

Giant Panda

WWF WILDLIFE AND CLIMATE CHANGE SERIES



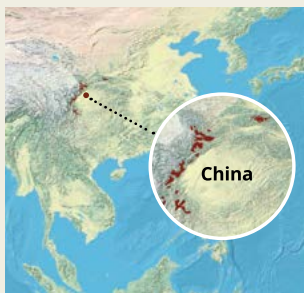
This assessment is one in a series resulting from a WWF study that assesses the vulnerability of numerous species to the effects of climate change. For each species, we also recommend climate-adaptive management strategies.

GIANT PANDA (*Ailuropoda melanoleuca*) population numbers have begun to increase in parts of their range, but their overall population size still remains very small, and only 6 populations have more than 100 individuals. This, coupled with a long generation time and low reproductive rate, will limit their ability to adapt to a changing climate.

Bamboo makes up almost 90% of their diet, and may itself be quite vulnerable in a changing climate. It is subject to periodic, synchronous flowering and die-off, forcing giant pandas to relocate to areas with healthy bamboo. Bamboo has a slow colonization rate, and may not be able to shift to higher elevations or latitudes at the same rate as giant pandas might.

Human activities such as agriculture, logging, and infrastructure development also pose a big threat. Giant pandas have been allowed to persist only at elevations higher than land that can be used for productive agriculture. However, as the agricultural value of land in current panda habitat increases under a changing climate, activities like growing crops and grazing livestock may further encroach on their habitat.

Priorities for climate-informed giant panda conservation should include maintaining and increasing suitable, connected habitat, and restoration of habitat with bamboo species or genotypes which are adapted to a warmer climate. It is also essential to help people adapt to the changing climate, and minimize habitat loss and fragmentation caused by agriculture and other land uses.



Giant panda range

DETERMINING SPECIES VULNERABILITY

The study identified which biological traits and other factors make the species vulnerable or resilient to changes in climate based on the following:

SENSITIVITY: the inability of the species to persist, as is, under changing climatic conditions. Species with high sensitivity are more vulnerable to climate change. For example, if the species has high freshwater requirements, it is sensitive to declining water availability.

ADAPTIVE CAPACITY: the ability of the species to respond to changes in climate either through dispersing to a more favorable habitat or through its potential to evolve in response to changing climatic conditions. For example, a species with a low reproductive rate and a long generation time has low adaptive capacity, and is likely to be more vulnerable to changes in climate.

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.

For more information on the methodology used, please download the Species Assessment Tool at worldwildlife.org/wildlife-and-climate, or view the Wildlife and Climate Change course at wwfadapt.org.

RATING THE CLIMATE VULNERABILITY OF THE GIANT PANDA

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

H indicates high vulnerability to climate change, and **L** indicates low vulnerability—and therefore greater resilience.



SENSITIVITY

M IUCN Red List Status
Vulnerable¹

M Geographic Range

Medium. Found in south-central China at 1,200-4,100 m across 6 mountain ranges in Gansu, Shaanxi, and Sichuan provinces—though approximately 75% of the population inhabits Sichuan Province.¹ The population remains fairly isolated across the total range of approximately 30,000 km².¹ Two-thirds of wild giant pandas are found within nature reserves.²

H Population Size

Small. The most recent survey indicates a total population of approximately 1,864 individuals, excluding dependent young. The population is divided into approximately 33 subpopulations, only 6 of which have more than 100 individuals. However, it is believed that the population has stabilized and begun to increase in parts of the range.²

M Temperature Tolerance

Medium. Prior to human disturbance, used to be found at much lower elevations in warmer climates,³ but have since moved to higher elevations to avoid anthropogenic stresses.⁴ Experience heat stress after prolonged exposure to temperatures above 25°C.⁵

H Does the species rely on environmental cues for reproduction?

Yes. Females ovulate only once a year for a short 2-3 day period in the spring.⁶ Breeding therefore occurs sometime between March and May, and births from August to September.⁷ Reproduction may also be affected by nutrient availability, as pandas will delay implantation or pause embryonic development during periods of low nutrients in bamboo.⁸

L Does the species rely on environmental cues for migration?

No. Does not migrate, but in some areas does have a seasonal elevational movement to track changes in resources and facilitate access to bamboo species with higher nutritional value.⁸

L Does the species rely on environmental cues for hibernation?

