

AN ANALYSIS OF THE RELATION BETWEEN THE STREAM ORDER, WATERSHED, DRAINAGE DENSITY AND WETLANDS USING GIS

Varsha Prem¹, N. Jawahar Raj² and B. Gurugnanam¹

¹Centre for Applied Geology, Gandhigram Rural Institute-Deemed University, Tamil Nadu

²Department of Geology, National College, Tiruchirappalli

E-mail: varsha.prem34@gmail.com

Abstract: Geographical Information System (GIS) was used to find out the relation between stream order, watershed, drainage density and wetland. The Kolli hills, parts of Easter Ghats of Tamil Nadu, is located at a latlong of 11⁰10'N and 78⁰30'E. The study area covers 481.19 km². The hill contains upto 6th order stream. The stream order was classified based on Strahler's stream order method. There are 15 micro watersheds. The biggest watershed is the 13th watershed. The drainage density was prepared by using the stream order. It is classified as 3, the high density area, moderate density area and the low- density area. The low-density area covers about 4.8% of the total area. There is a relationship between the stream order, watershed, drainage density and wetland. The present study explored the relationship exist between the above.

Keywords: GIS, Stream order, Watershed, Drainage Density and Wetland.

Introduction

Stream order is a measure of the relative size of the streams. Here the Strahler's stream order method is used. Watershed is a finite area having a number of stream order. Drainage density is the total length of all the streams and rivers in a drainage basin divided by the total area of the drainage basin. Wetlands are the area that covers by water where the low-density drainage is there the chances for the formation wetland is high. The focus of the paper is to find a relation between stream order, drainage density, watershed and wetlands.

Study Area

The study area for the present study comes under Namakal and Perambalur districts of Tamil Nadu. The geo-coordinates of the kolli hills is 11⁰10'N and 78⁰30'E. The total area is 481.19 km². The hill lies about 1380m above the mean sea level. The study area is mostly covered by Charnokite rocks with some hornblend biotite gneiss, dolerite dykes and magnetite quartzite bands.

Methodology

The base map was prepared by using toposheets of 1:50000 Scale (58 I/7, 58 I/8). The base map contains important locations, village boundary, forest cover, roads and the important drainage. Parameters such as Stream order, Watershed were prepared by using Geological Survey of India toposheets and ArcGIS software. Drainage density map, wetland map were prepared the stream order map.

