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## MORPHOMETRIC ANALYSIS OF VISAPUR MINI WATERSHED SUB BASIN OF RIVER YERALA

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### **ABSTRACT:**

Visapur Mini watershed Sub Basin of River Yerala in the south western side of Pusegoan village in Satara district, Maharashtra State. Visapur Mini watershed Sub Basin of River Yerala covers 9.56 Sq.km areas. Tropical evergreen forest is found in this sub basin. To achieve the Morphometric analysis characteristics Survey of India (SOI) Toposheet No. 47K/5 in scale 1:50,000 was used and base map, thematic maps and drainage maps were prepared with the help of Q GIS Software. In the present study linear and areal parameters were consider for the morphometric analysis. A. N. Strahler stream ordering method was used for identification of drainage pattern and morphometric characteristics of Visapur Mini watershed Sub Basin of River Yerala. 93 streams were recorded in this sub basin and total stream length is 49.14 km.

**Key Words:** Morphometric Analysis, Toposheet, Q GIS.

### **INTRODUCTION:**

Water is essential for the existence of all plants, animals and human being. Hydrological cycle plays vital role to provide water for the earth surface. Morphometric analysis provides the beneficial parameter for the assessment of the potential ground water region, identification of suitable site for watershed management and treatment, identification of water runoff and geographic characteristic of the drainage system. In the present study GIS is used as a tool for creation of digital data base. Q GIS powerful software of the analysis of geographic features was used for the Morphometric Analysis.

**STUDY AREA:**

Visapur Mini watershed Sub Basin of River Yerala at the height of 1037 meter above mean sea level. This odha is one of the important streams of River Yerala. This stream meets River Yerala near Khatgun village in Khatav taluka. Visapur Mini watershed sub basin of River Yerala covers 9.56 Sq. km. area. Visapur Mini watershed sub basin lies between 17° 40' north to 17° 45' north latitude and 74° 15' east to 74° 20' east longitude. The study area receives average annual rainfall above 560 mm (Fig.1).

**OBJECTIVES:**

1. To access digital database of Visapur Mini watershed Sub Basin of River Yerala.
2. To study the morphometric characteristic of Visapur Mini watershed Sub Basin of River Yerala.

**DATABASE AND METHODOLOGY:**

The present study based on the Secondary data. Maps were created with the help of Arc GIS software using SOI Toposheet No. 47K/5. A. N. Strahler's Method was used for stream ordering. Mathematical methods were used for calculating Bifurcation Ratio, Drainage Density and Creation.

