Oran of Rohida: an endangered tree species of Rajasthan

Sacred groves form a significant component of the traditional conservation movement in many parts of the world[1]. They are the stands of trees or patches of forest that local communities conserve primarily because of their religious beliefs and traditional rituals that run through several generations. Sacred groves are believed to serve as the last refugia for a number of taxa, particularly for rare, endangered and threatened species[2,3]. These groves can also serve economic, medicinal, social and cultural functions. 'Oran', a sacred grove, is a piece of land that is held by the local community in honour and respect of a local deity. In nature many sacred places are associated with indigenous cultures. Indigenous societies must be considered while exploring the relationships between sacred places, biodiversity and conservation. Believing trees to be the abode of gods and ancestral spirits, many communities set aside sanctified areas of forest and established rules and customs to ensure their protection. These rules vary from grove to grove, but often prohibit the felling of trees, collection of any material from the forest floor and the killing of animals[4].

Figure 1. 120-year-old Rohida tree.

The Oran of Rohida – a sacred grove of Marwar teak, standing at the Akoli village (25°11.023′N, 72°30.056′E) of Jalore district, Rajasthan, is the precious asset of an economically important timber species in 30–35 ha of area. This sacred grove has 1-year-old to 120-year-old Rohida trees as the dominant species along with few associated species like *Prosopis cineraria*, *Capparis decidua*, *Zizyphus* spp. and *Salvadora* spp. (Figure 1). Hunting, felling of trees and agricultural practices are taboo in the holy land of the Orans. None of these is utilized for commercial purposes. The Oran of Akoli village is also known as 'Oran of Mahadevji', as the indigenous societies believe that the Rohida tree is blessed by Lord Shiva. Due to faith and sanctity, the Orans are free from encroachment and indiscriminate exploitation. As *Tecomella undulata* was selectively harvested for timber use, by the 19th century most Rohida genetic resources got depleted in the wild and man-made plantations were initiated. Perhaps in terms of forest genetic resources, it is still resources of many founder alleles related to productivity and various other characteristics. Thus, sacred groves that have a conservation role, whether actual or potential and intentional or coincidental, need to be strengthened or augmented by economic incentives for local communities, legal, government, and/or environmental protection schemes, and the establishment and maintenance of buffer zones. Recognition and protection of sacred places by scientific, environmental, governmental and non-governmental organizations can simultaneously promote their conservation as well as that of the associated biodiversity and culture.

1. Hughes, A. and Chandran, M. D. S., In *Conserving the Sacred for Biodiversity Management* (ed. Ramakrishnan, P. S.), Oxford and IBH, New Delhi, 1998.
2. Gadgil, M. and Vartak, V. D., *J. Bombay Nat. Hist. Soc*., 1975, **72**, 312–320.
3. Kushalappa, C. G. and Kushalappa, K. A., Report, College of Forestry, Ponnampet, Karnataka, 1996.
4. Malhotra, K. C., In *Conserving the Sacred for Biodiversity Management* (eds Ramakrishnan, P. S. *et al.*), Enfield Science Publishers, India, 1998, pp. 423–438.

DESHA MEENA*
ANIL SINGH

Forest Genetics and Tree Breeding Division,
Arid Forest Research Institute,
Jodhpur 342 005, India
**e-mail: desha.meena@gmail.com*

Recent cloudburst-induced landslides around Okhimath, Uttarakhand

On 13 September 2012, the Okhimath region in Rudraprayag district, Uttarakhand was revisited by cloudburst-induced landslides which killed 66 people and damaged land and property (Figure 1). On that day, Okhimath Tehshil received 212.5 mm of rainfall. Cloudburst by definition is a localized torrential rain event in which the downpour rate is 200–1000 mm/h (fall down with around 10 m/sec), with drop size between 4 and 6 mm (ref. 1). Such a high-focused rain event results in the increase in pore water pressure. If such high-intensity rain falls on the unconsolidated debris-laden moderate to steep slopes (as was the case around Okhimath), it causes decrease in the frictional drag with a concomitant increase in the shear stress[2]. The final outcome is the generation of multiple landslides of varying magnitude that will be governed by the debris thickness and the underlying lithology.

Topographically Okhimath area occupies a gentle to moderate slope and has adequate forest cover, particularly in the upper reaches between 1500 and 2000 m. Geologically, Okhimath region is located in the seismically active Main Central Thrust (MCT)[3]. The local lithology is dominated by the fractured and fissile schist and gneisses which are dipping against the valley hill slope. These rocks are overlain by recent and old landside debris of variable thickness. Majority of the built-up areas (habitation sites) are located on the unconsolidated debris. The terrain is visited by frequent slope failures caused due to the presence

