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RAINFALL VS LANDSLIDE STUDY IN NILGIRI DISTRICT, TAMILNADU, SOUTH INDIA

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Abstract

The present study reveals that correlation between rainfalls Vs landslides was carried out. The rainfall data were collected from IWS (Institution of Water Studies) and split for annual and season wise from a decade years of (2003 to 2012). The rainfall data further interpreted through Graphical methods and correlated with landslide locations. The interpreted rainfall data shows that more amount of rainfall in Notheast Monsoon when compare to other seasons. But, almost equal amount of rainfall were noticed in SW Monsoon. The above data were taken into GIS, the bar diagram were constructed to relate the higher concentration of rainfall with respect to graphical location in GIS. The positive correlations were existing between rainfall and landslide. It clearly reveals that high amount of landslides occur in the Coonoor region and Wellington and Moderate amount of landslide occur in the Kothagiri and Ooty region. The particular landslide shows that rainfall is the predominant forcing factor for landslide.

Keywords: Rainfall Variation, Landslide, Spatial Distribution, Nilgiri.

INTRODUCTION

The hilly terrains area have been subjected to slope failure under the influence of variety of terrain factors and triggered by events such as extreme rainfall or tectonic movements. Landslide is a frequently occurring phenomenon in the Nilgiri district because of High Intensity of Rainfall. Rainfall is one of the triggering factors of landslides. As expected the landslide prone areas of Burliar & Marapalam falls under the steep slope category which clearly shows that a heavy rainfall is sufficient to make the rocks and boulders come hurtling down in these steep terrains, that's what happened in the recent landslide occurred in November 2006. The Nilgiris district usually receives rainfall during both south west and north east monsoon. The average rainfall in this region varies from place to place and in between 1500 mm to 3000 mm. In November 2009, the district received a rainfall of 1867 mm, which is the highest rainfall recorded in a period of thirty years. In areas prone to landslides, the main factor is the availability of the weathered overburden that is susceptible to sliding on unstable slopes, when induced by rainfall or earthquakes. The district receives rainfall from both southwest and northeast monsoons. The southwest monsoon is more active contributing nearly 50 percent in the west and 40 percent in the east. The northeast monsoon is moderate, contributing nearly 40 percent. The precipitation of rainfall gradually decreases towards west to east. Rainfall induced landslides in November 2009 left more than 50 people dead and resulted in property loss of about 200 crore in the Nilgiris region (Subramani, 2012), Though the immediate triggering factor for the landslide at many locations was heavy intense rainfall, there were several causal factors like excavation of slope at toe, vertical cutting, loading at crest, defective maintenance of surface drainage systems and extensive anthropogenic interference (Thanavelu,et.al,. 2008).

STUDY AREA

The study area is a part of the Western Ghats (TN uplands) and lies between the latitudes 11 ^{o} 10'00"N and 11 ^{o} '45'N and longitudes 76 ^{o}14'E and 76 ^{o} 02'E. It lies in the Survey of India toposheet No.58A/6, 7, 8, 10, 11, 12, 15 and 58 E/02 published by the Survey Of India on 1: 50,000 scale and it covers 2541 km^2 . The maximum and minimum altitudes are 2640m and 300m above mean sea level. The natural boundary of the plateau along much of its Southern side is the Bhavani River and the Northern frontiers are bounded by Moyar River. The Charnockite group of rocks with the enclaves of Satyamangalam Schist Complex exposes in the Nilgiri district. (Fig. 1)

