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THE STUDY OF WATERSHED CHARACTERISTICS OF ARKAVATHI BASIN USING GEOSPATIAL TECHNOLOGY

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Abstract*-Prioritization of sub- climaxes is a vital aspect of watershed operation as it may not be possible to execute development programs at a time for entire corners in a container owing to the deficiency of financial resources. The present study attempts to prioritize sub- climaxes in the Kanakpura corner, in Ramanagara quarter, Karnataka, predicated on the multicriteria ranking system. This process involves birth and determination of various parameters analogous as downfall, drainage density, pitch, land- use, and land-cover, using information from rain needles, topographical wastes, and satellite imagery in Geographic Information System (Civilians) platform. Kanakapura corner is subdivided into nine sub corners, videlicet Bannimukudlu, Bennagodu, Doddaalahalli, Gadasahalli, Horalagallu, Kodihalli, Madarahalli, Maralebbekupe, and Mudagod. Precedences indexing of each of the parameters was done, predicated on their impact significance, and overlay analysis was performed to identify criticalsub- climaxes. Some of the strategies proposed for effective conservation and operation of water resources are the construction of a check levee, performance of water harvesting styles, identification of artificial recharge spots. The results of the study show that priority needs to be given to the, Bennagodu, Madarhalli and Marasandra sub- climaxes followed by remaining sub-climaxes to regulate face water flux thereby perfecting water table position*.

Key Words:*MORPHOMETIC PARAMETERS, PRIORITIZATION, SUB WATERSHEDS, GIS.*

1.INTRODUCTION:

Water and land are two of the most important natural resources of the world since they are both essential of life and numerous development projects. These resources are finite and just as the global population grows, so too does need for these resources. As a result, water resource management, conservation and proper planning are expected for long term development. The water reaches at Earth's surface through precipitation. Some amount of water falling on land seeps into the soil or flows over the surface before entering the streams and lakes. The area of land that supplies water to river or lake is known as water shed. The whole world is divided into many watershed/sub-watersheds to make it easy to study the conservation, management, and utilization of natural resources. Morphometric analysis using Geospatial technologies such as Remote Sensing, Geographical Information System (GIS), Global Positioning System (GPS) techniques have been considered as powerful tools. These techniques have ability of obtaining Synoptic view of large area at one time and it is very useful to analyzing the data. The origin of Arkavathi river is in the Nandi Hills which is in Chikkaballapura district. And it flows through Ramanagara district and Kanakpura Taluk. Flowing through this district it will drains into Chikkarayappanahalli lake near Kaniverayanapura. Arkavathi river is the tributary of Cauvery River. Kumudhavathi, Vrishabhavathi and Suvarnamukhi are the three tributaries of Arkavathi river. This river is approximately 190 KM in length and 440 M in elevation.

2.STUDY AREA:

The Kanakpura watershed forms a part of the Arkavathi swash receptacle which is one of the top feeders of the swash Cauvery in Karnataka. The milepost is bounded between 12° 16′N and 12° 35′N authorizations, 77° 15′E and 77 ° 38′ E longitudes, covering an area of about 81550 ha. The study areas or Sub climaxes were Bennagodu, Madarhalli and Marasandra area of each range from 81500 ha (NRSA, 1995). It has an average elevation of 638 m. The drainage pattern of the study area is dendritic to sub-dendritic in nature. The climatic specific is generally restorative, temperature ranges from28.4 °C to35.8 °C, the smallest aquarelle true being recorded during the month of January and the driest season is April – May. The average periodic downfall is 741 mm. Lithologic characteristics of this terrain are Granite and Peninsular Gneisses, and Charnockite is present in some places. In general, soil characteristics in this region are shallow to deep, drained to well- drained, unheroic to sanguine- brown with moderate to high infiltration eventuality. Land- use patterns are generally husbandry and timber. the mean area of the milepost is lower than 500sq.km (± 50). The milepost is farther classified into sub climaxes (± 30- 50sq.km), Mini milepost (± 10- 30sq.km) and Micro milepost (± 5- 10sq.km) according to IMSD specialized guidelines (NRSA, 1995)

