijan (Table 5.4). Statistics and numbers on attacks of large carnivores on livestock are unavailable, but leopard attacks must be very few as there are so few animals. However, each leopard killed in retaliation is an additional threat to its survival in the Caucasus.

TABLE 5.4: LIVESTOCK POPULATIONS IN AZERBAIJAN^[76].

Date	Number of livestock (01 January 2013, in 1000s)		
	Cattle	Cows/ buffaloes	Sheep/goats
2006	2,380	1,150	7,700
2007	2,445	1,180	7,870
2008	2,510	1,220	8,111
2009	2,570	1,240	8,280
2010	2,610	1,260	8,410
2011	2,650	1,280	8,490
2012	2,680	1,290	8,560
2013	2,710	1,305	8,670

In an attempt to mitigate this conflict and prevent retaliation killing, WWF Azerbaijan established a trial project from 2004 to 2006 in the Talysh Mountains to compensate local people for livestock losses³³. Compensation measures were prepared and presented to local villagers in areas where livestock depredation was a problem³⁰. WWF maintained a herd of sheep in the Talysh Mountains and losses were compensated in only four cases where leopards were confirmed as the predator. The program was halted in 2006 due to difficulties mainly with regard to the correct identification of the predator. Local people in the Talysh region leave livestock unattended in the mountains. After an attack, a carcass is often not found in time to correctly identify the reason of death let alone the predator. A new system is now being discussed and WWF recently suggested the creation of a compensation scheme to the MENR⁵³.

Assessing and compensating attacks of leopards on livestock also offers an opportunity to get involved with local people and help them to improve livestock husbandry practices. Gaining the support of the local community is a key factor in leopard conservation, and this can only be done through engagement, not through repressive measures. Law enforcement and anti-poaching measures are important, but they must target the culprits only and must be done in such a way that they are accepted and encouraged by the majority of the local population.

Villagers in the leopard areas of the Nakhchivan Autonomous Republic or the Talysh Mountains are nowadays aware that the leopard is a protected species. In some cases, instead of reporting attacks on livestock, the carcasses are used to kill the predator by means of poison, steel traps or direct shooting. Herders may often not know which species killed their animals before the predator is actually dead. Such cases, if they concern leopards, go undetected and are kept secret to avoid the high penalty. This makes the numbers of retaliatory killings and poaching difficult to determine. Increasing the penalties for killing protected animals without additional measures to instruct and involve local people often have no positive effect, as it is almost impossible to investigate such cases without the support or at least the acceptance of the local community.

Another important point is the risk of attacks of leopards on humans. Two recent incidents of leopard attacks reported from the Talysh Mountains (Box 3.1) have most likely contributed to the anti-leopard sentiment in the area. In such cases, it is not even relevant if the incidents were real; as long as people *believe* that leopards are dangerous and feel left alone with their problem, they will not support the conservation of these animals.



▲ Landscape in Nakhchivan Autonomous Republic (© KORA/WWF)

SECTION 6

CONCLUSIONS AND RECOMMENDATIONS FOR THE RESTORATION OF THE LEOPARD IN AZERBAIJAN

The leopard is a flagship species for the conservation of natural habitats and wildlife in Azerbaijan. Azerbaijan has the potential to play a key role in the recovery of the leopard in the Caucasus ecoregion. It has extensive areas of suitable habitat, several protected areas that could host a sufficient prey base and core populations of leopards and it shares, with Iran and Armenia, the last remaining leopard nuclei in the ecoregion. In order to restore the leopard in Azerbaijan, two main goals are proposed:

- 1 Conservation of the remnant leopard populations in the south of Azerbaijan (Nakhchivan Autonomous Republic and Talysh Mountains);**
- 2 Reintroduction of a leopard population in northern Azerbaijan (Greater Caucasus).**

Restoring a viable population of a top predator is a complex and long-term endeavour that needs thorough planning and defined goals and objectives. Key factors for success are (1) a strong commitment by all national relevant authorities, scientific institutions and conservation organisations, (2) the support of the people of Azerbaijan and especially of local communities, (3) cooperation with other Caucasus countries, and international organizations, (4) adequate capacity in biodiversity conservation and wildlife management.