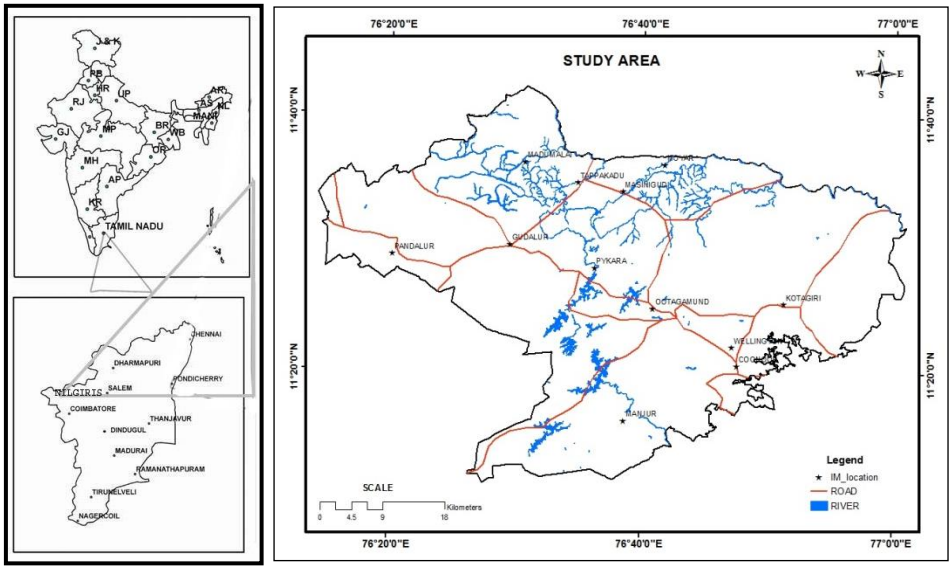


Fig. 1

MATERIAL AND METHODS

The reconstruction of rainfall has been done based the rainfall data. The collected data of rainfall has been split for season wise and annual wise for a decade (2003 to 2012) and assessed. The split-up data further interpret in season wise and Annual into the graphical interpretation. The details of existing landslide were collected and digitized in GIS platform. The relations between rainfall Vs landslides geographic locations were correlated.

RESULTS AND DISCUSSIONS

The overall annual rainfall precipitation recorded from 31 rain gauge stations in the study area. They are namely stations

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ADARLY	ANAIKATTI	AVALANCHE	CHERANCODE	COONOOR	COONOOR_RLY	DEVALA	ELLAMANNA	EMARALD	GLENMARGAN	GOVERNERSOLA	GUDALORE	GURRENCY	HILLGROOVE	KALLATTI	KARGUDI	KETHI	KINNAKORAI	KODANADU	KOTHAGIRI	KUNDAH	KUNSHOLA	MASINAGUDI	NADUGANI	NADUVATTAM	NAICKENSOLA	OOTY	OOTY_SCR	RUNNYMEDU	UPPERBHAVANI	VALVEWOODES

