

Biodiversity

MOUNTAINS MIGHT SEEM LIKE IMPENETRABLE MONOLITHS OF ROCK BUT, IN REALITY, THEY ARE AMONG THE WORLD'S GREATEST SOURCES OF BIODIVERSITY, PROVIDING REFUGE TO UNTOLD VARIETIES OF PLANTS AND ANIMALS. MANY OF THESE SPECIES HAVE DISAPPEARED FROM LOWLAND AREAS, CROWDED OUT BY HUMAN ACTIVITIES. MANY OTHERS EXIST NOWHERE ELSE BUT ON MOUNTAINS. ALL PEOPLE, WHEREVER THEY LIVE, SHARE THE RESPONSIBILITY OF PROTECTING MOUNTAIN BIODIVERSITY. BUT IT IS MOUNTAIN PEOPLE WHO ARE THE PRIMARY GUARDIANS OF THESE IRREPLACEABLE GLOBAL ASSETS. OVER GENERATIONS, THEY HAVE ACQUIRED A UNIQUE AND DETAILED UNDERSTANDING OF MOUNTAIN ECOSYSTEMS. UNTIL NOW, GOVERNMENTS AND INTERNATIONAL ORGANIZATIONS HAVE LARGELY OVERLOOKED THE KNOWLEDGE THAT MOUNTAIN PEOPLE POSSESS AND THE IMPORTANT ROLE THAT MOUNTAINS PLAY IN PRESERVING MUCH OF THE WORLD'S BIODIVERSITY.

A MOUNTAIN OF LIFE

Mountains have been described as islands of biodiversity surrounded by an ocean of monocultures and human-altered landscapes. Indeed, many plants and animals found in mountain habitat have disappeared from lowland regions, crowded out by human activities.

Isolation and relative inaccessibility have helped protect and preserve species in mountains – from deer, eagles and llamas to wild varieties of mustard, cardamom, gooseberry and pumpkin. In the Andes, for example, farmers know of as many as 200 different varieties of indigenous potatoes. In the mountains of Nepal, they farm approximately 2 000 varieties of rice. On the top of a mountain in the Mexican Sierra de Manantlan, the only known stands of the most primitive wild relative of corn continue to grow.

These precious reserves of genetic diversity are our insurance for the future, particularly as the global economy continues to turn lowland habitats into fields of high-yield food crops – monocultures that feed many

of the world's people but are vulnerable to evolving pests and pathogens.

Without the wisdom acquired by generations of mountain people, much of the biodiversity found in mountain environments would be virtually unknown. Only 1 percent of tropical plants, for example, have been screened for any kind of medicinal use. Yet, just as people around the globe are beginning to recognize the value of this tremendous resource, the future of mountain ecosystems and the species that depend on them for survival is in doubt.

Mountain gorillas in central East Africa, spectacled bears in the Andes and resplendent quetzals in Central America are all clinging to ever-shrinking patches of cloud forest. At the same time, trade in rare mountain plants and animals, including species of orchids, birds and amphibians, continues to deplete populations. Poverty in mountain communities is one reason for habitat destruction. Commercial mining, logging, tourism and global climate change also exact a heavy toll on mountain biodiversity.



*We are all
mountain people*

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Key facts

▲ Mountains harbour some of the world's richest biological diversity as well as some of the world's poorest people.

▲ Of the 20 plant species that supply 80 percent of the world's food, six originated in mountains. Among them, the potato first appeared in the Peruvian Andes, corn in the Sierra of Mexico and sorghum in the high Ethiopian plateaus.

▲ Biodiversity found in mountain regions ensures continuous genetic adaptation and change. This is particularly important as modern high-yielding food crops face evolving pathogens and pests.

▲ In some mountain regions, agricultural diversity and cultural diversity go hand in hand. In the Hindu Kush-Himalaya mountains, for example, each region's many ethnic groups grow their own varieties of vegetables and spices.

▲ Because of distinct divisions in labour, mountain women are often the guardians of agricultural biodiversity and know more than men about plant varieties, characteristics and susceptibility to disease as well as options for cooking.

▲ Eighty percent of the world's population relies on traditional medicines, yet one in every eight species of plants, many originating in mountain biomes, faces extinction.

PROTECTING BIODIVERSITY

Mountain people are the primary guardians of mountain bio-diversity. Over millennia, they have grown to understand the importance of shifting cultivation, of terraced fields, of recognizing plants with healing powers and of the sustainable harvesting of food, fodder and fuelwood from forests. Yet this extraordinary knowledge is often unappreciated or ignored by those outside of mountain communities.

