

Logging on Slopes Kills

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Ten hectares of forest were cleared for cultivation on a steep slope in the Alas Valley in Sumatra, and as a result 13 people were drowned. The authors describe what happened and show why a flood was almost inevitable.

On May 9, 1981, the village of Lawe Mengkuku 20 kilometres north-west of Kutacane in Aceh Tenggara, was devastated by a flood. Thirteen people were killed and 17 houses destroyed. The River Mengkudu, normally a very small stream only a metre wide and 8-15cm deep, had never flooded before. What caused the flood?

The immediate cause was easy to find. A dam had formed 1300m upstream from the village where the bottom of the river valley was 25m wide at a slight bend in the river, whereas at the village the flood formed a 150m wide front. The silt that splattered on to the upstream side of the tree trunks showed that the water level at this point was at least 20m high, possibly 25m. The volume of water and debris in the dam was more than 54,200 cu.m. So what caused a dam to form?

That was obvious too: eight erosion areas, totalling 2.325ha had landslided down from the steep 45°-60° slopes into the ravine below; the total volume of soil and stones that was eroded was more than 4000 cu.m. Many trees, 20-40m long and ½-1m in diameter, lodged in the bottom of the ravine. There may have been two or three dams in succession, and each one as it burst eroded more of the sides of the ravine, so that the next dam was bigger. Erosion at the bottom of these steep banks is enough to start a landslide if the slopes above are steep and the soil unstable. Why was the soil unstable?

The five landslides on the west bank, each about 100m high on a 50° slope, were not caused by the river, because further upstream all the vegetation on the ravine sides was undisturbed forest, and the silt marks showed that the highest level of the river just upstream was only 6m, with a surface width of 17m. The cause of the five eroded slopes was a ladang directly above them, a 10-ha area of forest on a 15°

slope that had been cleared for cultivation; all the ground vegetation and most of the logs had been burned.

The soil had been exposed and bare for 3-6 months, lashed by heavy rainstorms that broke it up, washing much of it down the slope. Without the forest vegetation, (especially if this soil was saturated, as it would be in the rainy season) most of the rainfall would run straight off the ladang onto the 100m forested slope below.

On a 15° slope, the run-off of night rainfall from bare saturated soil would be 85 per cent or more. After every heavy rain that deposited more than 65mm of rain, the 300m x 100m-area below the ladang would have some 5525 cu.m of water pouring on to it. On these steep slopes, this amount of run-off over many months makes the soil unstable, so that towards the end of the rainy season, and after several consecutive nights of heavy rain, most of the soil beneath the vegetation would be leached away; one more night of heavy run-off would cause a few trees to topple, which would quickly precipitate a landslide of the whole bank.

The night of the flood was in fact preceded by this pattern of rainfall.

When this debris crashed into the ravine below, it would cause large parts of the opposite bank to landslide also. The 10-ha ladang on the mountain slope thus destabilised the whole slope below it, causing it to collapse and dam the ravine.

With its exit blocked, the river would build up behind the dam. The dam that formed 300-500m downstream from these erosion slopes blocked the river until it held more than 54,200 cu.m of water and debris. When it burst, its force was sufficient to sweep vast numbers of trees that had been logged and left in its path onto the village below, together with many heavy boulders of 1-3 cu.m. It was the logs streaming down in the torrent

that did most of the damage in the village.

If that 10-ha ladang had not been cleared, the river above the erosion areas which had an area of 63 sq m (it drains a catchment area of 400 ha), would have spread out harmlessly in the wider area near the village, forming a front less than one metre high and over 63m wide, compared with the flood which actually hit the village which was 75m wide and 4.5m high, at a point 530m from the village. Thus if 10 ha of forest on that slope had not been logged, 13 people at Lawe Mengkudu would still be alive.

This flood was no freak of nature. The following night, only a few kilometres away at Seldoq, the Lawe Penanggalan flooded. Here the logs that came down did far more damage than at LMK, but not in lives lost. Thirty people took refuge inside the house of Bpk Aman Sar. As the logs came crashing down onto his house, one house a metre away and three houses

opposite were squashed. One person was killed; it was very nearly 31. Other normally small rivers (3-5m wide, 30-50cm deep) at Aunan and Lawe Gerger flooded, bringing down a mass of logs which destroyed newly built bridges, houses, roads and rice fields.

The message is clear; most of the small rivers draining into the Alas River from the steep slopes above, descend through narrow steep-sided ravines, which can and do, dam easily when the forest above them is cleared. In the Alas Valley, the logging of forest on the mountain watersheds, must be prohibited, or the toll of people killed will increase.

But this logging continues.

We would like to acknowledge support from the Leverhulme Trust (JMYR) and the Gerritts Foundation (BRS). We are also grateful to the Indonesian Institute of Sciences, and to Ken Proud of WWF-Indonesia.

Feral Goats in New Zealand

M. R. Rudge

New Zealand policy is to eliminate feral introduced animals, such as deer and goats, which have done immense damage to the native animals and vegetation. But an attempt to kill off the feral goats on one island in order to protect the native vegetation raised the cry that these were 'Old English' goats and should be conserved.

The Species Survival Commission (SSC), at its October meetings in New Zealand, departed briefly from discussing endangered species to hear the case for saving what may be an endangered breed, presented by a group on behalf of the feral goats of Arapawa Island in the Marlborough Sound region. The history of these goats is obscure, but they have probably been on the island since 1839. If they were brought from England, as so many of New Zealand's animals were, they may even be a relic of the Old English breed.

New Zealand has had a long-standing policy of eliminating feral mammals in order to protect native flora and fauna. But when moves were made against these

animals, local enthusiasts removed some of them to private land and prompted two government departments to set up a herd for study. Both herds are having breeding problems but the combined number of captive animals is now about 250. The long-term future of these flocks is still being debated but, for the time being at least, this strain is not in danger of extermination. Quite what the strain is still in question, but work is continuing to find objective ways of describing differences between New Zealand feral goat populations and their relationship to domestic breeds.

It is most unusual for New Zealand authorities to be even considering the conservation of introduced feral mam-