Results and Discussion

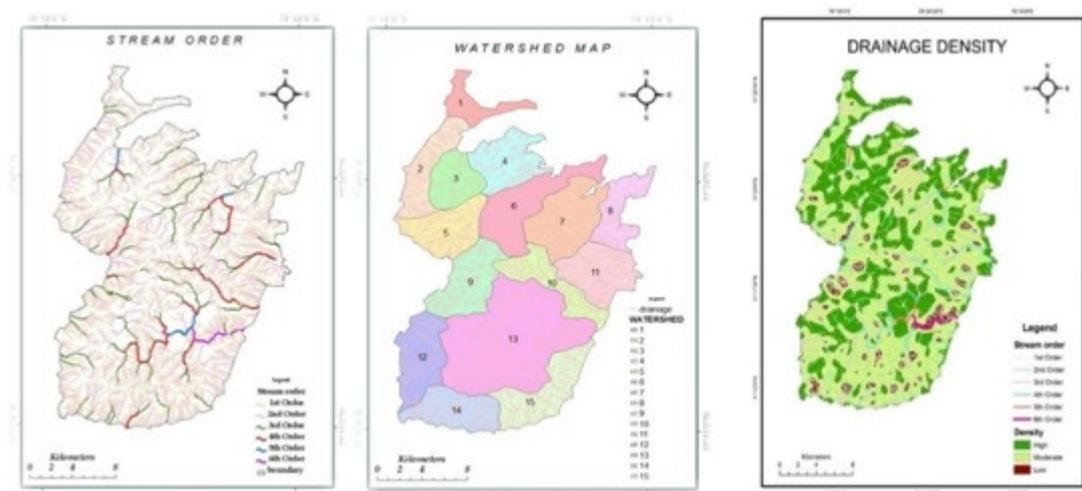


Fig: 1 Stream order

Fig: 2 Watershed

Fig: 3 Drainage Density

Stream Order

Stream order is defined as the measure of the relative size of streams. The Strahler's stream order method is used here to classify the stream order. The drainage map was prepared by using the Survey of India toposheet using ArcGIS. Based on this method the stream order is up to 6. There is only one 6th order stream. It comes on the east-south side of the Kolli hill. The Puliyanjolai Reserve forest and Tinnanur Nadu village cover the 6th order drainage.

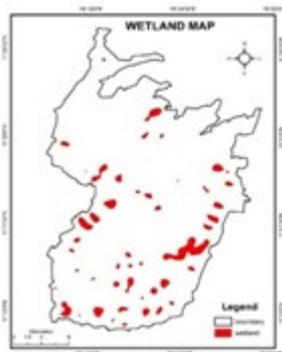
Watershed

Watershed is a limited area whose runoff is channeled through a single outlet. There are 15 micro watersheds. The biggest watershed is 13th one, and it comes at the Tinnanur Nadu which is close to the Puliyanjolai Reserve Forest. In the 13th watershed, the highest stream order (6th order) comes.

Drainage Density

Drainage Density is the length of all the streams and rivers in a drainage basin divided by the total area of the drainage basin. The study area is classified as high, moderate and low drainage density. The higher density covers 169 km² areas. Moderate density area is 289 km²

and the low drainage density covers only 23 km². The low drainage density area comes at the village Tinnanur Nadu and the Puliyanjolai Reserve Forest.

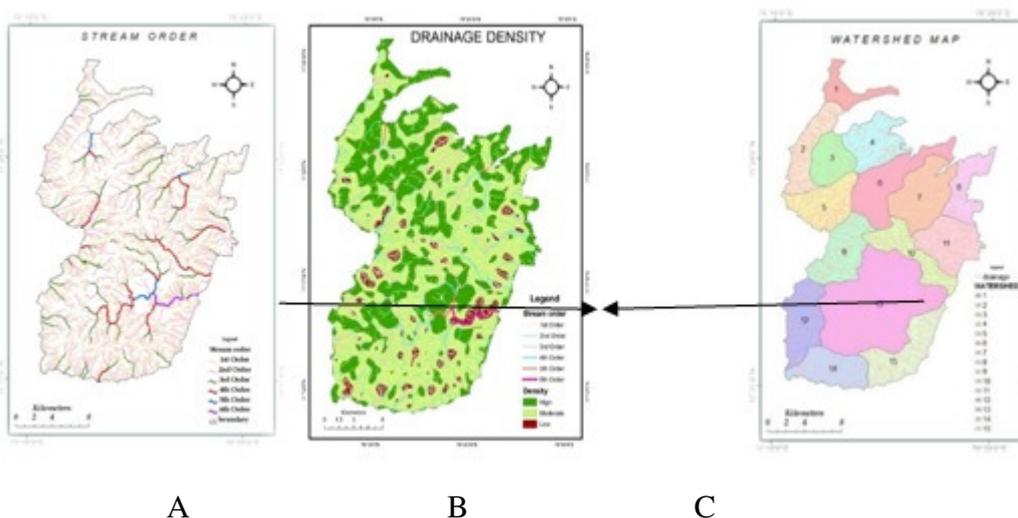


Wetland

Here wetland area covers about 4.8%. It is an inland type wetland. The largest wetland comes in Puliyanjolai Reserve Forest, and the village is Tinnanur Nadu. These are the places where the highest stream order, biggest watershed and lowest drainage density found.