Far from the centres of commerce and power, mountain people have little influence over the policies that direct the courses of their lives and contribute to the degradation of their mountain homes. Indeed, up until now, mountain ecosystems and mountain people have received little attention at all from governments and organizations worldwide – a disparity that threatens not only mountain life but the richness of lives everywhere.

EXPERT SOURCES

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Consortium for the Sustainable Development of the Andean Ecoregion

www.condesan.org/

Global Mountain Biodiversity Assessment

www.unibas.ch/gmba/

International Centre for Integrated Mountain Development

- Biodiversity Focus
www.icimod.org.sg/focus/biodiversity/biodiv_toc.htm

International Development Research Centre

- Mountain biodiversity at risk
www.idrc.ca/media/MountainBio_e.html

Mountain Forum on-line library
www.mtnforum.org/resources/resources.htm

WHAT ALL MOUNTAIN ECOSYSTEMS HAVE IN COMMON

Not all mountain ecosystems are the same. Yet they all, whether in cloud forests, on alpine grasslands or along glacier-fed streams, have two things in common: altitude and diversity. Rapid changes in elevation, slope and orientation to the sun have a tremendous influence on temperature, wind, moisture availability and soil composition over very short distances. These subtle changes create pockets of life found nowhere else but at a particular elevation and on a specific mountain or range.

Extreme climatic conditions push the limits of biological and human adaptation ever further. At high altitudes, native plants and animals develop special survival mechanisms. Some alpine wildflowers, for

example, are adapted to live in the micro-habitat created by the shade of a single rock.

For the people who struggle to survive in these harsh environments, understanding and respecting this delicate balance is crucial. Farmers in the mountains of Burundi and Rwanda, for example, plant between 6 and 30 different varieties of beans in order to exploit subtle differences in elevation, climate and soil.

Unique conditions, while generating a wide variety of species, make mountain ecosystems extremely fragile. Slight changes in temperature, rainfall or soil stability can result in the loss of entire communities of plants and animals.

ALIEN INVADERS

Like island habitats, mountain ecosystems have no naturally evolved defences against invading species. Often, these alien invaders are introduced by human visitors or as a consequence of planting non-native crops or ornamental plants.

Because they generally arrive without the predators or pests with which they evolved, these invasive species easily out-compete native flora and fauna. Examples of some of the most damaging alien species include feral pigs in Hawaii in the United States and Costa Rica, goats in Venezuela, foreign grasses in Puerto Rico and alien trout in the United States' Yellowstone National Park.

Methods to eradicate alien species are often experimental but always time-consuming and expensive.

A CALL FOR MOUNTAIN SCIENCE

There has never been a "science" of mountains. Our understanding of mountains – as opposed to oceans or lowland rain forests – is derived from a variety of scientific disciplines that rarely exchange ideas or information. As a consequence, crucial relationships between upper and lower watersheds, mountain forests and alpine grasslands, mountain people and lowland urban dwellers have never been understood. Integrating the many ways in which we examine mountain ecosystems – blurring the lines between geology, meteorology, hydrology, biology, anthropology and economics – will not only raise awareness but aid the development of sustainable practices that will help protect mountain ecosystems and the biodiversity they shelter.

THE PRESSURES OF A MARKET ECONOMY

Mountain farmers cultivate thousands of plant varieties, many of which thrive only at specific elevations and climates. Often, they encourage cross-fertilization between wild and cultivated varieties. In the Himalaya, for example, domestic and wild varieties of lemon, orange and mango trees are grown side by side. In Mexico, farmers allow teosinte, a distant ancestor of maize, to grow near their cultivated maize.

Planting many varieties of a single crop, as well as allowing wild varieties to mix in, encourages new characteristics to emerge while strengthening a species' genetic diversity and resilience. Many mountain farmers also say it improves yields and minimizes the need for pesticides, herbicides and fertilizers.

Recently, however, a growing number of mountain farmers have felt pressured to abandon age-old practices for modern, high-yield farming techniques. These not only include planting fewer seed strains, relying more heavily on irrigation and higher doses of pesticides, herbicides and fertilizers, but choosing specific fruit and vegetable crops because they will generate higher returns in the market economy. While some communities may benefit financially, for others such changes spell enormous losses. A number of mountain communities, for example, have moved from traditional sheep and goat farming to cattle ranching. As a consequence, entire forest ecosystems have been wiped out as land has been cleared for crops and cattle.

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