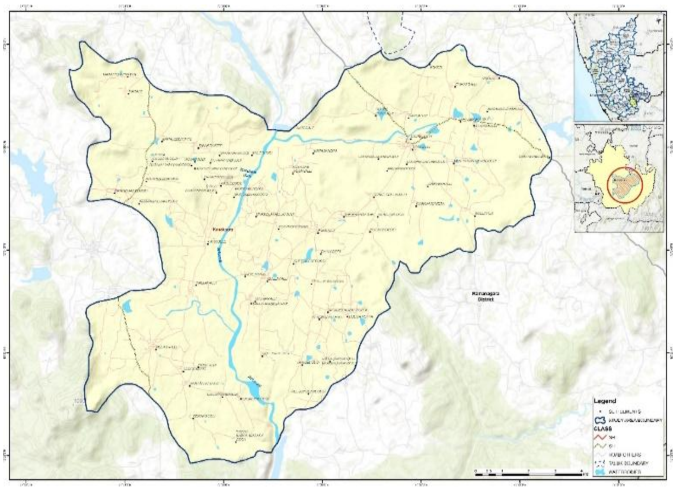


Fig 01: Base Map of the Study area

3. SUB WATERSHEDS:

The Kanakpura sub watershed is Situated in the southern part of the Indian state of Karnataka, and it covers an area of approximately 1,620 square kilometers. It is a part of the larger Arakavathi river basin and is a significant tributary of the Cauvery River. The sub watershed is mainly agricultural, with a large number of irrigation tanks and reservoirs that are used for storing water for agricultural purposes. The major crops grown in this area include paddy, sugarcane, and coconut. The Kanakpura sub watershed is facing several challenges related to water scarcity, soil erosion, and degradation of the natural ecosystem. In recent years, there has been a growing concern about the impacts of urbanization and industrialization on the sub watershed’s natural resources. Efforts are being made by the government and other stakeholders to address these challenges through the implementation of various conservation measures, such as the construction of check dams, rainwater harvesting systems, and watershed development programs. The aim is to enhance the sub watershed’s water security, promote sustainable agriculture practices, and restore the ecological balance of the region. The study area consists of three major subwatershed areas which are Madaralli, Marasndra, Bennagodu. The area sizes are 47.95sqkm,48.64sqkm,57.89sqkm respectively.

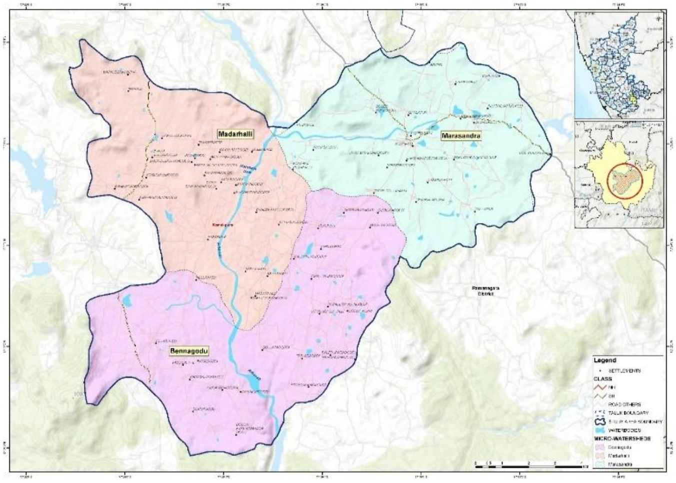


Fig.02: Sub watershed map

4.METHODOLOGY:

4.1 Digital elevation model:

A Digital Elevation Model (DEM) is a representation of the Earth's terrain or topography in a digital format. It is a three-dimensional (3D) model that provides information about the elevation or height of the Earth's surface at various points. DEMs are widely used in various fields such as geography, geology, cartography, environmental science, engineering, and urban planning. DEM data is typically collected using remote sensing techniques, such as satellite-based sensors, airborne LiDAR (Light Detection and Ranging), or photogrammetry. These techniques measure the elevation of the Earth's surface by bouncing laser pulses or capturing aerial photographs and then processing the data to create a digital representation. The resulting DEM dataset consists of a grid or matrix of cells, each containing a value representing the elevation at that location. The resolution of a DEM refers to the spacing between these grid cells, and it determines the level of detail in the model. Higher resolution DEMs provide more detailed information but require more storage space and computational resources.

4.2 Geometric correction:

Geometric correction is undertaken to avoid geometric distortions from a distorted image, and is achieved by establishing the relationship between the image coordinate system and the geographic coordinate system using calibration data of the sensor, measured data of position and attitude, ground control points, atmospheric condition etc.

