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Morphometric Analysis of Milli Watershed Area in Zaheerabad

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ABSTRACT

By using GIS and remote sensing morphometric analysis was done for the study area located at Medak district. by using satellite images & toposheets of scale 1:50000 are used for creating drainage maps, drainage density, elongation ratio, circulatory ratio etc. are calculated to analyse the nature of watershed by the help of contour map, stream map, land use &land cover map are also used in the study for finding the factors for the formation of water shed.

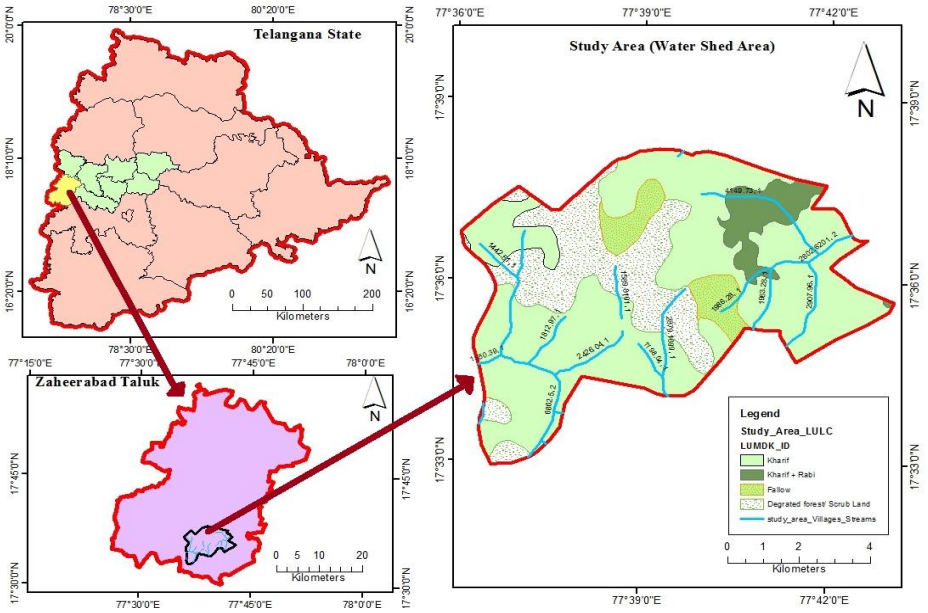
Keywords: GIS & RS, Stream network, land use, Land cover, Contour Map, Zaheerabad, Medak.

INTRODUCTION

Catchments and water sheds have been identified as planning units for administrative purpose to conserve precision resources. The concept of watershed management recognizes the inter-relationship between land-use, soil and water and the linkage between uplands and downstream areas. Keeping the ever increasing population, food security is needed and it is compulsory to develop water and land resources. The excessive exploitation of natural resources adversely affects the availability of these resources and causes serious threat to the existing eco-system.

Water-shed development programme not only protect and conserve the environment,but also contribute to lively hood .Integrated watershed concept using is easy, simple and affordable. Local technologies are used to mitigate droughts which occurs frequently in some places. The basic object is to increase production and availability of food, fodder and fuel. Watershed management is an iterative process of integrated decision making regarding use and modification of land and water with in the water shed.

STUDY AREA FIGURE



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Since water becoming the limiting factor for the development more systematic approaches are needed to analyse, uses, depletion and productivity of water. An improved knowledge of the land surface hydrologic states and fluxes, it is urgently needed in many hydrologic studies and water resources management. At present many tools can help for water budget analysis like GIS and RS techniques.

The study area lies between 17^0 31'30'' and 17^0 39' North latitude area of 65.82 Km^2, conventional surveys and satellite image data interpretation techniques and GIS technology is used not only to increase results accuracy, but also to reduce the bias on single theme. The satellite data will give the outline features which are useful to indicate ground water presence.Geomorphology, Geology, Structure and climate are the controlling factors for ground water occurrence, movement, and storage.