The primary direct threat to the leopard in Azerbaijan is retaliatory killings by local people in response to a perceived threat to livestock or personal safety and other illegal hunting. The most significant indirect threat is the availability of prey. It is imperative that these threats are addressed immediately if Azerbaijan's leopard population is to be restored.



In order to achieve this the following steps are recommended:

1 Conduct baseline surveys across Azerbaijan.

Information on leopards, their prey, threats and human attitudes are scarce in Azerbaijan. It is therefore necessary for comprehensive baseline surveys to be carried out to determine more accurate estimates of leopard numbers, relative abundance of prey species, habitat use, human activities taking place and threats. This information will inform future conservation actions.

Baseline surveys should commence with the priority sites where leopards have been recorded in recent years – Hirkan National Park and surrounding areas in the Talysh Mountains and Zangezur National Park and neighbouring areas of Nakhchivan Autonomous Republic - and potential reintroduction sites in the Greater Caucasus (see recommendation 8) before being expanded out to other areas of suitable habitat across the country.

A recommended approach is to utilise a combination of survey methods. Initially interviews should be carried out with local people and specific stakeholder groups (e.g. hunters, livestock herders) living in and around these areas. Using this approach information can be gathered on local peoples' knowledge of leopards and prey species, their livestock husbandry practices, hunting and other activities that may affect or be affected by leopards and their prey, conflicts with leopards, and attitudes towards leopards and conservation in general. The results of these interviews should be used to determine important sites for more detailed field surveys using camera traps, transects and other appropriate survey methods.

Baseline surveys can be time consuming and complex so it is essential that adequate funds and time are allocated for the work and they are carried out by suitably qualified people with experience of surveys in similar habitats, terrain and for similar species.

2 Establish permanent monitoring programmes in key sites.

Upon completion of baseline surveys in priority sites, permanent monitoring systems should be established. These will enable any changes in leopard, prey or threat indices to be picked up and appropriate management actions to be taken to address them. Results will also enable the effectiveness of conservation actions to be determined.

The basis of this monitoring programme should be systematic camera trapping. The data gathered must, as a minimum, allow for the assessment of relative abundance and distribution (e.g. occupancy) and population trends.

As part of this a leopard database should be established to record all observations and images. This will enable the identification of individuals so a minimum population estimate can be obtained and movements within the country and across borders can be followed.

3 Ensure effective management of protected areas.

Azerbaijan's protected areas must provide the core areas for the recovery of a leopard population. It is therefore essential that these are effectively managed and protected to secure the habitat and wildlife living inside. Thriving wildlife populations within the protected areas will act as a source of animals for areas outside of the protected areas.

It is therefore important that the management systems in the protected areas are strengthened. This should include: ensuring that they all have up-to-date management plans and the means to implement them; training of park managers and rangers; provision of infrastructure and equipment; providing adequate resources, both financial and human; establishing law enforcement and ecological monitoring systems to assist in adaptive management, utilising existing tools, like SMARTI⁶⁴, to ensure effectiveness; and ensuring international standards for protected area management are followed.

Initial priority should be given to Hirkan National Park in the Talysh Mountains, Zangezur National Park in Nakhchivan Autonomous Republic and Shahdag National Park in the Greater Caucasus.

4 Ensure protection and law enforcement activities are carried out outside protected areas.

The protected area network alone will not provide adequate habitat or prey for the restoration of the leopard population in Azerbaijan. It will also be necessary to ensure effective law enforcement outside of protected areas to prevent illegal activities taking place such as the hunting of leopards, overhunting of prey species and the illegal degradation of habitats. This will ensure the maintenance of corridors between protected areas and enlarge the area of habitat with sufficient prey available for an expanding leopard population.

The actions required to be undertaken will depend on the specific threats and their causes identified in each area (the baseline survey will identify these if they are not yet known). Actions may include: implementation of anti-poaching patrols; reviewing hunting quotas and ensuring enforcement of quotas for ungulate species; reviewing livestock management to control over grazing; implementing livestock veterinary procedures to prevent disease transmission to wild ungulates; and implementation of forest management schemes.

