



Can Mountain Goats Survive Climate Change?

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Summary

Climate change may affect the survival of mountain goats by reducing suitable habitat that includes dependable sources of water, cool summer temperatures and open alpine.

Climate

The climate in northwestern British Columbia has changed dramatically over the last 50 years. Winter low temperatures of -45 C were common in the 1960's. Today the new low is closer to -30 C. There is more rain in winter now and less snow due to mid-winter thaws. Fifty years ago, summers were often rainy and cloudy. Now we have long periods of hot dry weather with temperatures exceeding 30 C. This change in climate and our weather is affecting our forests, our alpine and our wildlife.

Water

Mountain goats are well adapted to the extremely low temperatures and bitter winds of winter in the alpine but summer heat may be more of a threat to their long-term survival. Water in winter is widely available in the form of snow and ice. Goats can find and consume snow everywhere in their range. By contrast in summer, water is limited to streams that continue to flow in hot dry weather.

Dry mountains

All of our local mountains receive large amounts of snow in winter but some mountains are completely dry in summer. On those mountains, freshets from snow melt dry up by the end of June. Melt water high on the mountain flows down through broken rock and may not re-appear until the water bubbles up in bogs and fens within the forests of the sub alpine. In contrast, our wetter mountains have glaciers and large snowfields with large streams of melt water located high on steep rock slopes.

Escape from predators

Mountain goats are adapted to climb, not to run. They cannot run fast enough to escape an attack in the open by bears, wolves or cougar. Steep rock is the only place mountain goats can escape all predators but steep rock cliffs often have no source of water in summer. Mountain goats will not travel far overland from escape terrain to reach water. Any further than 200 meters and goats risk

ambush or pursuit by predators. The best sources of water for mountain goats in summer are glaciers, springs and large snowfields close to steep rock escape terrain .

Ranking water sources

The best sources of water for goats can be ranked for suitability. In hot summer weather, many springs either stop flowing or flow deep under rock fields out of reach by mountain goats. Large snowfields can provide a constant source of water but many are located on shallow slopes far from any steep escape terrain required by mountain goats. Glaciers are the best source of water for mountain goats. Glacier water is constant in the hottest weather and often located close to steep rock that can serve as escape terrain for mountain goats.

World distribution

In spring, goats often move from a small winter range on south-facing slopes to a larger summer range that includes north-facing slopes. But if the summer range does not include a dependable source of water, goats cannot survive. This reality is reflected in the geographic distribution of mountain goats. World mountain goat populations are centred in the coastal and Rocky mountains of western North America that have numerous glaciers. Other drier mountains east of the coastal range and west of the Rocky Mountain range have enough escape terrain but not enough glaciers or other dependable sources of water in hot dry weather. Even if water is available for three seasons each year, if water is not available for a hot dry summer, the mountains are not suitable for mountain goats.

Shrinking habitat

Climate change and global warming are causing glaciers and large snowfields to shrink throughout the world's mountain goat range. The accumulation of snow in winter cannot make up for the ice and snow melting each summer, so glaciers and large snowfields shrink in size and number each year. Since mountain goats are dependent on glaciers and snowfields for water in mid-summer, global warming is effectively reducing the available habitat for mountain goats. Goats cannot stay on mountain slopes that lack water to drink located close to escape terrain.

Heat stress

Global warming can also affect mountain goats directly. An increase in daytime maximum temperatures may cause heat stress or promote predation . On hot afternoons, goats in our region often seek shade under trees and close to water. These places are often at the low part of escape terrain and increase the possibility of ambush by a large predator. Goats travel high on windy ridges to keep cool on hot days but high ridges often lack either good feed or water so goats must travel back down the mountain for at least part of the day and closer to predators.

Mountain goats in our region shed their winter coat by mid July. But recent changes to weather patterns due to global warming often mean high daytime temperatures over 25 C in June. Higher temperatures early in the summer may be stressing mountain goats while they are still wearing their heavy winter coat.

Advancing tree line

Warmer summer weather is melting ground ice and drying alpine meadows and fens. This allows trees to grow in soil that was too cold or too wet before climate change. Mountain goats prefer open alpine areas where they can easily spot approaching predators. As trees grow higher on mountain slopes, the open alpine is reduced in size. Goats stay away from treed areas that can

shield a predator from view so any new growth of trees at timberline reduces preferred habitat for mountain goats.

Conclusion

The combination of lack of water, heat stress early in the summer season and a shrinking open alpine may make climate change one of the most important factors in the survival of mountain goats. The centre of the population distribution of mountain goats may move further west into the glaciated mountains of the British Columbia coast range and higher on the mountain where glaciers still survive and temperatures are cooler. These trends together reduce the suitable habitat for mountain goats and it may take a reversal of global warming to change this fate.

This paper is authored by Jim Easterday of the British Columbia Mountain Goat Society in Smithers BC. Jim has observed mountain goats in the mountains of central British Columbia over the last 50 years.