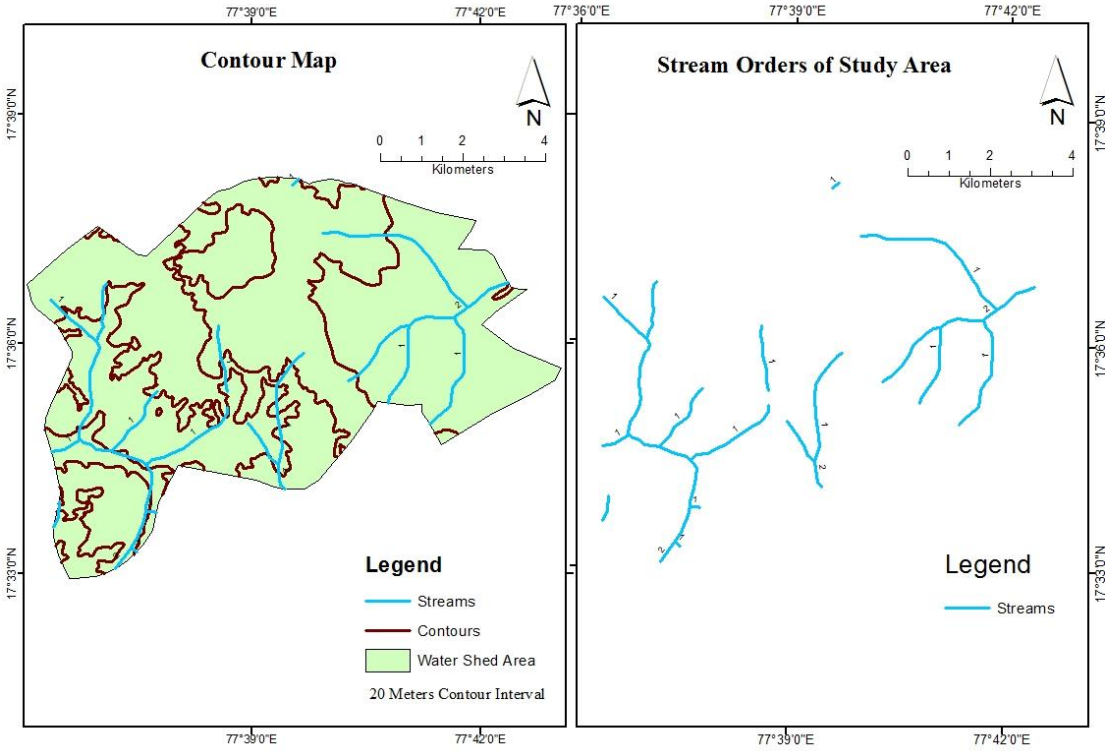
These features are not observed with naked eye but easily find through remote sensing .GIS can be used for storing hydrologic data as well as their spatial location.

The study area is situated at a distance of 120 km from Hyderabad the capital of Telangana. The Study area includes 7 villages in Zaheerabad of medak district .The soil cover is well developed and it contains red Colour. Normal rainfall occur in June to September and its average rainfall is 675.8 mm but the rainfall reduced is 438.6 mm with a deficit of 35% .In Medak district there are total 46 mandals out of which 43 mandals fall under deficit. The minimum temperature is recorded in the month of December as 11°C and maximum temperature occurs in the month of May as 44°C

Southwest monsoon create rainfall in the month of June.Cropping pattern is two seasons Kharif and Rabi.

Material and Method: DEM is generated for the satellite data, toposheet. The drainage network was analyzed by Hoston's laws and digitization was done with GIS.ARC GIS 10.2 was used for generating different layers .In Morphometric analysis we have to assume three aspects like linear aerial and relief aspects.

Contour Map and Stream Network Map



Linear aspects	Aerial aspect	Relief aspect
• Stream order	• Drainage density	• Total relief
• Stream Length	• Stream frequency	• Relief ratio
• Bifurcation ratio	• Form factor	• Average slope
	• Circulatory ratio	
	• Elongation ratio	
	• Length overland flow	

Bifurcation ratio $R_b = \frac{Nu}{N_{u+1}} = \frac{15}{3} = 5$ (Schumn)

Basic Length $L_b = 1.312 \times A^{0.568}$ (Nookaratnam)

$= 1.312\ (65.3)^{0.568}$

$= 14.15$ Km

Drainage density $D_d = \frac{L_u}{A} = 0.519$ (Horton)

L_u - Total stream of length of all order

Area of basin

Stream frequency $F_s = \frac{N_u}{A} = 0.27$ (Horton)

N_u – Total number of all streams of all orders

Texture ratio $T = \frac{N_u}{P} = 0.44$ (Horton)

Form factor $Rf = \frac{A}{L_b^2} = 0.32$

Circulatory ratio $R_c = \frac{4\Pi A}{p^2}$ (Miller)

$= 0.495$

Elongation ratio $R_e = \frac{2\sqrt{\frac{A}{\Pi}}}{L_b}$ (Schumn)

$= 0.64$

Compactness constant $C_c = \frac{0.2821P}{\sqrt{A}} = 1.42$ (Horton)