5 Develop and implement a behaviour change campaign

A major challenge for a programme to restore the leopard population in Azerbaijan will be changing the negative attitudes and perceptions of many people towards leopards in some areas and changing behaviours that have a negative impact on leopards such as over exploitation of ungulate species or overgrazing of livestock. It will therefore be necessary to develop and implement an innovative communications and behaviour change strategy as part of the restoration programme.

This strategy should be developed to positively shift knowledge, attitudes and behaviours related to unsustainable use of natural resources and leopard persecution. The strategy should identify specific target groups and the relevant knowledge, attitudes and behaviours to be addressed. A suite of behaviour change and social marketing tools can then be tailored to these audiences. These may include interactive radio programmes, drama, music, storytelling, social media etc.

It is important to note that behaviour change is not the same as education or awareness raising. These may be a component of the strategy but alone may not be sufficient to change behaviours. A social marketing or behaviour change organisation experienced in environmental behaviour change should be engaged to assist with this. IDEA would be an ideal in-country implementing partner because of their experience with engaging and communicating with different stakeholder groups.

6 Community Engagement

In order to support a behaviour change campaign, local communities living in the same areas as leopards and dependent on many of the same natural resources, should be engaged with to assist them to mitigate 1, the threats posed to them and their livestock, and 2, the threats they pose to leopards.

The actions required will depend on the issues in a specific area. In areas where livestock are predated on by leopards (or perceived to be) livestock protection initiatives should be considered. It may be appropriate to complement these with compensation schemes. However, compensation systems, if not properly thought through and carefully implemented, have a high risk of failure and result in a negative effect on local people's attitudes so should only be attempted with long-term support, resources and appropriate training and reporting systems in place.

Other innovative community engagement schemes in which local people can benefit from the presence of leopards should also be investigated and pursued. For example performance payment schemes where local leopard representatives are appointed in communities, provided with cameras and receive payments for images of leopards or other evidence of leopard presence. These types of schemes will have the dual benefit of giving the leopard a positive value to communities and also providing important information on leopards.

Other options range from "leopard-friendly labels" on local products to "ecosystem service subsidies", jobs in protected areas, to "eco-tourism". Such incentives must be tailored to the local communities and to the national tradition, culture and economy. It is important that they are economically sustainable and designed so they have a direct positive conservation impact.

7 Establish a reintroduction programme

Even with the implementation of recommendations 1-7, the only realistic way to recover the leopard in the Greater Caucasus seems to be reintroduction, as there appear to be no viable habitat connections to existing leopard populations and little prospect of establishing any at this stage.

There appears to be a good potential for reintroducing a leopard population in Azerbaijan's protected areas and adjacent forested landscapes in the Greater Caucasus. Leopards for this purpose must come from a captive breeding programme as it is clear that the wild population is far too small to support removal of the number of cats that would be necessary (see chapter 3). The European Association of Zoos and Aquariums (EAZA) managed conservation breeding programme is the recommended source of animals. The EAZA population currently contains only 83 leopards and is already working with the existing

Russian reintroduction project at Sochi, so it will be important that Azerbaijan is able to contribute to increasing the numbers of available leopards via breeding facilities in country.

A reintroduction plan will need to be drawn up following the internationally recognised IUCN/SSC *Guidelines for Reintroductions and Other Conservation Translocations*^[55]. A similar plan exists for the reintroduction of the Amur leopard in Russia, drawn up by a comprehensive working group composed of both Russian and international scientists and is a useful reference document, although it has yet to be implemented.

It must be noted that reintroduction programmes are difficult, risky and costly and the timescale for a successful reintroduction is long – at least a decade – and some of the steps listed below will take time to complete. If the highest possible standards are not followed the likelihood of failure is high^[56].

STEPS REQUIRED FOR A REINTRODUCTION PLAN

The actions listed here are all essential steps towards a successful reintroduction, and must be components of a "Reintroduction Plan for the Caucasus Leopard in Azerbaijan".