4.3 Extraction of Drainage network:

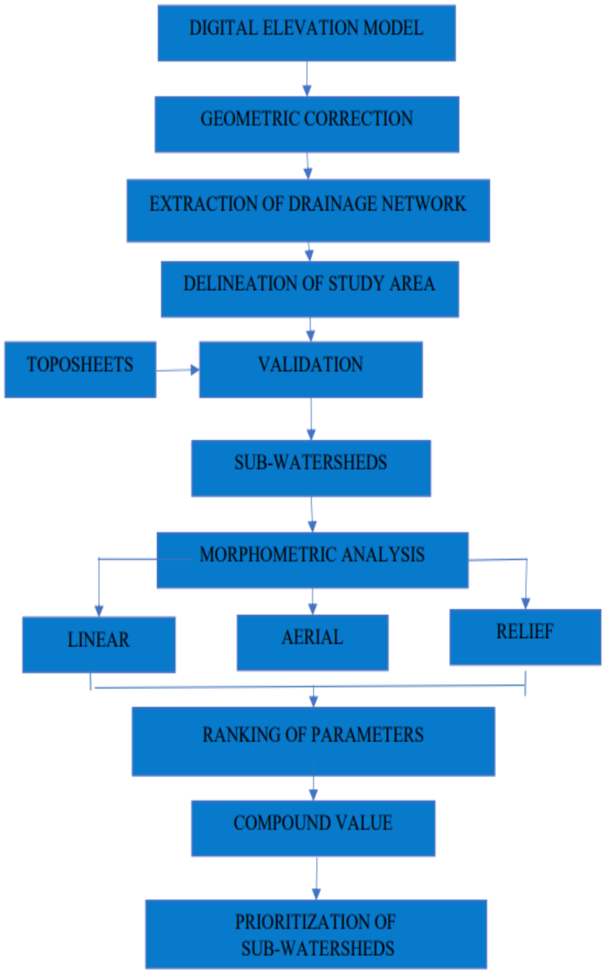
Extraction of Drainage network plays an important role in geomorphologic analyses, hydrologic modelling, and non- point source pollutant simulation, among others. The extraction of drainage networks from digital elevation data is important for quantitative studies in geomorphology and hydrology. A method is presented for extracting drainage networks from gridded elevation data. The method handles artificial pits introduced by data collection systems and extracts only the major drainage paths. Its performance appears to be consistent with the visual interpretation of drainage patterns from elevation contours.

4.4 Delineation of study area:

Watershed delineation means is that drawing lines on a map to identify a watershed's boundaries. These are typically drawn on topographic maps using information from contour lines. Contour lines are lines of equal elevation, so any point along a given contour line is the same elevation.

4.5 Sub-watershed:

Sub-watershed means a division of the district as nearly equal in size to other divisions of the district as feasible and including as nearly as practicable one or more tributaries to the main stream which drains from the district. This occurs when the precipitation (rain or snowmelt) at the soil surface exceeds the sum of infiltration and surface subtraction. The surface water component accepts solids with associated contaminants liberated from top soil by erosion and leaching.



4.6 Parameters:

4.6.1 Linear parameters:

Stream length is reflective of chronological development of sluice parts including monumental disturbances if any. Generally, advanced the order, longer the length of sluice, in nature. The equation used for computation of sluice length is same as the border computation. Stream length rate (RL) is the rate between the lengths of aqueducts of a given order to the total length of aqueducts in the coming order (Horton 1945). RL tends to be constant throughout the consecutive sluice orders of the receptacle. Bifurcation rate is the rate between the number of sluice parts of a given order and the number of sluice parts of next advanced order. Bifurcation rates characteristically range between3.0 and5.0 for climaxes in which the geologic structures distort the drainage pattern. Abnormally high bifurcation rates might be anticipated in regions of acutely dipping gemstone strata, where, narrow strike denes are confined between pitch crests. The lower values of Rb are characteristic of lower structural disturbances (Strahler 1964) and the drain- age pattern has not been distorted because of the structural disturbances (Nag 1998).

4.6.2 Areal parameters:

Drainage density(D) is defined as total length of aqueducts in a catchment per unit area and it is a measure of the stuffiness of the receptacle. Drainage viscosity of an area is high, is a reflective of high run- off and accordingly low infiltration rate whereas, low drainage viscosity of an area implies low run- off and high infiltration (Prasad etal. 2008). Drainage texture (Rt) is an expression of the relative channel distance in a fluvial deconstructed terrain. T is the product of Dd and Fs. It depends upon several natural factors similar as climate, [illegible] infiltration capacity, relief and stage of development of a receptacle (Smith 1950). Stream frequency (Fs) is the rate of total number of aqueducts (Nu) in a receptacle to the receptacle area (Horton 1945). It is a measure of closeness of drainage. High drainage frequency means further face run- off and low drainage frequency means further percolation and hence further groundwater eventuality (Sreedevi etal. 2009). Stream frequency is reckoned by dividing the total number of aqueducts (Nu) in a receptacle by the total receptacle area (A)

