

Hydrology of Pookot Lake Ecosystem of Western Ghats Region

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SYNOPSIS

Detailed hydrologic and other allied investigations were carried out in the Pookot lake and its catchment, situated in the Western Ghats, to suggest appropriate conservation measures. The investigations include: monitoring and estimation of hydrologic parameters and hydrographic surveys. The paper highlights these investigations and certain useful recommendations drawn up based on the studies; some of the measures are being implemented by the Government and other concerned agencies.

1.0 INTRODUCTION

1.1 The Pookot lake is a natural water body of about 7.5 ha, situated in the Western Ghats; the catchment of the lake is 40 ha in area and is separated from adjoining catchments by a chain of hills rising to the order of 800 m above mean sea level. The slopes of northern and eastern sides of the catchment are 80 and 56 m/km; the elongation and circularity ratios are 0.4 and 0.2 respectively.

1.2 The major rock type of Pookot area is biotite gneiss. The mineral contents include quartz, feldspar and biotite.

1.3 The general pattern of vegetation in the catchment is given in Fig 1. Some of the changes brought about in the landuse of the catchment of the lake in the recent past include deforestation, coffee plantation, construction of sheds, roads, etc.

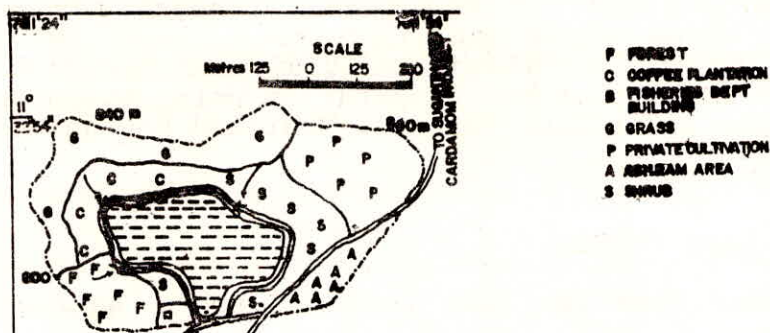


Figure 1. Landuse map of Pookot lake catchment

1.4 The lake and its catchment call for conservation and protective measures. The forests in the catchment have disappeared and cash crops have replaced the natural vegetation. This has adversely affected different phases of the hydrologic cycle. The development activities have caused more sediment movement to the lake. The Government of India approached the State to protect this unique aquatic ecosystem with indigenous flora and fauna of Western Ghats.

2.0 HYDROLOGIC INVESTIGATIONS IN THE CATCHMENT

2.1 The meteorologic and hydrologic features of the catchment were studied using the data collected from the field. The average annual rainfall in the catchment is 4433 mm and the number of rainy days, 140. About 60% of the rainy days are in the south-west monsoon and 30% in the north-east monsoon; rainy days per month during the dry season (January-April) do not exceed five days.

2.2 Based on the rainfall frequency analysis, it is observed that the highest one-day rainfall for the catchment is of the order of 533 mm and this value is the highest for the period 1901-1970 in comparison to all the other stations of the State, indicating the role of orography in the rainfall pattern of the region.

2.3 The probable maximum precipitation for one-day duration was estimated (Hershfield, 1960) as 610 mm and that of 5-day and 10-day durations as 1930 mm and 2720 mm respectively.

2.3 The streamflow into the lake begins in June and continues upto December; the maximum flow is during south-west monsoon period ($1914 \times 10^3 \text{ m}^3$); thereafter sudden reduction in flow is observed in September ($10 \times 10^3 \text{ m}^3$).

2.4 The runoff coefficient reaches the maximum value during the month of August (ranging from 0.91 to 0.98) and then steadily decreases with the weaning of south-west monsoon and again picks up in the peak of north-east monsoon in October (ranging from 0.91 to 0.94).

2.5 The evapotranspiration of the lake catchment for reference crop was computed using different approaches, such as that of Hargreaves (Chow, 1964), Thornthwaite (1939) and Modified Penman (MAFF, 1967). It is found that the computation using evaporation pan method is close to the estimation based on Modified Penman method.

3.0 STUDIES IN THE LAKE PROPER

3.1 The evaporation from the lake is found to be maximum during April (4200 m^3) and minimum during October (2206 m^3).

3.2 The average water storages in the lake during the south-west monsoon, the north-east monsoon and the dry season are: 0.14 Mm^3 , 0.095 Mm^3 and 0.075 Mm^3 respectively, the average quantity in the summer months being just 79 percent of the north-east monsoon period.

3.3 Based on a hydrographic survey carried out in 1984 and considering the general slope characteristics, it was estimated that a quantity of 12632 Mm^3 of recently deposited sediment could be removed to achieve more capacity for the lake; however, desilting was not carried out with an aim not to disturb the ecosystem.

3.4 The second hydrographic survey carried out four years after in 1988, after introducing some of the conservation measures, indicated that the additional sediment deposited is only 459.36 Mm^3 . The annual loss per year from a hectare of catchment was only 16 Mm^3 ; the deposit was mainly from the nearby areas where the streamlets join the lake (Fig 2).

3.5 As a part of the initial conservation works, the existing sluice gate at the outlet was repaired.

4.0 CONSERVATION MEASURES

4.1 In addition to the hydrographic and other allied investigations reported, chemical and biological aspects of limnology also were studied in detail. Based on this integrated study, a few measures to conserve this lake ecosystem in the Western Ghats were recommended.