Site selection:

- Survey the Azerbaijan part of the Greater Caucasus (protected areas as well as all other suitable habitats; see recommendation 1) to determine (1) habitat suitability, (2) prey availability, (3) local peoples' attitudes, (4) potential threats to and conflicts with leopards, (5) potential sites for a breeding and release centre within the selected area.
- Compile findings into a site selection report and have this reviewed by relevant institutions in Azerbaijan, neighbouring countries (Dagestan, Russia, and Georgia), and international experts to obtain stakeholder agreement on the reintroduction site and location of the breeding and release centre within it.

Public consultation process with local communities and stakeholders:

- Develop and implement, based on the information in the site selection report, a programme at the selected site to inform, involve and consult with local people and stakeholders.

- Produce a plan for the monitoring of and responses to social attitudes and possible leopard-human conflicts, together with options for resolution of any problems that may arise.

Habitat and prey base preparation at the release site and across the expansion areas:

- Develop and implement, based on the information in the site selection report, a set of measures to ensure the selected release area is fully prepared to host and manage a reintroduced population of leopards. Measures may include (see also recommendations 1-6):
 - *Habitat management*: Ensure effective management of release sites (e.g. protected areas) and the expansion area (multi-use landscape)
 - *Habitat suitability*: Improve or protect habitats for leopard and prey (e.g. land use practices such as grazing regime and logging).
 - *Prey base*: Implement measures to increase the abundance of prey species that are considered important for leopard.
 - *Conflict prevention*: Implement measures to prevent conflicts with local people (e.g. communication and behaviour change campaign, livestock husbandry and protection measures, compensation system, etc.).

STEPS REQUIRED FOR A REINTRODUCTION PLAN - CONTINUED

- Design and implement a framework for disease risk assessment at the release site. This can be adapted from the Amur leopard disease risk assessment process and assisted by the NGO Wildlife Vets International (WVI), who carried out the work for Amur leopards.

Engage in breeding of leopards for reintroduction and implement releases:

- Apply for membership of the European Association of Zoos and Aquariums (EAZA) for Baku zoo. This will automatically bring with it participation in the EAZA Persian leopard conservation breeding programme (EEP).
- Include in Baku zoo one or more leopard breeding facilities, built to modern zoo standards. Ensure keeping staff are appropriately trained and the facility becomes a full participant in the EEP, obtaining potential breeding pairs of leopards for these facilities and following EEP recommendations for breeding and transfers. This will increase the overall supply of young leopards.
- Work with the leopard EEP and appropriate international experts to produce a long term plan for breeding and release of leopards, designed to ensure maximum genetic diversity and a good demographic balance in the reintroduced population over time. This plan will span at least ten years of releases.
- Construct, at a suitable site outside Baku, a semi-wild captive facility in which leopards can be bred and reared in semi-wild conditions and fed on live prey. This will provide a first step towards acclimatizing leopards for transfer to the breed and release enclosure. It can also contain viewing hides at which interested visitors and stakeholders could observe the leopards as if in wild conditions, and provide excellent opportunities for photograph and filming of leopards in natural habitat for educational and PR purposes.
- Construct, at the location within the identified release site, a semi-wild breed and release enclosure within the habitat, together with a facility for holding and/or breeding prey species for feeding purposes. Proven breeding pairs of leopards, ideally with experience within the semi-wild facility, should be sent here to produce cubs for release at dispersal age, which should be reared with as little contact with humans as possible and fed on live prey from birth. There should be no provision for visitors or photography at this site; human interaction with cats intended for release must be kept to an absolute minimum so that released leopards keep away from humans.
- Produce husbandry, veterinary and other protocols for management of leopards at the above two sites, based on the existing protocols for the Amur leopard reintroduction plan, working with WVI and with the Sochi centre so that the end result is a single set of protocols being used at both projects. WVI has already supplied the Persian leopard EEP – and through them, it is hoped, the Sochi centre - with the veterinary protocols developed for the Amur leopard EEP and for the planned release centre.
- Develop release protocols, working with international experts, and implement reintroduction according to the plan and the IUCN/SSC reintroduction guidelines.