Fig 3: Methodology/Flow Chart

4.6.3Relief parameters:

Basin relief(R) is an important factor in understanding the denudational characteristics of a receptacle. The difference in elevation between larger and smallest points on the receptacle is called receptacle relief. Relief rate (Rh) is the rate between total relief (R) of the receptacle and its longest dimension parallel to the top drainage line (Lb). It indicates steep- ness of drainage receptacle showing the effect of intensity of declination processes operating on pitches of the receptacle (Jasmin and Mallikarjuna 2013). Analysis indicator (Di) is the rate between relative relief and absolute relief of the receptacle which always varies between zero (complete absence of analysis) and one (extreme case, perpendicular precipice at ocean reinforcement). Analysis indicator is a parameter inferring the degree of analysis or perpendicular corrosion and expounds the stages of terrain or geography development in any given physio-graphic region or milepost (Singh and Dubey 1994). Ruggedness number (Rn) is expressed as the product of receptacle relief and drainage viscosity (Strahler 1952). The basins having high Rn values are largely susceptible to erosion.

Table 01: Formulae:

Sl. no.	Mophometric Parameters	Formula	Reference
1	Stream Order	Hierarchial rank	Strahler (1964)
2	Stream Length (Lu)	Length of the Stream	Horton (1945)
3	Mean Stream Length (Lsm)	Lsm = Lu / Nu Where, Lsm = Mean Stream Length Lu = Total stream length of order ‘u’ Nu = Total no. of stream segments of order ‘u’	Strahler (1964)
4	Stream Length Ratio (RL)	RL = Lu / Lu – 1 Where, RL = Stream Length Ratio Lu = The total stream length of the order ‘u’ Lu – 1 = The total stream length of its next lower order	Horton (1945)
5	Bifurcation Ratio (Rb)	Rb = Nu / Nu + 1 Where, Rb = Bifurcation Ratio Nu = Total no. of stream segments of order ‘u’ Nu + 1 = Number of segments of the next higher order	Schumn (1956)
6	Mean bifurcation ratio (Rbm)	Rbm = Average of bifurcation ratios of all orders	Strahler (1957)
7	Relief Ratio (Rh)	Rh = H / Lb Where, Rh = Relief Ratio H =Total relief (Relative relief) of the basin in Kilometers Lb = Basin length	Schumm (1956)
8	Drainage Density (D)	D = Lu / A Where, D = Drainage Density Lu = Total stream length of all orders A = Area of the Basin (km^2)	Horton (1932)
9	Stream Frequency (Fs)	Fs = Nu / A Where, Fs = Stream Frequency Nu = Total no. of streams of all orders A = Area of the Basin (km^2)	Horton (1932)
10	Drainage Texture (Rt)	Rt = Nu / P Where, Rt = Drainage Texture Nu = Total no. of streams of all orders P = Perimeter (km)	Horton (1945)
11	Form Factor (Rf)	Rf = A / Lb^2 Where, Rf = Form Factor A = Area of the Basin (km^2) Lb^2 = Square of Basin length	Horton (1932)
12	Circularity Ratio (Rc)	Rc = 4 * Pi * A / P^2 Where, Rc = Circularity Ratio Pi = ‘Pi’ value i.e., 3.14 A = Area of the Basin (km^2) P^2 = Square of the Perimeter (Km)	Miller (1953)
13	Elongation Ratio (Re)	Re = 2 v (A / Pi) / Lb Where, Re = Elongation Ratio A = Area of the Basin (km^2) Pi = ‘Pi’ value i.e., 3.14 Lb = Basin length	Schumn (1956)
14	Length of Overland flow (Lg)	Lg = 1 / D * 2 Where, Lg = Length of Overland flow D = Drainage Density	Horton (1945)

5. RESULTS AND DISCUSSION:

5.1 Morphometric analysis:

According to Clarke (1966) and horse and Chakraborty (2003) morphometry is the dimension and fine analysis of the configuration of the earth's face, shape, and confines of its terrenes. This analysis can be achieved through measures of direct, upstanding and relief aspects of receptacle and pitch benefactions. The measures of colourful morphometric parameters videlicet stream order, sluice length, mean sluice length, bifurcation rate, sluice length rate, receptacle length, drainage viscosity, sluice frequency, extension rate, circularity rate, form factor, relief rate, etc., has been carried out using the fine formulae given in Table 2 and results are epitomized in Table 3. In the present study, the satellite remote seeing from SRTM satellite data has been used for updating of drainages and streamlined drainages have been used for morphometric analysis.