4.2 The recommendations include: declaring the catchment as a protected area, providing fence along the water divide line of the catchment for about 60% of the total perimeter, planting the catchment with indigenous species of trees and plants, providing sediment traps, preventing application of fertilizers in the coffee plantation, and discouraging felling of trees.

4.3 The investigating team initiated the following activities to achieve the conservation goals:

- (i) The lake and its catchment was declared as protected area by the Government;
- (ii) Awareness programmes were conducted;
- (iii) The investigating team convinced the Government the need for providing fence to prevent cattle and intruders;
- (iv) Actions were initiated to plant the catchment with local varieties of trees;
- (v) The sediment traps constructed were really useful in arresting the sediment load;

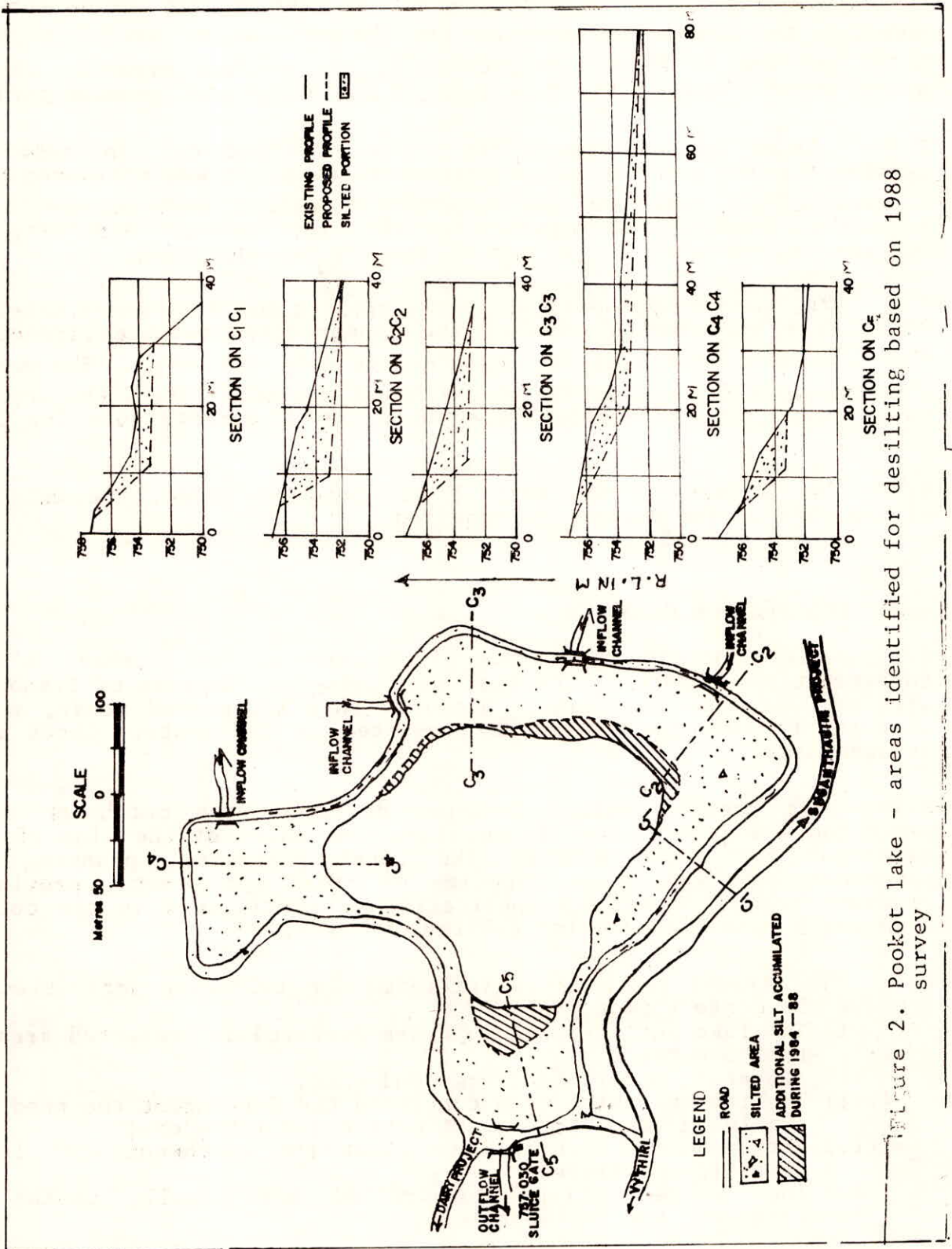


Figure 2. Pookot lake - areas identified for desilting based on 1988 survey

- (vi) The repairs carried out on the sluice gate was of immense use in regulating the flow of water from the lake;
- (vii) The coffee plantation in the Government land within the catchment was given up; and
- (viii) The traffic through the catchment was diverted by the construction of a substitute road.

5. CONCLUSIONS

5.1 The hydrologic investigations carried out in the Pookot lake and its catchment helped in understanding the hydrologic processes in the area in particular and in the Wynad district in general.

5.2 The problems associated with the conservation of a typical lake in the Western Ghats region were identified and the remedial measures could be chalked out.

5.3 The results of study could be directly made use of by the authorities to conserve the Pookot lake and manage the entire catchment.

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