8 Cooperate with neighbouring countries on transborder conservation initiatives.

Azerbaijan will not be able to restore its leopard population without cooperation with neighbouring countries which may be a source of immigrating leopards or into which leopards move and therefore must be afforded the same levels of protection.

Possible areas of transborder cooperation that should be considered include:

- *Transboundary Protected Areas:* Promote new transboundary protected areas, for example, the

planned UNESCO World Heritage site in the Talysh and Alborz Mountains, or cooperation between existing protected areas in proximity to each other such as the Zangezur National Park in Nakhchivan and Kiamaky Wildlife Refuge, Marakan Protected Area and Arasbaran Biosphere Reserve in Iran.

- *Corridor:* Support a “leopard corridor” between Zangezur/Marakan/Kiamaky/Arasbaran in the west and the Talysh Mountains (Hirkan National Park and Lisar Protected Area) in the east. The potential corridors (Fig. 4.4) are both on the Iranian side, but Azerbaijan should support the re-establishment of this corridor in any way possible.



REFERENCES

- [1] Myers N., Mittermeier R. A., Mittermeier C. G., Da Fonseca G. A. B. and Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature*, 403: 853-845.
- [2] Zazanashvili N., Mörschel F., Askerov E., Manvelyan K., Krever V., Farvar T.M. & Sedat K. 2007. Conservation of the leopard in the Caucasus. *Cat News Special Issue*, 2:4-8.
- [3] Zazanashvili N., Garforth M., Jungius H., Gamkrelidze T. & Montalvo C. (Eds.) 2012. Ecoregion conservation plan for the Caucasus. *Caucasus Biodiversity Council Special Issue*. WWF, KfW, BMZ, 64 pp.
- [4] MENR (Ministry of ecology and natural resources of the Azerbaijan Republic), 2010. Country Study on Biodiversity of the Azerbaijan Republic. Fourth National Report to the Convention of Biological Diversity.
- [5] Breitenmoser-Würsten Ch., Breitenmoser U., Mallon D. & Zazanashvili N. 2007a. Strategy for the conservation of the leopard in the Caucasus. Tbilisi, Georgia. 26 pp.
- [6] MENR (Ministry of ecology and natural resources of the Azerbaijan Republic), 2009. National Action Plan (2010-2014) for the conservation of the leopard (*Panthera pardus*, L.) in Azerbaijan. Baku, Azerbaijan. 28 pp.
- [7] Williams L., Zazanashvili N., Kandaurov, A. & Sanadiradze G. (Eds) 2006. Ecoregional conservation plan for the Caucasus. WWF, KfW, BMZ, CEPF, MacArthur Foundation. 220 pp.
- [8] Lukarevsky V., Malkhasyan A. & Askerov E. 2007a. Biology and ecology of the leopard in the Caucasus. *Cat News Special Issue*, 2:9-14.
- [9] Heptner, V.H. & Sludski A.A. 1972. Mammals of the Soviet Union Vol. III: Carnivora (Feloidea). Vysshaya Shkola, Moscow. 784 pp. (English translation, 1992, Amerind Publishing Co., New Delhi).
- [10] Taghdisi M., Mohammadi A., Nourani E., Shokri S., Rezaie A. & Kaboli, M. 2013. Diet and habitat use of the endangered Persian leopard (*Panthera pardus saxicolor*) in north-eastern Iran. *Turkish Journal of Zoology*, 37:554-561.
- [11] Farhadinia M.S., Nezami B., Hosseini-Zaveri F. & Valizadeh M. 2009. Persistence of Persian leopard in a buffer in north-eastern Iran. *Cat News*, 51:34-36.
- [12] Lukarevsky V., Askerov E. & Hazaryan G. 2004. Condition of the leopard population in the Caucasus. *Beitr zur Jagd- und Wildforsch* 29:303-19.
- [13] Khorozyan I. & Malkhasyan A. 2003. Ecology of the leopard (*Panthera pardus*) in Khosorov Reserve, Armenia. Implications for conservation. *Società Zoologica "La Torbiera"*. *Scientific Reports* 6:1-40.
- [14] Hebblewhite M., Miquelle D.G., Murzin A.A., Aramilev V.V. & Pikunov D.G. 2011. Predicting potential habitat and population size for reintroduction of the Far Eastern leopards in the Russian Far East. *Biological Conservation*, 144(10):2403-2413.
- [15] Henschel, P., Hunter, LTB, Coad, L. Abernathy, K & Mühlenberg, M 2011. Leopard prey choice in the Congo Basin rainforest reveals strong exploitative competition with human bushmeat hunters. *Journal of Zoology*, 285(1):1-11.
- [16] Gavashelishvili A. & Lukarevsky V. 2008. Modelling the habitat requirements of leopard *Panthera pardus* in west and central Asia. *Journal of Applied Ecology*, 45:579-588.
- [17] Breitenmoser U., Breitenmoser-Würsten Ch., Mörschel F., Zazanashvili N. & Sylvén M. 2007b. General conditions for the conservation of the leopard in the Caucasus. *Cat News Special Issue*, 2:34-39.
- [18] Lukarevsky V., Akkiev M., Askerov E., Agili A., Can E., Gurielidze Z., Kudakatin A.N., Malkhasyan A. & Yarovenko Y.A. 2007b. Status of the leopard in the Caucasus. *Cat News Special Issue*, 2:15-21.

