



Case Study | Natural Resource Management

Watershed Mapping and Land-Cover Classification in Sedimentation Study

India's Western Ghats is one of 25 biodiversity hot spots in the world and is home to the Kudremukh National Park, an area characterized by rich evergreen forest and significant populations of endangered species, including the lion-tailed macaque and tiger.

Downstream from Kudremukh, the Bhadra River flows past the Bhadra Tiger Reserve and into the Bhadra Reservoir, an important irrigation storage reservoir in the state of Karnataka. The Bhadra River, the reservoir and the catchment provide critically important resources for the wildlife in Kudremukh as well as the Bhadra Tiger Reserve. It also supports the livelihoods of a large human population in the region.

Since the 1980's, Kudremukh has also been home to India's largest iron-ore mine. Open-cast mining is known to have devastating effects on downstream ecosystems the world over, but the impacts of open-cast mining in humid tropical areas are particularly severe. The Kudremukh Iron Ore Company Limited's (KIOCL) mining operation in the hilly Western Ghats region of India receives among the highest rainfall of any open-cast mining operation in the world (6000-7000 mm a year). Over 400 mm of rain have been recorded in a single day, and a few spells of extremely high erosive potential, particularly during the monsoons, account for much of the annual rainfall in these hills. In the monsoon season, rivers in India carry enormous sediment loads. Many rivers carry between 85% to nearly 100% of their entire annual load in the monsoon months.



The Ashoka Trust for Research in Ecology and the Environment, along with the Centre for Wildlife Studies, Bangalore, India, jointly studied the impact of iron-ore mining in Kudremukh National Park on water quality of the Bhadra River. This study was funded by the Wildlife Conservation Society, New York, as part of the efforts to understand human impacts in critical tiger habitats. The IDRISI software was used for several components of the sedimentation study--for the mapping of the watershed and the land-cover classification.

The study was carried out during the monsoon of 2002 and was the first rigorous study done in the wet-season to assess the impacts of mining and associated activities in Kudremukh on the sediment load in the Bhadra river. Based on analyses of previous data, the estimated contribution of this small sub-catchment (< 6 % of total Bhadra catchment) to the total load entering the reservoir in 1985 and 1986 was 53 and 67% respectively.

Photo courtesy of the Environmental Investigation Agency, India.



Watershed Mapping and Land-Cover Classification in Sedimentation Study (continued)

Estimated sediment loading since the beginning of mining in the early 80's, based on analyses of previous data, increased successively from 1,197 tons in 1984 to 49,429 tons in 1986 measured at Malleshwara just downstream of the mine. From this study in the 2002 monsoon alone, more than 68,000 tons of sediment load was estimated at Nellibeedu downstream of Malleshwara, including one event in which over 19,900 tons was discharged in a single day. A minimum of 53 such similar rainfall events occurred in the time-period 1990 to 2002.

Wildlife First and others have campaigned for over a decade to stop mining operations in Kudremukh. The sedimentation study was used in a report that contributed to the Supreme Court's 2002 decision to stop mining in Kudremukh by 2005.