Stream length ratio $= \frac{25.78}{10.11} = 2.54$

Lemniscate, $K = \frac{L_b^2}{AX4} = 0.76$

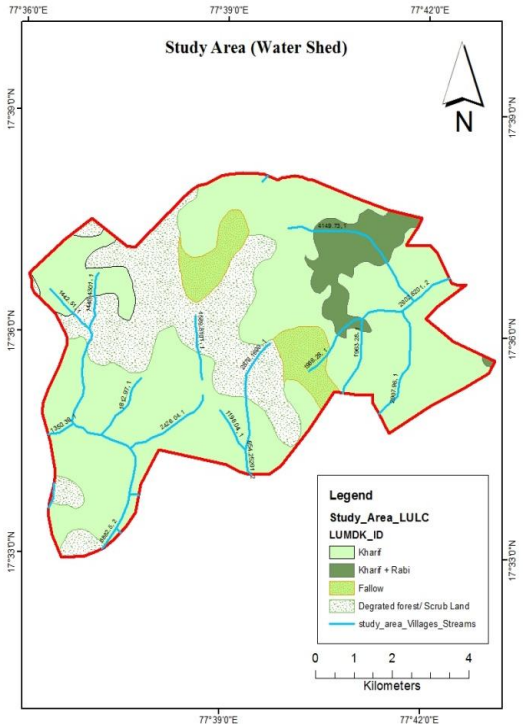
Observations

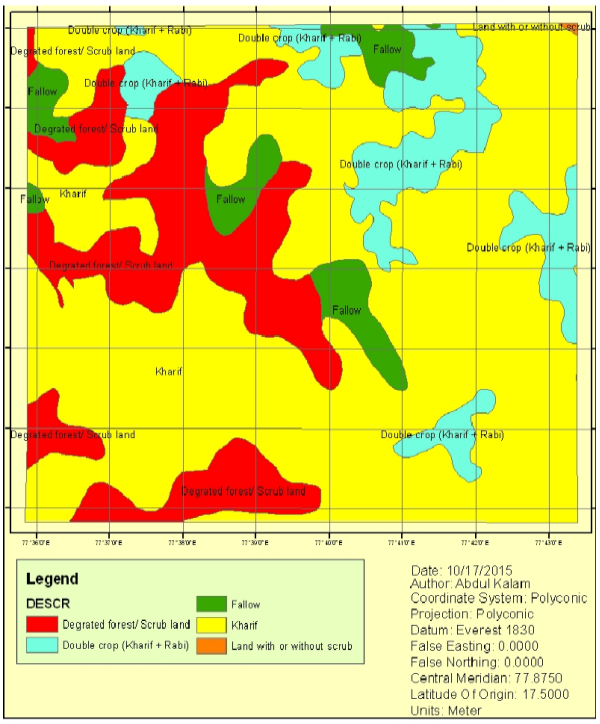
- Form factor 0.32-The elongated nature of study area can be determined by the value of form factor .The flow of water is distributed over a small period of time.
- Elongation ratio - 0.64
- Limits:
- 0.9-1.0 circular
  - 0.8-0.9 Oval
  - 0.7- 0.8 Less elongated
  - 0.5-0.7 Elongated
- Since elongation ratio is 0.64, it is clear that watershed basin is elongated.
- Texture ratio -0.44, it is less than 2 which indicates the watershed area is very coarse in nature.
- Circulatory ratio is 0.49 which indicates basin is not circular.

S.NO	DRAINAGE NETWORK	ABBREVIATION	RESULT
01	Stream Order		1 to2
02	Stream Number	Nu	18
03	Stream length	Lu	35.9Km
04	Stream Length Ratio	Lur	2.54
05	Bifurcation Ratio	Rb	5.00
BASIN GEOMETRY			
01	Length of Basin	Lb	14.15Km
02	Basin Area	A	65.3Km^2

03	Perimeter	P	41Km
04	Lemniscate	K	0.76
05	Form Factor	Rf	0.32
06	Elongation Ratio	Re	0.64
DRAINAGE TEXTURE ANALYSIS			
01	Stream Frequency	Fs	0.27
02	Drainage Density	Dd	0.54

Land use Land Cover Figure





CONCLUSIONS

The elongated nature of study area can be determined by the value of form factor and the flow of water is distributed over small period of time. The form factor value is 0.32.

Elongation ratio is obtained at 0.64 which shows watershed basin is elongated and it is not in circular shape.

Texture ratio is 0.44 which is < 2 indicates coarse texture.

Circulatory ratio is 0.49 which indicates the basin is not in circular shape.

From the study it is clear that GIS is important tool for Geomorphometric analysis of drainage area

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IITM Indian regional/subdivisional Monthly Rainfall data set (IITM-IMR)

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