

Snow Leopard

WWF WILDLIFE AND CLIMATE CHANGE SERIES



This assessment is one in a series resulting from a WWF study that assesses the vulnerability of numerous species to the effects of climate change. For each species, we also recommend climate-adaptive management strategies.

SNOW LEOPARDS (*Panthera uncia*) may be quite resilient to the direct impacts of climate change in the near term: they are able to tolerate a wide range of temperatures, they have minimal freshwater requirements and they have a high dispersal ability.



However, the snow leopard's small population size coupled with significant knowledge gaps about the species make this big cat potentially vulnerable to a changing climate. Additionally, snow leopards are susceptible to the indirect impacts of climate change. The effects of climate stressors on humans, and subsequent changes in livelihoods, may exacerbate the ongoing human impacts on snow leopards, including poaching and habitat encroachment. Climate effects on snow leopard prey may also have a negative impact.

Priorities for climate-informed snow leopard conservation should include ensuring access to a secure prey base; gaining a better understanding of snow leopard biology, particularly regarding genetics and disease; creating conditions for human populations in the snow leopard's range to better adapt to the impacts of climate change; and continuing to focus on reducing current threats, such as poaching, retaliatory killings and habitat degradation.



Snow leopard range

DETERMINING SPECIES VULNERABILITY

The study identified the key vulnerabilities of a species based on four factors:

SENSITIVITY: the inability of the species to persist, as is, under changing climatic conditions. To assess sensitivity, we looked at IUCN Red List status, geographic range, population size, temperature tolerance, reliance on environmental cues (for reproduction, migration, hibernation), symbiotic interactions, diet, abundance of food sources, freshwater requirements, habitat specialization and susceptibility to disease.

ADAPTIVE CAPACITY: the ability of the species to respond to changes in climate. To assess adaptive capacity, we looked at dispersal ability, generation time, reproductive rate and genetic variation.

EXPOSURE: the extent of climatic change and variation that the species encounters and is projected to encounter.

OTHER THREATS: any other relevant threats, such as habitat destruction, poaching, human-wildlife conflict and pollution, as well as the human responses to climate change that exacerbate these threats.

CLIMATE VULNERABILITY OF THE SNOW LEOPARD

Vulnerability Levels: **H** = High **M** = Medium **L** = Low **U** = Unknown



SENSITIVITY

H IUCN Red List Status
Endangered¹

L Geographic Range

Large. High mountains of central Asia at 3,000-5,400 m (900-2,500 m at the northern range limit),² and a suspected global distribution of approximately 1,800,000 km².³

H Population Size

Small. 4,000-7,500.^{1,4} Effective population size (Ne) of 2,000-3,300.¹

L Temperature Tolerance

High. Potentially as broad as -40°C to 40°C.⁵

U Does the species rely on environmental cues for reproduction?

Don't know. Breeding season is between January and mid-March.⁶

U Does the species rely on environmental cues for migration?

Don't know. Doesn't necessarily have a seasonal migration, but is known to migrate to lower elevations in the winter, in parts of its range, tracking the seasonal movement of its prey.²

L Does the species rely on environmental cues for hibernation?

No. Does not hibernate.

L Does the species have any strong or symbiotic relationships with other species?

No. However, the snow leopard distributional range is very similar to that of blue sheep, Asiatic ibex and argali.

L Diet

Generalist. Carnivorous; feeds on a wide variety of prey, mostly ungulates (wild and domestic).² Requires 3.2 kg of meat/day.⁷ Blue sheep, Asiatic ibex and argali are the three most important prey species.⁶ Also consumes small prey such as marmots and birds. Livestock may constitute a significant amount of snow leopard diet.

M Abundance of Food Source

Medium. Opportunistic predators. During the winter, they sometimes follow their prey to lower altitudes, where they are also more likely to come in contact with humans and livestock. They also face prey loss due to hunting, disease, competition with livestock and competition for prey from other species, such as wolves.⁶

L Freshwater Requirements

Low. Similar to other cats, obtains moisture from springs, streams and prey.

M Habitat Specialization

Specialist. Prefers steep terrain broken by cliffs, ridges, gullies and rocky outcrops above the tree line, with vegetation that is dominated by shrubs or grasses.² May also move into open forested areas, especially where common leopards are absent and sufficient prey exists, such as musk deer or red deer.

U Susceptibility to Disease

Don't know. Transmission of livestock disease to snow leopard prey is a concern, and outbreaks of foot and mouth disease in snow leopard prey have been reported in India and Pakistan over the last few years.² There is potential for disease transmission from feral dogs as well.²

ADAPTIVE CAPACITY

L Dispersal Ability

High. Home range size varies from as small as 12 km² to possibly 1000 km².^{6,8,9} Mean daily journey length of 1 km,⁸ with observations as high as 28 km.⁹ New information from a long-term study in South Gobi shows that snow leopards can disperse across the open plains and steppe landscape between mountain ranges, which are otherwise considered unsuitable habitat.² Fencing along international borders may restrict their movement.²

M Generation Time

Medium. Approximately 8 years.¹⁰ Age at sexual maturity is 2-3 years.¹¹ Average lifespan may be as high as 13-15 years in the wild.^{5,6}

M Reproductive Rate

Medium. Gestation of 93-110 days; litter size of 1-5 cubs; births occur between April and July; females mate every other year.^{5,6} Where undisturbed, and where sufficient prey exists, snow leopards are likely capable of rapid recovery.

U Genetic Variation

Don't know. Currently, there is insufficient data to make this determination.

EXPOSURE

M What degree of climate variability is the species currently exposed to?

Medium. They generally occur in semi to highly arid areas at high altitudes, with low temperatures.¹

M What level of change in temperature and precipitation is projected across the species' range?