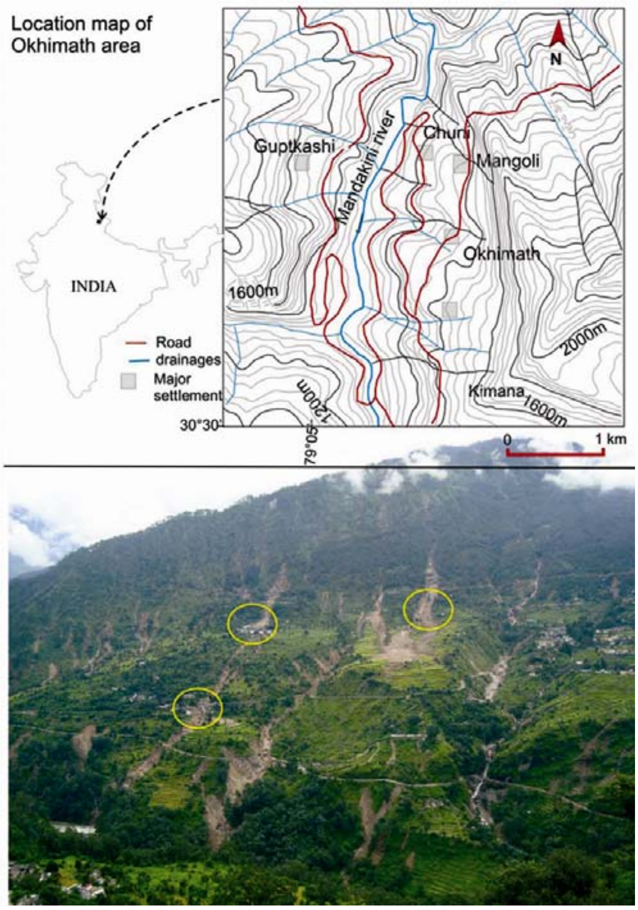

Figure 1. Location and panoramic view of Okhimath area. Yellow circles indicate the sites of maximum devastation.

Figure 2. Arrows indicate the recently developed fissures above Okhimath town.

of unconsolidated debris of varying thickness, seasonal streams emanating from the steep escarpment slopes (Figure 1) and the inherent seismic activity associated with MCT[4]. More importantly, the terrain provides an orographic barrier which facilitates torrential rain. According to our unpublished data, there is a significant variation in the rainfall intensity as a function of vertical height. The most intense rainfall was recorded in the nearby Byung area[5], which however remained unaffected. This indicates the temporal variability in rainfall pattern even at the local level.

With the increase in population villagers are forced to inhabit the slopes that are considered by traditional wisdom as unsafe for living, e.g. proximal to seasonal stream courses, or near the river banks. The magnitude of destruction was maximum in areas where the seasonal streams suddenly flatten out. This suggests that the streams lost their carrying capacity due to sudden decrease in the gradient. As a result, sediment-laden water was laterally spread and as and when it encountered any built-up area on the way, its mighty force caused wholesome destruction. In addition to landslides, land subsidence was also a cause for the damage. We observed deep fissures extending ~50 m above the main township of Okhimath (Figure 2; 30°30′47.32″N; 79°05′49.96″E). Such fissures may become the cause of worry in near future.

The maximum devastation took place in Chuni-Mangoli village (30°31′28.13″N; 79°05′59.61″E and 1350 m amsl), which is located on gently sloping debris lobes (north of Okhimath town). A drinking water tank of 1 lakh litres capacity was also damaged, which probably aided to the landslide fury. Hundreds of landslide scars riddled the ~5 km stretch between north of Chuni-Mangoli and up to Kimana village. As a major landslide occurred in the same region in 2002, the local people were aware of the imminent danger. Since then, the villagers have been regularly demanding that the authorities take remedial measures for the safety and security of the local people, but nothing substantial has been done so far. Local newspapers have also highlighted this problem several times. Also, regional assessment of the vulnerability of this valley has been reported in many scientific publications.

Unfortunately, knowing fully well that MCT is a zone of recurrent seismicity, we rarely bother to evaluate the terrain status, and what kind of changes these watersheds are witnessing after the earthquake shocks. Sudden collapse of a mountain front like Bhenti, which wiped out two villages and forming a lake in the Madhyamaheshwari basin during 1998, is still an enigma. The terrain proximal to MCT requires special attention and treatment for the safety and security of local inhabitants in Uttarakhand.

1. Joshi, V. and Kumar, K., *J. Mt. Sci.*, 2006, **3**, 228–236.
2. Crozier, M. J., In *Encyclopedia of Geomorphology* (ed. Goudie, A. S.), Routledge, New York, 2004, pp. 605–608.
3. Valdiya, K. S., *Geology of Kumaun Lesser Himalaya*, Wadia Institute of Himalayan Geology, Dehradun, 1980, p. 291.
4. Bist, K. S. and Sah, M. P., *Curr. Sci.*, 1999, **76**, 481–484.
5. Sundriyal, Y. P., Project completion report submitted to DST, 2008.

ACKNOWLEDGEMENT. We thank Mr K. S. Panwar, Mr Anil Bartwal and Mr Balbir Singh for their assistance in the field.

NARESH RANA[1,*]
Y. P. SUNDRIYAL[1]
N. JUYAL[2]

[1]*Department of Geology,*
H.N.B. Garhwal University,
Srinagar-Garhwal 246 174, India
[2]*Earth Science Division,*
Physical Research Laboratory,
Ahmedabad 380 009, India
**e-mail: naresh_geo@yahoo.co.in*