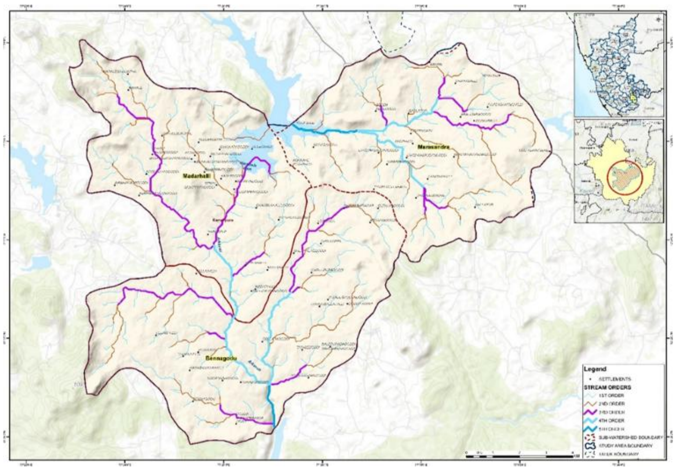


Fig.03: DRAINAGE MAP FROM SRTM DEM

5.1.1 Linear aspects:

Linear aspects like sluice order, sluice length, mean sluice length, sluice length rate and bifurcation rate were determined and results have been presented in Table 4.

5.1.2 Stream order:

The designation of sluice orders is the first step in drainage receptacle analysis and is grounded on a hierarchic ranking of aqueducts. In the present study, ranking of aqueducts has been carried out grounded on the system proposed by Strahler (1964) (Table 2). The order wise sluice figures for all 3sub-watersheds are presented in Table 3. Thesub-watersheds, Bannagodu and Marasandra are of V order and Madarhalli are of IV order, it is apparent that the outside frequence is in case of first order aqueducts. It is also noticed that there is a drop in sluice frequency as the sluice order increases.

5.1.3 Stream length:

The number of aqueducts of colourful orders in a sub-watershed is counted and their lengths from mouth to drainage peak are measured (Table 4) with the help of Civilians software's. The sluice length (Lu) has been calculated grounded on the law proposed by Horton (1945) for all the 3sub-watersheds and presented (Table 4). Generally, the total length of sluice parts is maximum in first order aqueducts and diminishments as the sluice order increases.

5.1.4 Mean stream length:

According to Strahler (1964) the mean sluice length is a characteristic property related to the drainage network and its associated shells. In the present case, the mean sluice Morphometric analysis in the Kanakapura milepost, Arkavathi swash receptacle, Karnataka 53 length (Lsm) has been determined by dividing the total sluice length of order 'u' and number of aqueducts of member of order 'u' (Table 2). It is noted from Table 4 that Lsm varies from0.32 km to0.43 km in Madarhalli area and0.29 to0.56 km in Marasandra area and0.39 to0.55 km in Bennagodu area Lsm of any given order is lesser than that of the lower order and lower than that of its coming advanced order. This divagation might be due variations in pitch and topographic elevation of the area.

5.1.5 Bifurcation ratio:

According to Schumn (1956), The term bifurcation rate (Rb) may be defined as the rate of the number of the sluice parts of given order to the number of parts of the coming advanced order. Horton (1945) considered the bifurcation rate as an indicator of relief and deconstructions. Strahler (1957) demonstrated that bifurcation rate shows a small range of variation for different regions or for different terrain except where the important geological control dominates. It's observed from Table 3, the Rb isn't same from one order to its coming advanced order. These irregularities are dependent upon the geological and lithological development of the drainage receptacle (Strahler, 1964). The lower values of Rb are characteristics of the sub-watersheds which have suffered less structural disturbances (Strahler, 1964) and the drainage patterns have not been distorted because of the structural disturbances (horse, 1998). In the present study, the advanced values of Rb indicates strong structural control on the drainage pattern while the lower values reflective of sub-watersheds that are not affected by structural disturbances. The mean bifurcation rate (Rbm) may be defined as the normal of bifurcation rates of all orders (Table 4). In the present case, Rbm varies from1.237 to3.800 (Table 3) in Madarhalli area and1.000 to2.333 in Marasandra area and1.282 to6.000 in Bennagodu area all sub-watersheds fall under normal receptacle order (Strahler, 1957). This Indicate schematic branching pattern of aqueducts.