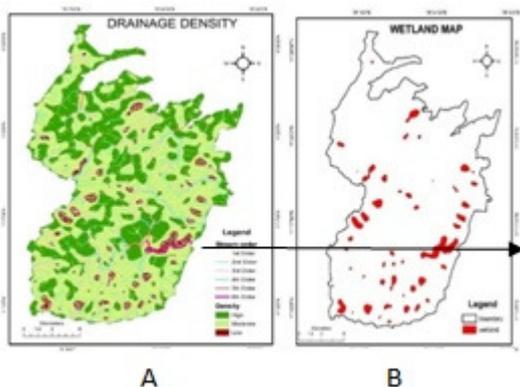
Comparison maps between

1. Stream order, Watershed and Drainage density map



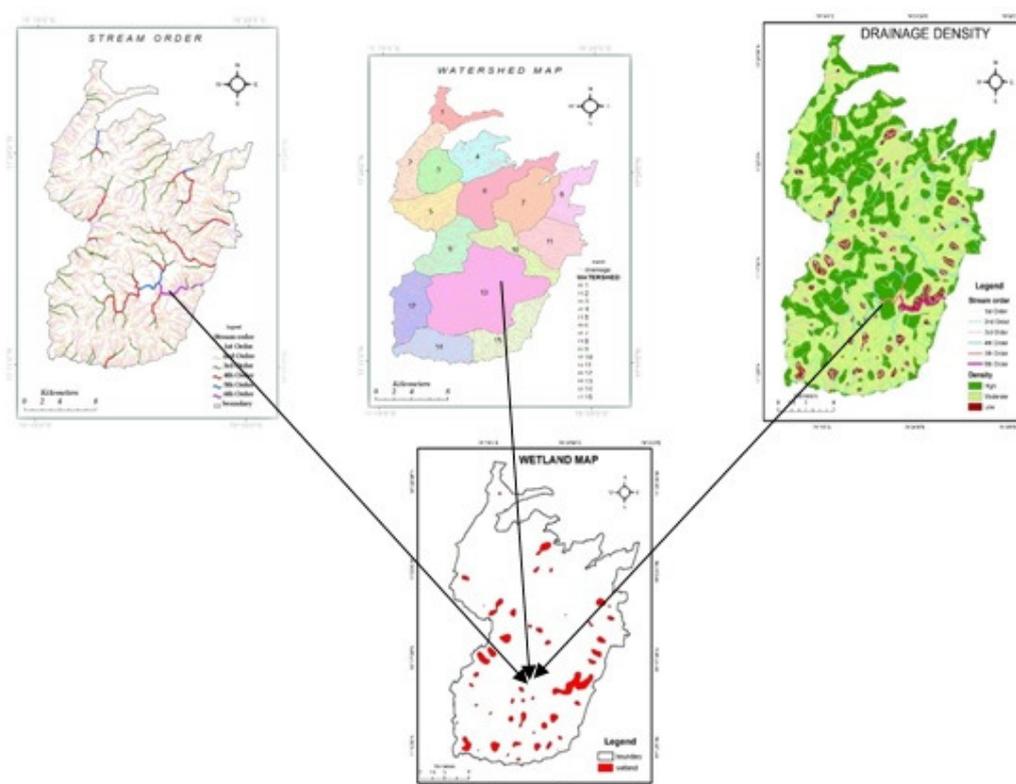
The images represent the Stream order(A), the Drainage density(B) and the Watershed(C) maps. In the area of the highest stream order comes the lowest density area. Similarly the biggest watershed area contains the lowest density area.

2. Drainage Density and Wetland Map



The image A represents the Drainage density, and B represents the Wetland map. The lowest density area contains the wetland area.

3. Stream order, Watershed, Drainage density and Wetland map



Highest stream order, biggest watershed and lowest density areas contain the wetland area

Conclusion

A river system consists of a river network and its entire watershed. The drainage density and the wetland show an inverse relation, i.e., when the drainage density is low, the possibility for the occurrence of wetland is high. When the stream order and watershed area increases the wetland area is also increases, i.e. this shows direct relation. The low-order streams are the younger streams which flow very fast and the infiltration is low, subsequently the drainage density is high so the formation of wetland is low. The higher-order streams are the older streams which flow very slowly and the infiltration is high, then the drainage density is low so the formation of wetland is high.

Acknowledgment

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