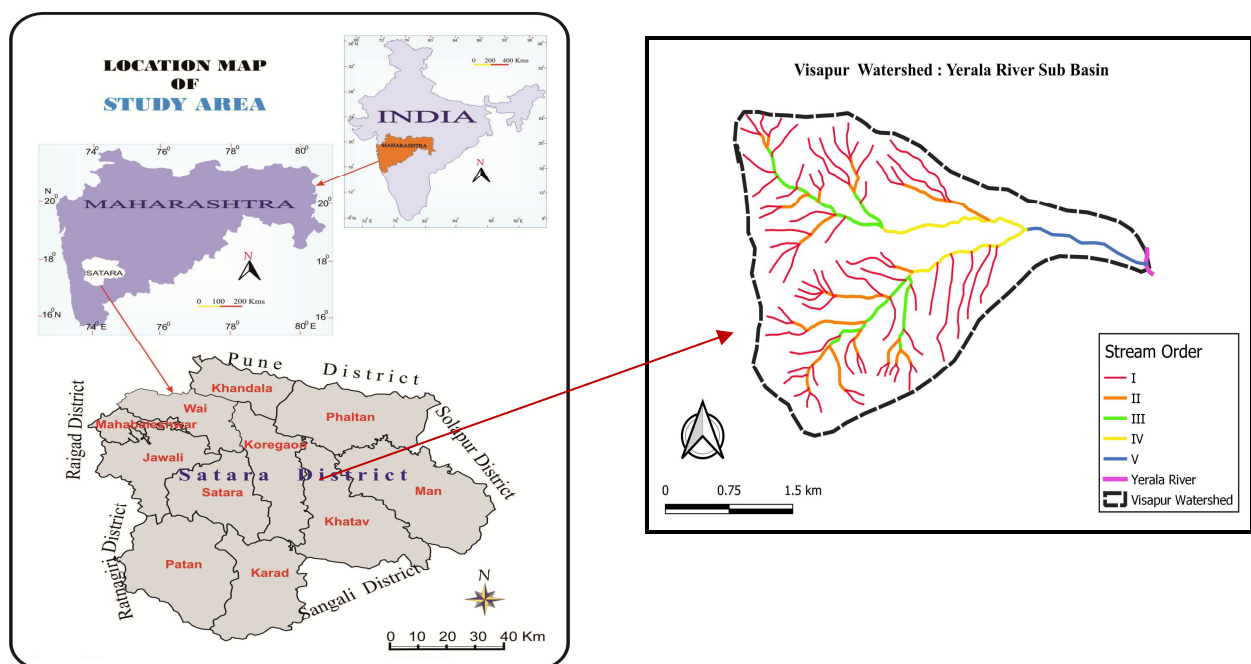
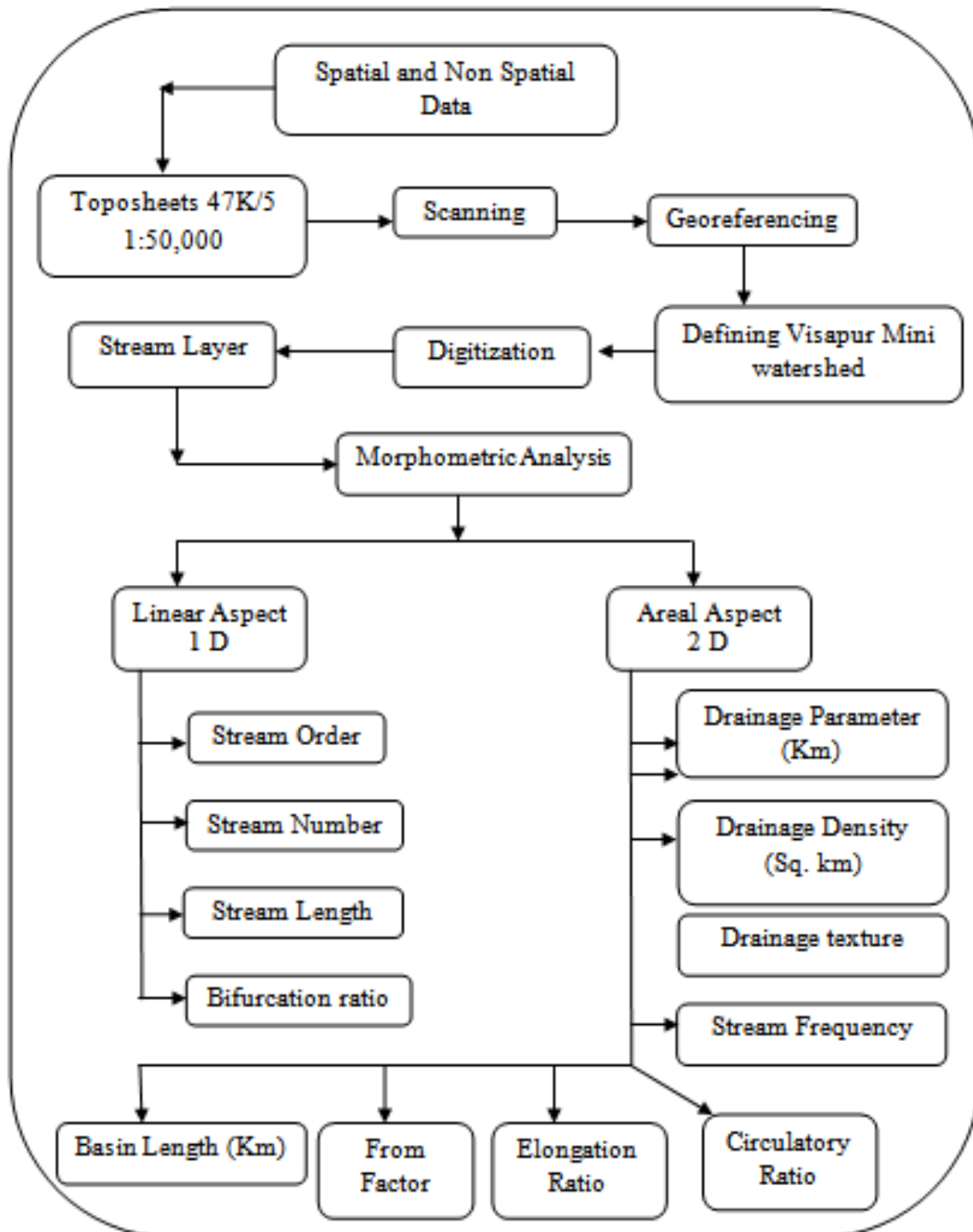