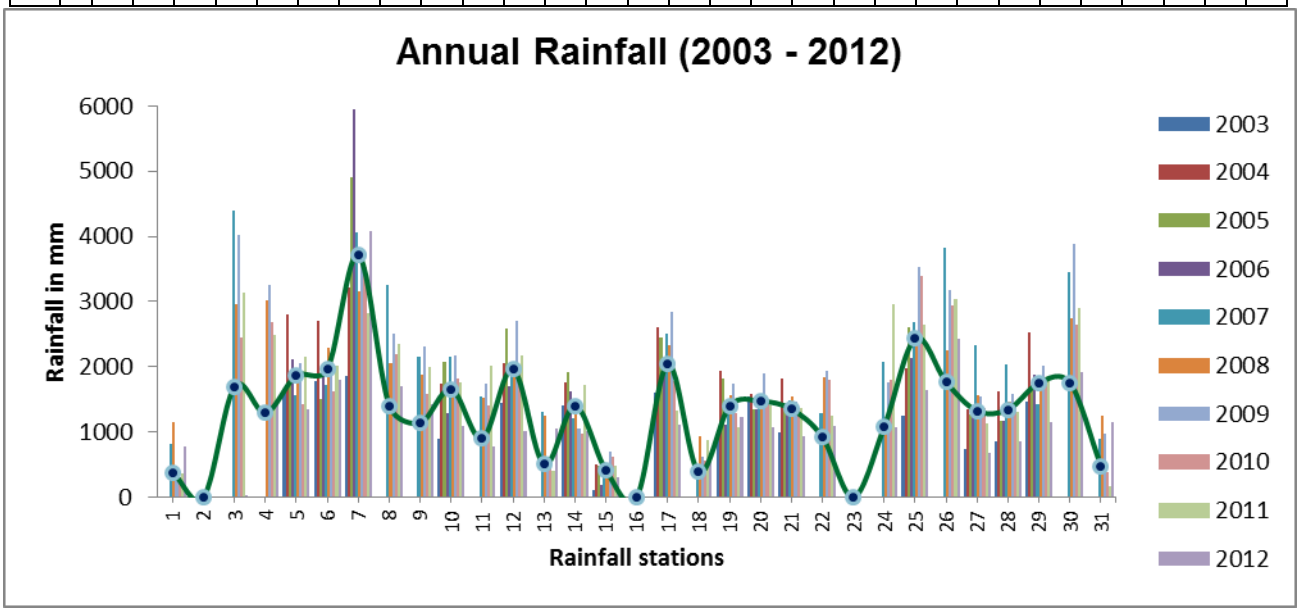


Fig. 2

In Develaa rainfall stationhas accounted of 6000 mm (Fig. 2), especially, in 2006 it was highly prominent. This was the only record as highest in the decade history as anomalous in the study area. Even in other years in the other station too it is recorded as good in amount. In Kallati, rainfall precipitation was lower than the other stations of the study area. Anaikatti, Kargudi and Masinagudi were accounted with data not available, but the stations are launched newly. Average annual rainfall too was varied in variety such as up and downs, but in accountable wise.

Summer season rainfall accounts have been split from the annual rainfall. It is reconstructed for the further deep view of study the rainfall. It was quit differed throughout the years from station to station. There was a steady rise in summer rainfall in Kethi area (Fig. 3). Likewise, Glenmargan, Gudalore, Hillgroove and Naduvattam too behaved the same, but not in s*u*fficient level Kethi.

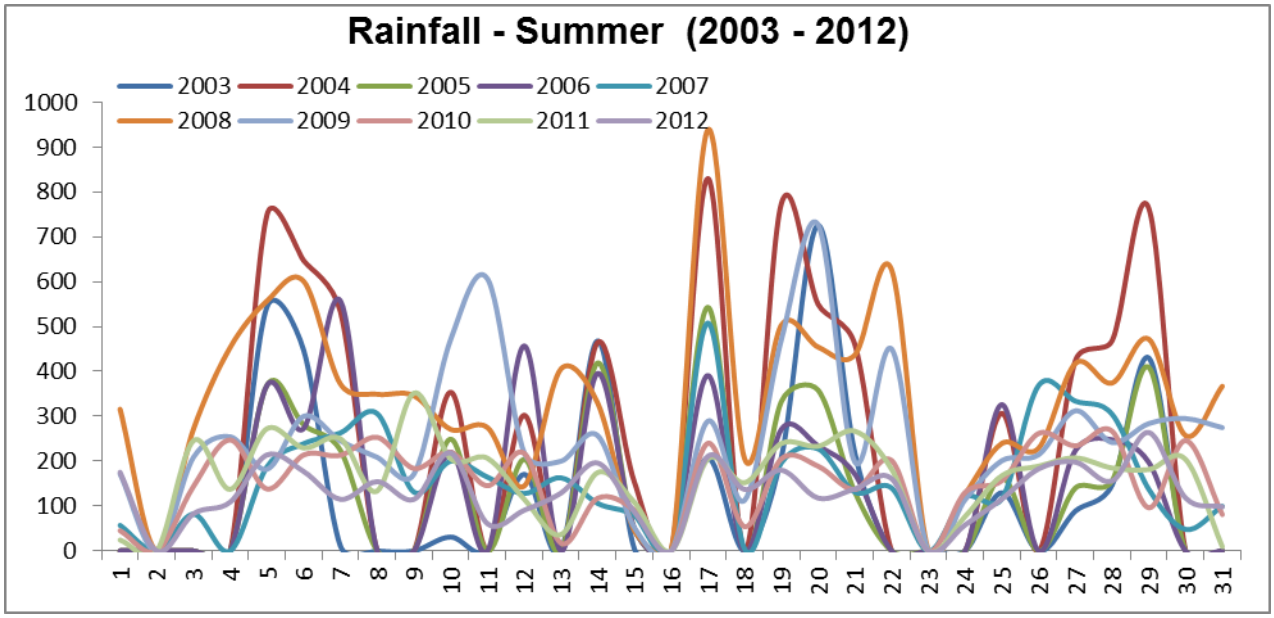


Fig. 3

Winter season of the area for rainfall through the rain gauge station has been notified for the decade years from 2003 to 2012. The amounts were been irregular to one another. In years wise to the accounts were notified as non-linear. Cherancode, Coonor, Coonor Rly, Hillgroove and Runnymedu have shown steady upraised rainfall in adjacent years from 2003 to 2012 respectively (Fig. 4).