- [19] Sanei A., Mussavi M., Kiabi B.H.Z., Zehi A.B., Masoud M.R., Mohamadi H. & Jafaari B. in press. Status assessment of the Persian leopard *Panthera pardus saxicolor* in Iran. Cat News Special Issue 9.
- [20] F. Arikan, personal communication.
- [21] Khorozyan I. 1999. Modelling mortality pattern of Armenia leopard population. Coll. Art. Young. Res. Nat. Sci, 1:24-27.
- [22] Zazanashvili N., Mörschel F., Askerov E., Manvelyan K., Krever V., Farvar T.M. & Sedat K. 2007. Conservation of the leopard in the Caucasus. Cat News Special Issue, 2:4-8.
- [23] Darvishsefat A. A. 2006. Atlas of protected areas of Iran. University of Tehran, Tehran, I.R. Iran, 157 pp.
- [24] Moqanaki E.M., Breitenmoser U., Kiabi B.H., Masoud M. & Bensch S. 2013. Persian leopards in the Iranian Caucasus: a sinking "source" population? Cat News, 59:22-25.
- [25] Khorozyan I. G. & Abramov A. V. 2007. The Leopard *Panthera pardus* (Carnivora: Felidae) and its resilience to human pressure in the Caucasus. Zoology in the Middle East, 41(1):11-24.
- [26] Yarovenko Y.A. 2010. Status and distribution of leopards (*Panthera pardus*) in the mountains of Dagestan, Russia. Final report Rufford Small Grants, 16 pp.
- [27] A. Arabuli personal communication.
- [28] V. Krever personal communication.
- [29] Yarovenko Y.A. 2012. Population ecology of the leopard (*Panthera pardus*) in Dagestan, Russian north Caucasus. Final report, Rufford Small Grants, 16 pp.
- [30] WWF. 2005. Conservation of the leopard in the Caucasus region: final report on initial phase January 2002–May 2005. 23 pp.
- [31] Yarkovenko Y. A. 1997. Modern condition and problems of conservation of the leopard in Dagestan. Rare species of Mammals in Russia and adjacent territories. The International Meeting, Moscow. 102 pp.
- [32] B. Lortkipanidze personal communication.
- [33] E. Askerov personal communication.
- [34] Moqanaki E.M. & Farhadinia M.S. 2010. Persian leopard newsletter, 3:1-8.
- [35] R. Mazoud, personal communication.
- [36] Iranian Department of Environment unpublished report.
- [37] Avgan B., Huseynali T.T., Ismayilov A., Fatullayev P., Askerov E. & Breitenmoser U. 2012. First hard evidence of leopard in Nakhchivan. Cat news, 57:33.
- [38] WWF Caucasus programme office. 2014. Caucasus ecoregion newsletter: news from the Caucasus. Special issue. 6 pp.
- [39] A. Steirn, personal communication.
- [40] Baskaya S. & Bilgili E. 2004. Does the leopard *Panthera pardus* still exist in the Eastern Karandeniz Mountains of Turkey? Oryx, 38(2):228-232.