Fig: 1 Location Map

## METHODOLOGY FOR MORPHOMETRIC ANALYSIS:



**RESULT AND DISCUSSION:****Table: 1 Stream Order and Number of Stream in Visapur Mini Watershed Sub Basin of River Yerala**

Stream order	No. of Stream	In %
I	69	74.19
II	17	18.28
III	4	4.30
IV	2	2.15
V	1	1.08
Total	93	100

Source: Compiled by Researcher

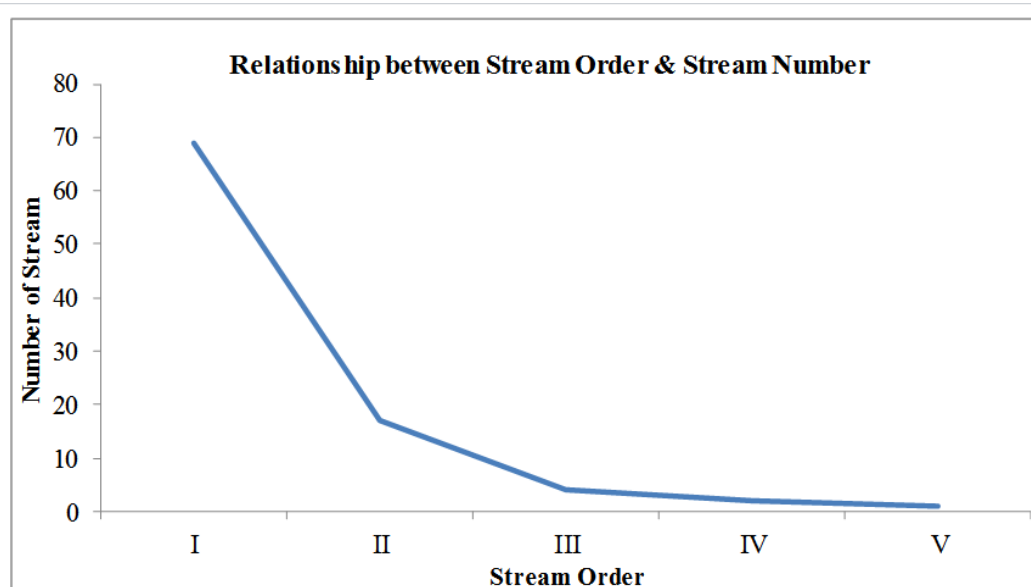


Fig:2

The above table 1 shows the distribution of stream order and stream numbers in Visapur Mini watershed Sub Basin of River Yerala. Fifth order is a last stream order in this sub basin. Total 93 streams have been observed. Among them 69 streams are of first order. Total number of second, third and fourth order streams are 25. Stream order analysis reveals that there is negative correlation between stream order and stream number (Fig.2).

**Table: 2 Stream Length of Visapur Mini Watershed Sub Basin of River Yerala**

Stream order	Stream Length in km	In %
I	27	54.95
II	17	34.60
III	1.77	3.60
IV	1.85	3.76
V	1.52	3.09
Total	49.14	100

Source: Compiled by Research Student

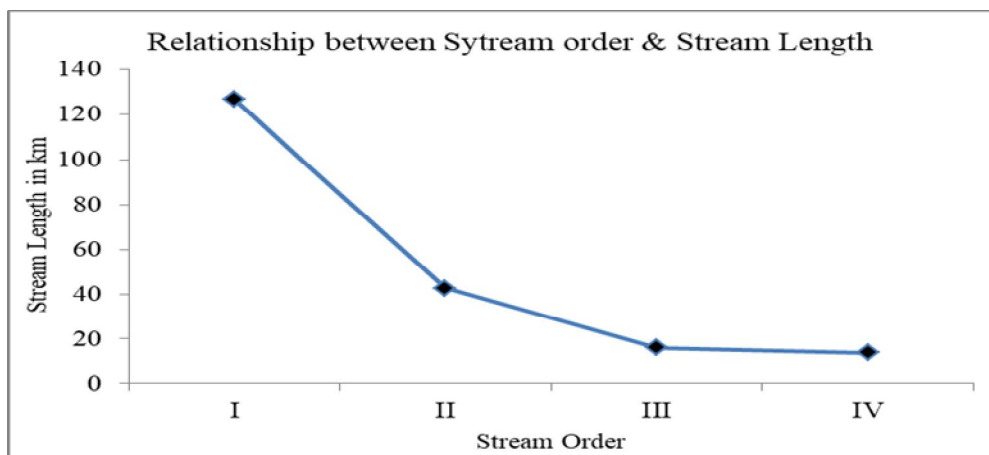


Fig: 3

The above table 2 represents the total length of streams of different orders. The total length of streams in Visapur Mini watershed Sub Basin of River Yerala is 49.14 km. Out of this 27 km length is of first order stream. Total second order stream length is 17 km. Third and fourth order stream length in study region is 1.77 km and 1.85 km respectively. Stream order and stream length analysis reveals that there is negative correlation between stream order and stream length.