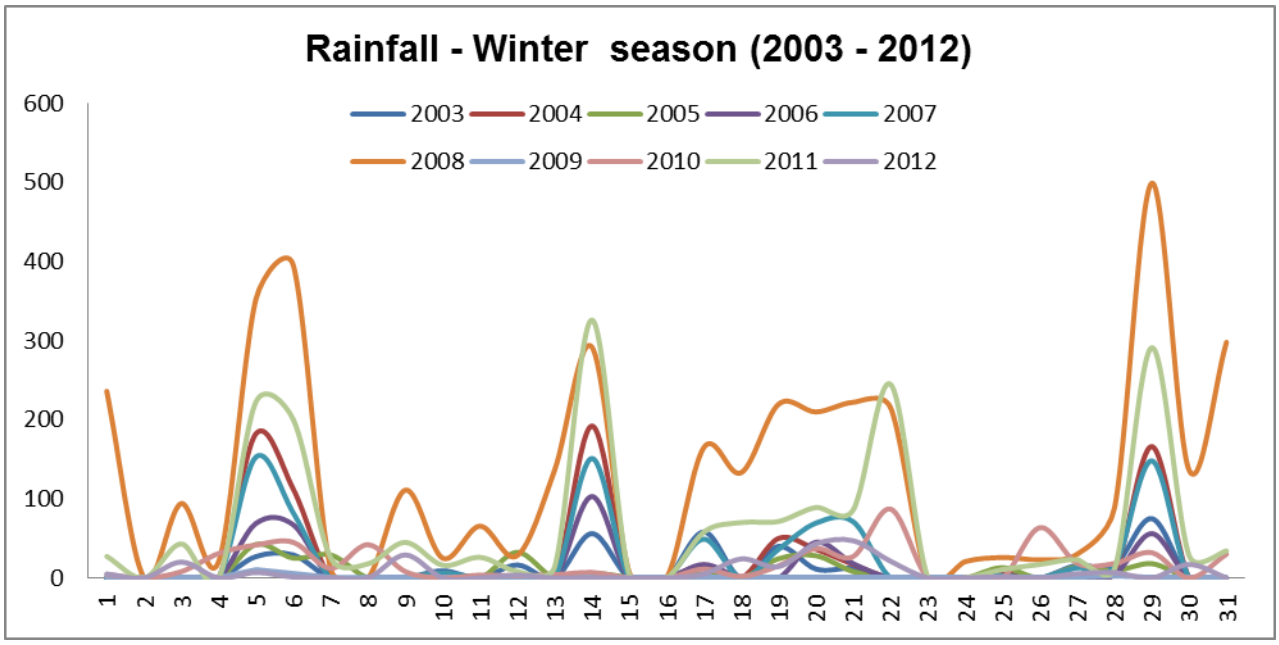
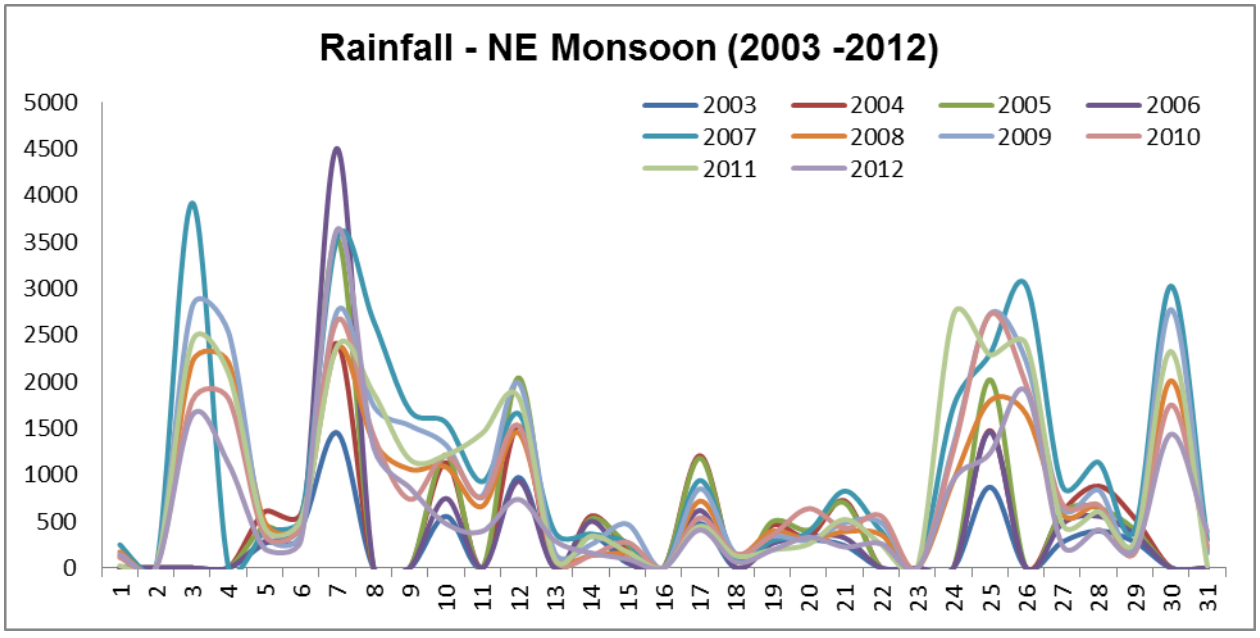