Table 02: Linear Aspects from SRTM Analysis:

Stream Order	No. of segments	Total Length (Km)	Bifurcation ratio	Mean Length (Km)	Cumulative length (Km)	Length ratio
Madarahalli (SW1)						
1	98	42.094		0.43	42.094	
2	47	20.845	2.085	0.44	62.939	1.50
3	38	15.250	1.237	0.40	78.190	1.24
4	10	3.175	3.800	0.32	81.365	1.04
Marasandra (SW2)						
1	97	41.873		0.43	41.873	
2	45	25.291	2.156	0.56	67.164	1.60
3	21	9.276	2.143	0.44	76.439	1.14
4	21	7.665	1.000	0.36	84.104	1.10
5	9	2.651	2.333	0.29	86.755	1.03
Bennagodu (SW3)						
1	110	51.154		0.47	51.154	
2	50	26.030	2.200	0.52	77.184	1.51
3	39	15.283	1.282	0.39	92.467	1.20
4	18	8.464	2.167	0.47	100.931	1.09
5	3	1.644	6.000	0.55	102.574	1.02

5.1.6 Areal aspects:

The different aerial aspects of the basin give a better understanding of nature of the basin. The aerial aspect includes the parameters like basin area, basin perimeter, drainage density, stream frequency, constant channel maintenance, length of overland flow, etc.

5.1.7 Drainage density:

Horton (1932) has introduced drainage viscosity (D) into American hydrologic literature as an expression to indicate the closeness of distance of channels. It is defined as the total length of aqueducts of all orders per drainage area (Table 2). viscosity factor is related to climate, type of jewels, relief, infiltration capacity, foliage cover, face roughness and run-off intensity indicator. Of this only face roughness has no significant correlation with drainage viscosity. The quantum and type of rush influences directly the volume and character of face run- off. An area with high rush similar as showers loses lesser chance of downfall as run- off performing in further face drainage lines. quantum of foliage and downfall immersion capacity of soils, which influences the rate of face run off affects the drainage texture of an area. The analogous condition of lithology and geologic structures, semi-arid regions have finer drainage viscosity texture than sticky regions. According to Nag (1998), low drainage viscosity generally results in the areas of largely resistant or passable topsoil material, thick foliage, and low relief. High drainage viscosity is the attendant of weak or impermeable subsurface material, meagre foliage, and mountainous relief. Low drainage viscosity leads to coarse drainage texture while high drainage viscosity leads to fine drainage texture. From Table 4, it is observed that the drainage viscosity varies between1.696 to1.772sq.km indicating veritably coarse to coarse drainage texture. In the present case, it is suggested that low drainage viscosity indicates the region has largely passable topsoil.

5.1.8 Stream frequency:

Horton (1932) introduced aqueduct frequency (Fs) or channel frequency which is the total number of aqueduct corridor of all orders per unit area (Table 4). Hypothetically, it is possible to have the container of same drainage density differing in aqueduct frequency and basins of same aqueduct frequency differing in drainage density. Table 4 shows Fs for all sub climaxes of the study area. It is noted that the Fs exhibits positive correlation with the drainage density values of the sub climaxes indicating the increase in aqueduct population with respect to increase in drainage density. The Stream frequency Fs varies from1.900 to2.043.

5.1.9 Drainage Texture:

Drainage texture (Rt) is one of the important generalities of geomorphology which means that the relative distance of drainage lines. Drainage lines are numerous over impermeable areas than passable areas. According to Horton (1945), Rt is the total number of aqueduct corridor of all orders per border of that area (Table 2). He recognized infiltration capacity as the single important factor which influences Rt and considered drainage texture which includes drainage density and aqueduct frequency. Smith (1950) has classified drainage density into five different textures. The drainage density lower than 2 indicates truly coarse, between 2 and 4 is related to coarse, between 4 and 6 is moderate, between 6 and 8 is fine and lower than 8 is truly fine drainage texture. In the present study, the drainage density (Table 4) is of moderate to truly fine drainage texture.

5.1.10 Form factor:

According to Horton (1932), form factor (Rf) may be defined, as the rate of container area to square of the container length. The value of form factor would always be lower than0.78 for a perfectly circular container. lower the value of form factor, more elongated will be the container. Rf value of the study area are presented in table 3. It's noted that all the sub climaxes are stretched with lower values of form factor which is lower than0.450.