Table: 3 Bifurcation Ratios of Visapur Mini watershed Sub Basin of River Yerala

Stream order	No. of Stream	Bifurcation Ratios
I	69	4.05
II	17	4.25
III	4	2
IV	2	2
V	1	-
<b>Mean Bifurcation Ratios</b>		<b>2.46</b>

Source: Compiled by Researcher

Horton (1945) defines bifurcation ratio as the ratio between the numbers of stream of any given order to the number in the next lower order. The above table 3 shows the bifurcation ratio of Visapur Mini watershed Sub Basin of River Yerala. In Visapur Mini watershed mean bifurcation ratio is 2.46.

Table: 4 Areal Aspect of Visapur Mini Watershed Sub Basin of River Yerala

Area in Sq. Km	Drainage Density in Sq.km	Perimeter in Km	Stream Frequency	Drainage Texture	Circulatory Ratio	Basin Length in Km	Elongation Ratio	Form Factor	Compactness Coefficient
9.56	5.14	15	9.73	6.2	0.53	5.4	0.56	0.32	0.88

Source: Compiled by Researcher

Table: 5 Methods used for Morphometric Analysis

Morphometric Parameters	Formula	Reference
<b>1.Linear aspect</b>		
Stream Order (U)	Hierarchical order	Strahler (1964)
Stream Length (Lu)	Length of the stream	Horton (1945)
Bifurcation Ratio (Rb)	Rb = Nu/Nu+1 Where, Nu = Total number of stream segment of order 'U'; Nu+1 = Number of segment of next higher order	Schumn (1956)
<b>2.Areal Aspect</b>		
Drainage Density (Dd)	Dd = L/A Where, L = Total length of streams of all orders A = Area of the basin (km <sup>2</sup> )	Horton (1945)
Stream Frequency (Fs)	Fs = N/A Where, N = Total number of stream. A = Areas of the basin (km <sup>2</sup> )	Horton (1945)
Drainage Texture (Rt)	Rt = Nu/P Where, Nu = Total number of streams of all orders P = Perimeter of the basin (km)	Horton (1945)
Circulatory Ratio (Rc)	Rc = $4\pi A/Lp^2$ Where, A=Area of the basin Lp=Perimeter of the basin	Miller (1953)
Elongation Ratio (Re)	Re=(2 × (A / π) <sup>0.5</sup> ) / Lb Where, A=Area of watershed, π=3.14, Lb=Basin length	Schumn (1956)
Form Factor(Ff)	Ff = A / Lb <sup>2</sup>	Horton (1932)
Compactness Coefficients (Cc)	Cc = 0.2821 P/A <sup>0.5</sup> , A = areas of basin (km <sup>2</sup> ), P = basin perimeter (km)	Horton (1945)

## CONCLUSION:

Total 93 streams have been observed in Visapur Mini watershed Sub Basin of River Yerala. Among them 69 streams are of first order. Total Numbers

of second, third and fourth order streams are 24. The total length of stream in Visapur Mini watershed Sub Basin of River Yerala. is 49.14 km. Out of this 27 km length is of first order stream. Total second order stream length is 17 km. Third and fourth order stream length in study region is 1.77 km and 1.5 km.

The drainage density of Visapur Mini watershed Sub Basin of River Yerala is 5.14 km<sup>2</sup>. Basin perimeter is 15 km. Maximum stream frequency indicates the large number of streams availability. The stream frequency of Visapur Mini watershed Sub Basin of River Yerala is recorded 9.73. Visapur Mini watershed Sub Basin of River Yerala very fine type of Drainage texture has been observed. The higher the value of "C" more the circular shape of the basin and vice versa. Basin length is the longest dimension of a basin to its main drainage channel. Basin length in study region is 5.4 km. Elongation ratio of this watershed is 0.56 indicates a wide variation of climatic condition as well as geological formation and high relief steep ground slope. The form factor values of Visapur Mini watershed Sub Basin of River Yerala is 0.32.

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