Fig. 4

NE monsoon is the common and base according to the Tamilnadu climate. In here Cherancode, Anaikatti, Devala, Elammanna, Gudalore areas have shown steady upraised rainfall precipitation in all the respective years. Highl rainfall noted as in Devala and lowest denoted in Kinnakorai. The Hillgroove which was precipitated with high rainfall in winter

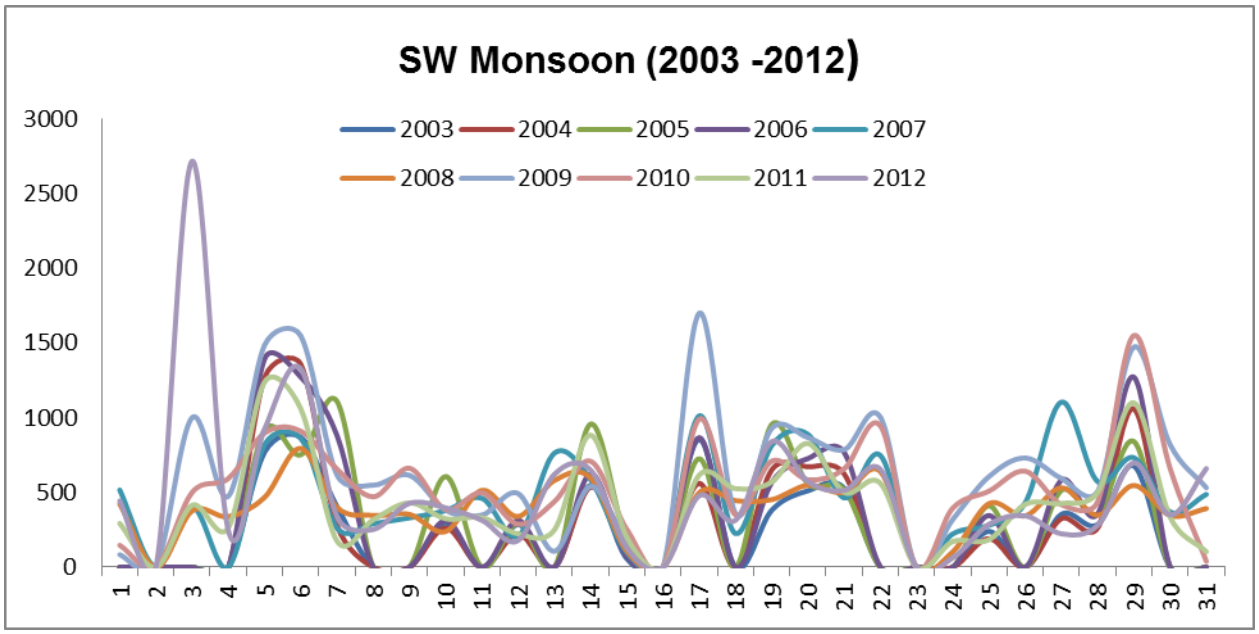


was denoted in lower level NE monsoon, the latitudinal placement (Fig.5).