5.1.11 Circularity ratio:

It is the rate of the area of the container to the area of a circle having the same circumference as the border of the container (Miller, 1953). The circularity rate (Rc) is told by the length and frequency of courses, geological structures, land use/ land cover, climate, relief, and pitch of the container. In the present study, the Rc (Table 4) ranges from0.668 to0.783. High Rc0.783 in Marasandra sub- watershed indicates that circular and it is characterized by high to moderate relief and drainage system is structurally controlled. The remaining sub- climaxes have lower than0.70 indicating that they are stretched.

5.1.12 Elongation ratio:

Schumn (1956) defined extension rate (Re) as the rate between the fringe of the circle of the same area as the drainage container and the maximum length of the container (Table 2). A circular container is more effective in the discharge of run- off than an elongated container (Sarvesh Singh and Singh, 1997). The values of Re generally vary from0.52 to0.75 over a wide variety of climatic and geologic types. Values close to1.0 are typical of regions of truly low relief, whereas values in therange0.6-0.8 are generally associated with high relief and steep ground pitch (Strahler, 1964). These values can be grouped into four orders videlicet (a) circular (>0.9), (b) round (0.9 to0.8), (c) less elongated.

5.1.13Length of overland inflow

It is the length of water over the ground before it gets concentrated into definite sluice channels (Horton, 1945) (Table 2). This factor principally relates equally to the average pitch of the channels and is relatively synonymous with the length of distance inflow to a large degree. The Lg is roughly equal to half of the complementary of the drainage viscosity (Horton, 1945). Table 3 reveals that the Lg is0.238 in Madarhalli, Marasandra and Bennagodusubwatersheds.

Table 03: Areal Aspects from SRTM Analysis:

Drainage Density	Area	Strem Frequecy	Constant of Channel Maintanance	Length of Overland flow	Basin Length	Form Factor	Perimeter	Compactness Coefficient	Circularity Ratio	Elongation Ratio
Madarahalli (SW 1)										
1.696	47.970	2.043	0.590	0.238	10.918	0.402	33.388	1.360	0.735	0.716
Marasandra (SW2)										
1.772	48.955	1.981	0.564	0.238	10.596	0.436	31.697	1.278	0.783	0.745
Bennagodu(SW3)										
1.771	57.906	1.900	0.565	0.238	11.476	0.440	40.365	1.496	0.668	0.748

5.1.14 Relief Aspects:

The relief measures like relief rate, receptacle length and total relief are tabulated in Table 4. Relief rate

5.1.15 Relief Ratio:

The elevation difference between the loftiest and smallest points on the vale bottom of sub-watersheds is known as the total relief of that sub-watershed. The relief rate (Rh) of maximum relief to vertical distance along the longest dimension of the receptacle parallel to the principle drainage line is nominated as relief rate (Schumn, 1956) (Table 2). Consequently, there's direct relationship between the relief and channel grade. There's also a, correlation between hydrological characteristics and the relief rate of a drainage receptacle. The Rh typically increases with dwindling drainage area and size of sub watersheds of a given drainage receptacle (Gottschalk, 1964). The values of Rh are given in Table 3 and ranges from0.009 to0.014. It is noticed that the high values of Rh indicate steep pitch and high relief, while the lower values may indicate the presence of basement jewels that are exposed in the form of small crests and mounds with lower degree of pitch (GSI, 1981).

Table 04: Relief Aspects from SRTM Analysis

Basin Relief	Basin ratio	Relative relief	Ruggedness number	Melton R Number	Lemniscate
Madarahalli (SW1)					
114	0.010	3.42	1.94	0.165	2.48
Marasandra (SW2)					
94	0.009	3.60	2.02	0.163	2.29
Bennagodu (SW2)					
165	0.014	2.83	2.02	0.150	2.27