- [41] Johnson K. 2003. Status and distribution of the leopard in Turkey and the Caucasus Mountains. *Endangered Species Update* 20(3): 107-122.
- [42] Williams L. (Ed). 2003. Ecosystem profile: Caucasus biodiversity hotspot. Critical Ecosystem Partnership Fund. 63 pp.
- [43] Zazanashvili N., Garforth M., Jungius H., Gamkrelidze T. & Montalvo C. (Eds.) 2012. Ecoregion conservation plan for the Caucasus. Caucasus Biodiversity Council Special Issue. WWF, KfW, BMZ, 64 pp.
- [44] Zimmermann F., Lukarevsky V. S., Beruchashvili G., Breitenmoser-Würsten C. & Breitenmoser U. 2007. Mapping the Vision–Potential Living Space for the Leopard in the Caucasus. *Cat News Special*, 2:28-33.
- [45] Breitenmoser U., Breitenmoser-Würsten Ch. & Boitani L. 2012. Assessing conservation status and units for conservation. *In* *Carnivore ecology and conservation. A handbook of techniques. Techniques in Ecology and Conservation Series*. Boitani L. and Powell R.A. (Eds). Oxford University Press, Oxford, pp. 362-378.
- [46] Hamidi K. A., Ghoddousi A., Soufi M., Ghadirian T., Jowkar H. & Ashayeri S. 2014. Camera trap study of Persian leopard in Golestan National Park, Iran. *Cat News*, 60:12-14.
- [47] Askerov, E., 2013. Leopard. *In* Red Book of Azerbaijan Republic. Second edition. Fauna. Baku. p. 480-481.
- [48] Foster-Turley P. & Sultanov E. 2010. Biodiversity analysis update for Azerbaijan. Final report Vol. I of II, Prosperity, livelihoods and conserving ecosystems. 83 pp.
- [49] Convention on Biological Diversity. 2004. Existing measures and programmes for biodiversity conservation. Country study on biodiversity and first national report, the Republic of Azerbaijan. pp. 79-136.
- [50] Caucasus Leopard Working Group. 2011. Monitoring for the conservation of the leopard in the Caucasus Ecoregion. Workshop report, WWF Caucasus Programme and IUCN/SSC Cat Specialist Group, 33 pages.
- [51] Red Book of Azerbaijan Republic, 2013. Second edition. Fauna. Baku. p. 480-481.
- [52] Guliev S.M., Weinberg P.J. & Askerov E. 2009. Dagestan tur (*Capra cylindricornis* Blyth) conservation strategy in Azerbaijan. Zazanashvili, N. and Mallon, D. (Eds) 2009. Status and Protection of Globally Threatened Species in the Caucasus. Tbilisi: CEPF, WWF. Contour Ltd., pp. 53-60.
- [53] Trend, 30.11.2006: <http://az.trend.az/news/society/836404.html>
- [54] <http://www.smartconservationsoftware.org/>
- [55] IUCN/SSC. 2013. Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission, viiii + 57 pp.
- [56] Hunter, L. & Rabinowitz, A. 2009. Felid reintroduction using captive founders: Poor science and worst practices. *Cat News* 51:32-33.
- [57] Khorozyan I. G., Baryshnikov G.F. & Abramov A. V. 2006. Taxonomic status of the leopard *Panthera pardus* (Carnivora, Felidae) in the Caucasus and adjacent areas. *Russian Journal of Theriology*, 5(1):41-52.
- [58] Nowell K. & Jackson P. 1996. Wild cats: status survey and conservation action plan. IUCN/SSC Cat Specialist Group. IUCN, Gland, Switzerland. 382 pp.
- [59] Miththapala, S., Seidensticker, J. & O'Brien, S. J. 1996. Phylogeographic subspecies recognition in leopards (*Panthera pardus*): molecular genetic variation. *Conservation Biology*, 10(4):1115-1132.