. **Fig.5**

SW monsoon is located in Kerala and southern part of Karnataka states. But the part of Nilgiri region is occurs in the Kerala recent places. This could be cause of the wide of the

mark season wealth of the area.Highly noted as in Avalanche, Coonoor, Kethi, Runnymedu, Upper bhavani and lowest denoted in Anaikatti (Fig.6).



(Fig.6)

GIS ENVIRONMENT

The annual average rainfall station wise data & existing landslides Geographic locations were taken into the GIS platform. These data were correlated in GIS through spatial distribution analysis. The rainfall data were classified into three classes, respectively, High rainfall & landslides, Moderate rainfall & landslides and Low rainfall & landslides (Fig.7). The spatial distribution shows that the higher rainfall & landslides were noticed in Coonoor, Ooty Wellington. Moderate rainfall & landslides were Manjur, Pykara, Kothagiri slight part of Pandalur and near Gudalur. Lower rainfall & landslides were Madumalai, Tappakadu, Masinigudi, Moyar. The higher amount of landslides occurred in higher & moderate classes in the rainfall areas.

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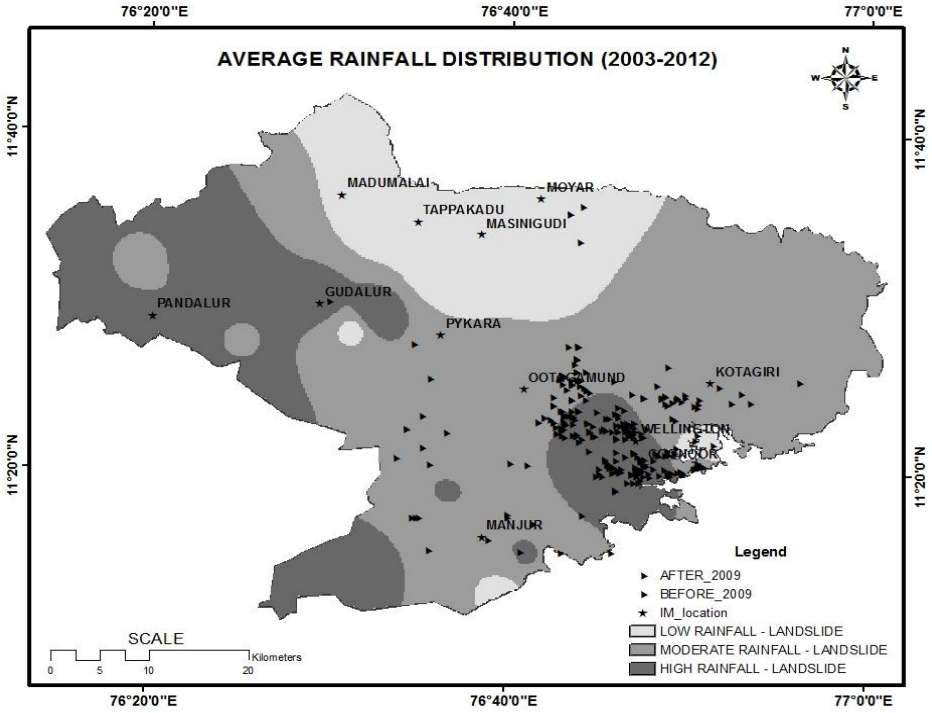

(Fig.7)

CONCLUSION

The study rainfall data in season wise were done through graphical methods. The existing landslide locations were taken into the GIS platform. The study area receiving higher amount of rainfall were noticed in NE and slightly SW. Graphical interpretation were done with rainfall gives better understanding of the rainfall variations over landslides data were taken into GIS platform, the graphical diagram were constructed to relate the higher concentration of rainfall with the existing landslides. It clearly reveals that high amount of landslides occur in the Coonoor region and Wellington and Moderate amount of landslide occur in the Kothagiri and Ooty region. The particular landslide shows that rainfall is the predominant forcing factor for landslide.

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