No. Does not hibernate, but generally descends to lower elevations in the winter.⁹

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

Yes. Bamboo makes up almost 90% of their diet.¹

H Diet

Specialist. Feed almost exclusively on up to 60 species of bamboo,¹⁰ with a preference for young plants.³ However, each subpopulation has access to only a few species of bamboo. Due to inefficient digestion, they need to consume 20-40 lbs of bamboo a day to get all their nutrients, which involves 10-16 hours a day spent foraging.⁵

M Abundance of Food Source

Medium. A fragmented habitat has limited the area of available bamboo forest. Additionally, bamboo is subject to periodic, synchronous flowering and die-off (at intervals of 15-120 years).¹ In the past, pandas have been able to relocate to areas with healthy bamboo when a die-off occurred, but a significant reduction in suitable habitat availability may now limit that.¹

L Freshwater Requirements

Low. Obtain water from eating bamboo, and drinking from waterways fed by melting mountain snow.⁵

M Habitat Specialization

Specialist. Occupy temperate montane old-growth forests. Sensitive to the type and density of bamboo, avoid steep slopes, and often found close to water.^{8,10,11,12}

M Susceptibility to Disease

Medium. Susceptible to a variety of chronic and debilitating diseases, including from viral infections¹³ (e.g., canine distemper, rabies, parvovirus, adenovirus) and parasites.¹⁴ An increase in stress and reduction in food quality could compromise the immune system of giant pandas and make them more vulnerable to pathogens.

ADAPTIVE CAPACITY

M Dispersal Ability

Medium. Though they have a high physical capability to move longer distances, giant pandas tend to have short movements within habitat patches and, infrequently, longer-distance movements to access other habitat patches.⁸ Increasing human activities may therefore have a disproportional impact on a species that does not move very large distances.⁸ All bamboo species have very limited dispersal ability,¹⁵ and may not be able to shift to higher elevations or latitudes at the same rate as giant pandas might.¹⁶

H Generation Time

Long. Approximately 14 years.¹⁷ Reach breeding maturity between the ages of 4 and 8, and may remain reproductive until age 20.⁶

H Reproductive Rate

Low. The mother gives birth to one or two cubs, but only raises one.¹ In her lifetime, a mother may successfully raise only 5-8 cubs.⁶

M Genetic Variation

Medium. A number of studies suggest that giant pandas have relatively high genetic diversity¹⁸ at a genome-wide scale¹⁹ and in mitochondrial DNA and microsatellites.²⁰

EXPOSURE

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

Medium. Regional warming is projected to be above the global average in east Asia, with an increase in precipitation extremes projected in all seasons.²¹

OTHER THREATS

H Other Threats

High. Increasingly fragmented and degraded habitat, due to agriculture, logging, infrastructure development (increasing road networks, hydropower, mining, tourism development),^{2,22,23} and livestock grazing.²⁴ The panda has been allowed to persist only at elevations higher than land that can be used for productive agriculture. However, under a changing climate, the agricultural value of land in current panda habitat may increase.¹

RECOMMENDED CLIMATE-ADAPTIVE MANAGEMENT STRATEGIES



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

1. Restore habitat with bamboo species or genotypes which are adapted to warmer climates, allowing enough time to accommodate for the slow rate of bamboo colonization.⁸
2. 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.
3. Increase the extent of protected areas to include stepping stones, movement corridors, and climate refugia. This may include creating nature reserves where giant pandas do not currently exist (e.g., the northern side of the current range),¹³ increasing connectivity between fragmented populations,²⁵ and creating buffer zones around existing habitat.
4. Reduce pressures from other threats, many of which are likely to be exacerbated by climate change. Examples include
 - minimize habitat loss and fragmentation caused by agriculture, poor land use, development, etc., particularly as higher elevations become more suitable for human activities⁸
 - monitor trends that might indicate that communities facing increased hardships are turning to methods of earning income that adversely affect giant pandas and other wildlife
 - help people adapt to the changing climate by promoting alternative livelihoods that conserve ecosystem services and do not negatively impact giant pandas; provide local residents with incentives to conserve giant pandas and their habitat²⁶
5. If giant pandas are faced with an increased risk of extinction, translocation of individuals/subpopulations to more climatically suitable locations may need to be considered. Potential translocation sites include those at more northern latitudes or higher elevation.⁸

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For more information, please contact Nikhil Advani at nikhil.advani@wwfus.org

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

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