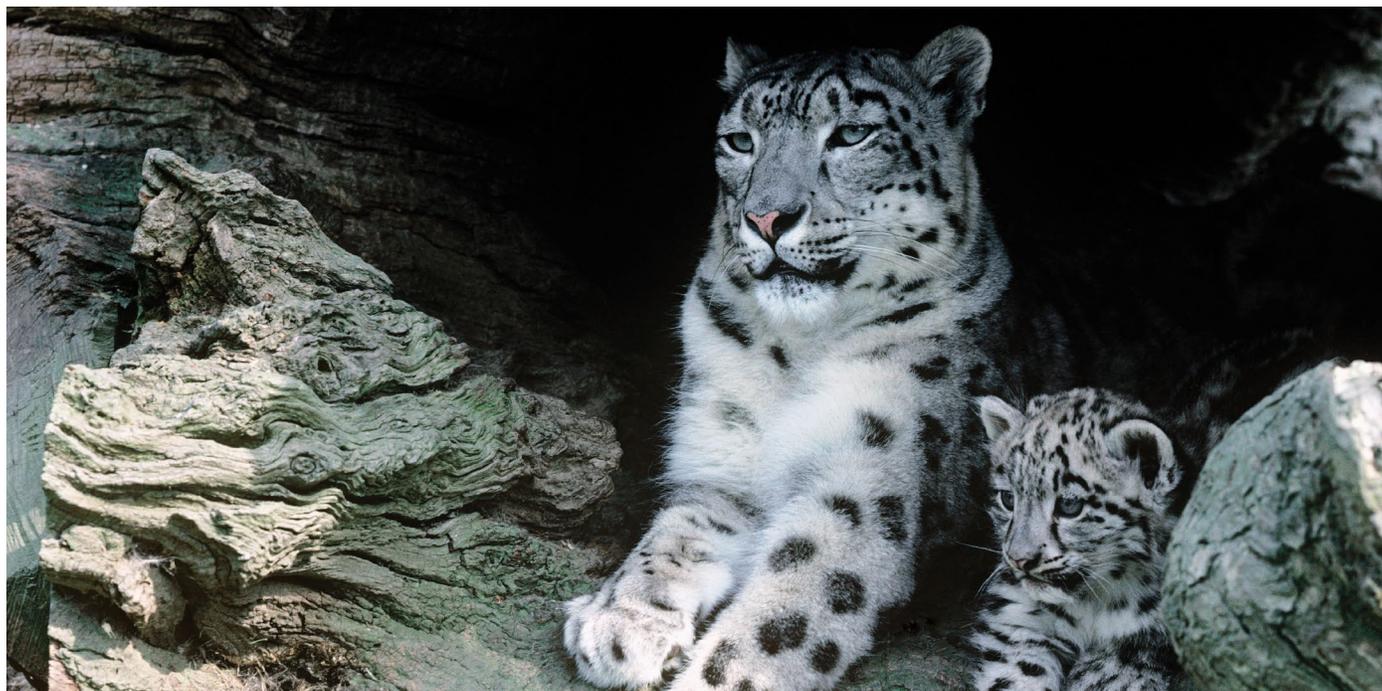
Medium. Central Asia is projected to have strong warming, with similar magnitude between summer and winter. Precipitation is likely to increase, as will the frequency of extreme precipitation events. There is, however, high uncertainty in model projections for the central Asian region, partly due to the mountainous terrain which dominates the area.¹²

OTHER THREATS

H Other Threats

High. Habitat degradation/fragmentation, poaching, hunting, habitat encroachment for livestock grazing, and persecution for livestock predation. Lack of appropriate policy, enforcement, transboundary cooperation, and awareness. Increased human population growth and resulting human-wildlife conflict. Hydroelectricity development, mining and road construction. Growing goat population for cashmere.^{1,2}

RECOMMENDED CLIMATE-ADAPTIVE MANAGEMENT STRATEGIES



Based on the vulnerability assessment, we recommend these climate-adaptive management strategies for snow leopards:

1. Ensure that snow leopards have continued access to their natural prey base, particularly as human-driven activities may begin shifting to higher elevations and encroaching on snow leopard habitat.
2. Increase research efforts on snow leopard ecology and behavior to fill information gaps on questions such as susceptibility to disease and genetic makeup. Under a changing climate, exposure to disease may increase. Increased knowledge of snow leopard genetics will give us a better understanding of their adaptive capacity and how best to manage populations.
3. Increase monitoring of population range shifts, changes in phenology, changes in population abundance, changes in behavior and the correlation of any of these with changes in weather and climate.
4. Increase the extent of protected areas to include stepping stones, movement corridors and climate refugia; improve management and restoration of existing protected areas to facilitate resilience.¹³ Ensure appropriate policy/enforcement/collaboration for protected area management. These principles should also be applied, to the extent possible, outside protected areas.
5. Reduce pressures from other threats, many of which are likely to be exacerbated by climate change, through increasing the capacity of humans to manage the effects of climate change. Examples include
 - Prevent the encroachment of livestock grazing on snow leopard habitat.
 - Prevent persecution of snow leopards for livestock predation.
 - Mitigate the effects of hydroelectricity development, mining, etc.
 - Minimize habitat loss and fragmentation caused by poor land use, development, etc., on unprotected land.
 - Monitor trends (such as an increase in poaching) that might indicate that communities facing increased hardships are turning to methods of earning income that adversely affect snow leopards and other wildlife.
 - Help people adapt to the changing climate by promoting alternative livelihoods that conserve ecosystem services and do not negatively impact snow leopards.

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For this and other species assessments, visit worldwildlife.org/wildlife-and-climate

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