- [60] Uphyrkina O., Johnson W.E., Quigley H., Miquelle D., Marker L., Bush M. & O'Brien S. J. 2001. Phylogenetics, genome diversity and origin of modern leopard, *Panthera pardus*. *Molecular Ecology* 10:2617-2633.
- [61] Rozhnov V. V., Lukarevskiy V. S. & Sorokin P. A. 2011. Application of molecular genetic characteristics for reintroduction of the leopard (*Panthera pardus* L., 1758) in the Caucasus. *Doklady Biological Sciences* 437(1):97-102.
- [62] A. Kitchener, personal communication.
- [63] Ghoddousi A., Hamidi A.K., Ghadirian T., Ashayeri D. & Khorozyan I. 2010. The status of the Endangered Persian leopard *Panthera pardus saxicolor* in Bamu National Park, Iran. *Oryx*, 44(4):551-557.
- [64] Athreya V., Odden M., Linnell J. D., Krishnaswamy J., & Karanth U. 2013. Big cats in our backyards: persistence of large carnivores in a human dominated landscape in India. *PloS one*, 8(3):e57872.
- [65] Wang S. W. & Macdonald D. W. 2009. Feeding habits and niche partitioning in a predator guild composed of tigers, leopards and dholes in a temperate ecosystem in central Bhutan. *Journal of Zoology*, 277(4):275-283.
- [66] Balme G. A., Hunter L. T., & Slotow R. 2009. Evaluating methods for counting cryptic carnivores. *The Journal of wildlife management*, 73(3):433-441.
- [67] Balme G. A., Slotow R., & Hunter L. T. B. 2010. Edge effects and the impact of non protected areas in carnivore conservation: leopards in the Phinda–Mkhuze Complex, South Africa. *Animal Conservation*, 13(3):315-323.
- [68] Maputla N. W., Chimimba C. T., & Ferreira S. M. 2013. Calibrating a camera trap–based biased mark–recapture sampling design to survey the leopard population in the N'wanetsi concession, Kruger National Park, South Africa. *African Journal of Ecology*, 51(3):422-430.
- [69] Anonymous. 2013. Status of large carnivores in Armenia. The Science Center of Zoology and Hydroecology of National Academy of Science. pp 1-7.
- [70] Kiabi B.H., Dareshouri B.F., Ghaemi R.A. & Jahanshahi M. 2002. Population status of the Persian leopard (*Panthera pardus saxicolor* Pocock 1927) in Iran. *Zoology in the Middle East* 26: 41–47.
- [71] Respublika Info, 27.3.2013: <http://respublikainfo.wordpress.com/2013/03/27/lerikd%C9%99-d%C9%99hs%C9%99t-18-yasli-qizi-b%C9%99bir-parcaladi/>
- [72] Xeberci/ANS Press, 9.4.2009: <http://xeber.azeri.net/hadise/bebir-yeniyetmeye-hucum-edib>
- [73] Rozhnov V. V. & Lukarevsky V. 2008. (Eds) Program for reintroduction of Central Asian leopard in the Caucasus region. Scientific Press Ltd. Moscow, 65 pp.
- [74] WWF. 2013. Monitoring program for mountain ungulates in Azerbaijan. 16 pp.
- [75] Mallon D., Weinberg P. & Kopaliani N. 2007. Status of prey species of the leopard in the Caucasus. *Cat News Special Issue* 2:22-27.
- [76] The state statistical committee of the Republic of Azerbaijan (livestock and forestry): <http://www.stat.gov.az/source/agriculture/indexen.php>

The Zoological Society of London
Registered Charity in England and Wales: no 208728
zsl.org

Regent's Park
London
NW1 4RY



LIVING CONSERVATION