

## Skiing threatens alpine vegetation

Jane Bradbury

The last skiers have long since carved their way down the ski trails of Europe, but as the remaining snow melts, what sort of vegetation is emerging on the runs and how does it compare to that on the surrounding hillsides? Not surprisingly, according to Christian Rixen (Swiss Federal Institute for Snow and Avalanche Research SLF, Davos, Switzerland), “all types of piste preparation have an impact on the natural vegetation, with lower species diversity and productivity on pistes than on neighbouring reference plots. However, our new study also provides information about the specific changes associated with artificial snow and with summer machine-grading of pistes, which should help ski-resort managers lessen the ecological impact of their activities.”

Alpine skiing is a sport enjoyed by millions. To keep these winter tourists happy, machine-graded trails now snake their way down mountains around the world. To ensure reliable snow cover, particularly in the face of



*Sempervivum montanum* – is this late flowering alpine plant affected by piste preparation?

global warming, most resorts now also have artificial snow-making facilities. To investigate the ecological effects of trail preparation, Rixen's team compared vegetation patterns on 38 on-piste plots with 38 off-piste plots in 12 Swiss resorts (*J Appl Ecol* 2005; 42: 306–16). “We saw a massive, long-lived impact of machine grading, including reductions in the abundance of early flowering and woody plants”, says Rixen. Early flowering plant loss was also associated with artificial snow, but woody plants, snowbed species, and late flowering species increased where artificial snow was used. Continues Rixen, “pistes

where artificial snow was used had similar numbers of species as those with natural snow, but the species composition was altered”, a probable consequence of differential melting and nutrient properties of the two types of snow.

“The main ecological problems associated with downhill skiing are that the plant (as this research shows) and animal communities associated with ski pistes are altered”, explains William Alldredge, retired professor of Fishery and Wildlife Biology at Colorado State University (Fort Collins, CO) and wildlife consultant for ski areas. “In the US, these impacts are not restricted to ski slopes. There is also the infrastructure that goes with increased human populations, increased human activity throughout the year, and a tremendous increase in summer recreation at ski areas”. Snow-making in the US, he adds, probably has similar effects on vegetation as in Switzerland, but this can also affect the riparian ecosystems that supply water to make snow. Ski areas, concludes Alldredge, “are just one example of our dilemma in balancing ecosystem values with human demands”. ■

## Sharp decline in Nepal's rhino population

Kumar P Mainali

The world's second largest population of endangered one-horned rhinoceros (*Rhinoceros unicornis*) has fallen sharply, according to a recent report from Nepal's Department of National Park and Wildlife Conservation. The report reveals that the number of rhinos in and around Royal Chitwan National Park, home to most of Nepal's rhinos, has declined by 32% (544 to 372) in 5 years.

Poaching, which has flourished due to political instability, is cited as the main cause; poachers have killed at least 94 rhinos since 2000. Another 66 rhinos died of natural causes (including fighting, old age, and predation by tigers) during the same period. Poaching intensified

when the number of protection posts was reduced from 32 (manned by about 20 Royal Nepalese Army soldiers) to seven (with about 60 soldiers) in the Park, as patrol soldiers were reassigned to fight against the Maoist insurgency.

Poachers mainly targeted adult rhinos, as opposed to younger animals, because of the better “quality” of the adults' horn, but a higher percentage of sub-adults and young were lost. In 1994, when the population was expanding, 46% were sub-adults, falling to 38% in 2000; the current figure is 30%. The female to male ratio of adults and sub-adults combined also decreased, from 1.44:1 to 1.26:1.

The growth rate of the total population has also decreased, from 3.88% in 2000 to 0.91%. Sarala Khaling (WWF Nepal) does not see any simple expla-

nation for this downturn, suggesting that “a thorough analysis of the demographic parameters of rhinos” is needed.

The good news is that poaching casualties dropped from 40 to 29 to 10 over the past 3 years, respectively, and the number of deaths by natural causes has also fallen. Pralad Yonzon, Chair of the Resources Himalaya Foundation (Lalitpur, Nepal), has faith that rhinos will survive in Nepal, but argues that it will take a broad-based societal commitment. “Our grassroots communities in biodiversity conservation receive hefty external sponsorship. These ‘sponsored communities’ could not withstand the poaching of rhinos. Conversely, community forestry user groups without any sponsorship have withstood the ongoing test of insurgency.” ■