6. INFERENCE:

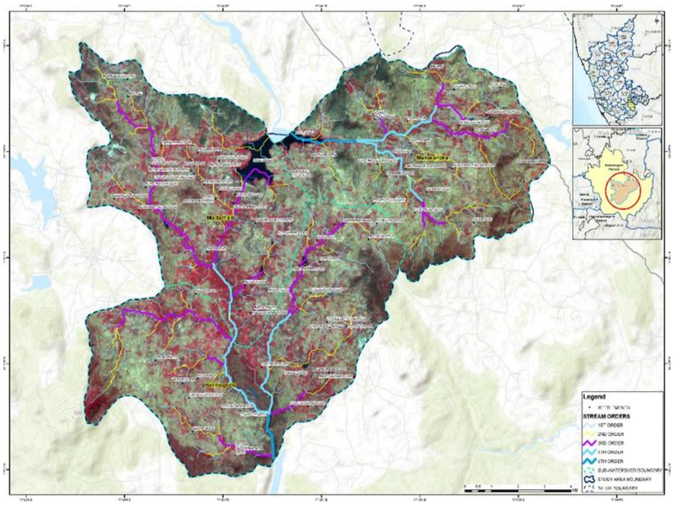


Fig 04: Satellite overlayed Map with straheler stream orders Map

The toposheet data collected from survey of India Authority (SoI) and the SRTM Satellite data are collected from USGS.God website. There are so many changes accord during these several years the straheler stream orders have changed and the new tank has been constructed the 6thstreheler stream order has completely disappeared from the new SRTM Satellite data the first streheler stream order and the second streheler stream orders are disappeared in the most of the area and the new streheler stream orders are appeared in the new SRTM Satellite data. Several villages are also extended due to the increase in the population. The new tank is also constructed for the irrigation purpose across the arkavathi river in the year of 2004 the name of the tank is Harobele Dam which is situated in the north of the madarhalli area. The Harobele Dam is extended some parts of north Marasandra area near Kotagale and marasandra villages. The mulegundei village is completely submerged due to the construction of Harobele Dam.

6.1 Prioritization of Sub watersheds:

Prioritization is the process in which the sub-watersheds are arranged in a scale grounded on the need for treatment for watershed conservation i.e., the milepost which requires advanced conservation is given top precedence ranking and vice versa. Grounded on the Morphometric study, twenty- four morphometric parameters are considered for prioritizing the sub-watersheds of the Arkavathi receptacle grounded on the corrosion vulnerability. Soil corrosion has a direct relationship with direct and relief parameters whereas an inverse relationship with upstanding parameters. Hence advanced the values of the direct and relief parameters viz. mean sluice length rate, mean bifurcation rate, drainage viscosity, drainage texture, sluice frequency, drainage intensity, length of overland inflow, infiltration number, receptacle relief, relief rate and relative relief advanced will be the threat of soil corrosion. thus, a sub-watershed with a larger value of these parameters is designated as the first rank, the next largest value is designated as the alternate rank and so on, eventually, the lowest value is assigned as the last rank. Whereas lower the values of the upstanding parameters viz. extension rate, circularity rate, Lemniscate’s rate, form factor and conciseness measure advanced will be the threat of soil corrosion. thus, a sub-watershed with the lowest value of these parameters is designated as the first rank, the coming lowest value is designated as the alternate rank and so on, eventually, the largest value is assigned as the last rank. For each sub-watershed, the emulsion value is deduced by comprising the species distributed to all the parameters. Eventually, the sub-watershed with the smallest emulsion value is rated as the loftiest precedence, regions indicate a lesser volume of runoff and soil corrosion pitfalls and hence it is critical to plan and execute watershed operation practices for these regions. Twenty- four morphometric parameters are used for prioritizing the sub-watersheds and the results are as shown in Table 4 and highlights the chart of sub-watersheds with their precedence rankings. From Table 4 it is understood that the SW- 2 which is Marasandra, SW- 3 which is Bennagodu and SW-1which is madarahalli are more susceptible to soil corrosion and land declination. Hence, the sub-watersheds need lesser attention for the perpetration of soil and water conservation practices to insure sustainability.

7.CONCLUSION:

Morphometric analysis is a abecedarian approach for describing the physiological and quantitative features of a milepost. It has formerly been used to save natural coffers by prioritizing sub-watersheds. Civilians and remote sensing ways can be effectively used to estimate morphometric characteristics rather than traditional approaches. Hence, the geospatial technology was used to conduct a quantitative morphometric study for the sub-basins of the Arkavathi receptacle. This study highlights sub-watershed prioritization grounded on watershed morphometric parameters considering their impact on soil corrosion vulnerability. Twenty- four morphometric parameters are estimated for all the 3sub-watersheds of the Arkavathi receptacle. Grounded on these parameters, corrosion-prone zones are linked by enforcing the emulsion values system which ranks the sub-watersheds concerning their soil corrosion vulnerability. The results show that SW- 2 face high threat and SW- 3 and 1 face low threat in terms of soil corrosion. The final precedence can be followed for the planning and prosecution of soil and water conservation practices for effective watershed operation. Overall, the present exploration concludes that the study of drainage morphometry is a vital system to understand the characteristics of a milepost and it can be effectively employed to prioritize the sub watersheds.

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