



Maurya, S., Srivastava, P. K., Gupta, M., Islam, T., & Han, D. (2016). Integrating Soil Hydraulic Parameter and Microwave Precipitation with Morphometric Analysis for Watershed Prioritization. *Water Resources Management*, 30(14), 5385-5405. <https://doi.org/10.1007/s11269-016-1494-4>

Peer reviewed version

Link to published version (if available):
[10.1007/s11269-016-1494-4](https://doi.org/10.1007/s11269-016-1494-4)

[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Springer at <http://link.springer.com/article/10.1007/s11269-016-1494-4>. Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available: <http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>

Table 1 Formulae used for the computation of morphometric parameters

Sl. no.	Morphometric parameters	Formula/definition	References
1	Stream order (μ)	Ranking hierarchically	Strahler (1964)
2	Number of stream (N_μ)	Total number of stream segment of the order u	Strahler (1957)
3	Stream length (L_μ)	Total length of the stream segments of that particular order	Horton (1945)
4	Texture Ratio (T)	$T = N_\mu / A$ Where N_μ = total number of stream of all order A = area of the river basin (Km^2)	Horton (1945)
5	Bifurcation ratio (R_b)	$R_b = N_\mu / N(\mu+1)$ Where N_μ = total number of stream segments of the order ' μ ' $N(\mu+1)$ = number of stream segments of the next higher order	Schumm (1956)
6	Stream frequency (F_u)	$F_u = \sum N_\mu / A$ Where, $\sum N_\mu$ = total number of stream segments of all orders A = area of the river basin (Km^2)	Horton (1932)
7	Form factor (R_f)	$R_f = A / L^2$ Where, A = area of the basin (Km^2) L = basin length (km)	Hortan (1932)
8	Elongation ratio (R_e)	$R_e = D / L = 1.128 \sqrt{A} / L$ Where, D = diameter of a circle of the same area (A) as the basin A = area of the basin (Km^2) L = basin length (km)	Schumm (1956)
9	Circularity ratio (R_c)	$R_c = 4\pi A / P^2$ Where, A = area of the basin (km^2) P = perimeter (km)	Miller (1953); Strahler (1964)
10	Shape factor (B_s)	$B_s = L^2 / A$	Horton (1932)

		Where , L = basin length (km) A = area of the basin (km^2)	
11	Length of overland flow (L_o)	$L_o=2/Dd$ Where , Dd = drainage density of basin	Horton (1945)
12	Drainage density(Dd)	$Dd=\sum L\mu/A$ Where, $\sum L\mu$ = total length of the stream segments of all orders A = area of the river basin or grid (km^2)	Horton (1932)
13	Basin length (L_b)	$L_b= 1.312 X A^{0.568}$ Where, L_b =Length of Basin(km) A =Area of Basin (km^2)	Nookaratnam et al. (2005)
14	Compactness Constant (C_c)	$C_c=0.2821P/A^{0.5}$ Where, C_c =Compactness Constant A =Area of the basin (km^2) P =Perimeter of the basin (km)	Horton (1945)

Table.2 Analyzed morphometric parameters

Watershed number	Area (km ²)	Perimeter (km)	length (km)	N1	N	Lb (Km)	Rb	Dd	Fu	T	Lo	Rf	Bs	Re	Rc	Cc
1	39.04	32.57	17.04	2	3	10.52	2	0.44	0.08	0.06	0.22	0.35	2.83	0.67	0.46	1.47
2	329.96	171.41	139.03	14	22	35.35	2.43	0.42	0.07	0.08	0.21	0.32	3.79	0.58	0.14	2.66
3	115.27	62.86	48.17	8	11	19.59	3.15	0.42	0.10	0.13	0.21	0.30	3.33	0.62	0.37	1.65
4	149.31	97.21	52.77	9	12	22.53	3.25	0.34	0.08	0.12	0.17	0.30	3.40	0.61	0.20	2.24
5	151.03	72.10	59.37	8	11	22.68	4.5	0.35	0.07	0.15	0.20	0.29	3.41	0.61	0.36	1.65
6	187.80	90.33	69.59	11	13	25.67	6	0.37	0.07	0.12	0.19	0.29	3.51	0.60	0.29	1.86
7	592.32	278.29	244.08	33	43	49.29	3.95	0.41	0.07	0.12	0.21	0.24	4.10	0.56	0.10	3.23
8	462.66	177.89	199.67	28	40	42.83	3.204	0.43	0.09	0.16	0.22	0.25	3.97	0.57	0.18	2.33
9	144.68	68.41	59.59	10	12	22.13	5.5	0.00	0.08	0.15	0.00	0.30	3.39	0.61	0.39	1.60
10	133.77	60.56	57.33	8	11	21.17	3.25	0.43	0.08	0.13	0.21	0.30	3.35	0.62	0.46	1.48
11	296.39	110.46	136.89	21	28	33.26	4.75	0.46	0.09	0.19	0.23	0.27	3.73	0.58	0.31	1.81
12	296.86	107.51	130.42	22	30	33.29	3.55	0.44	0.10	0.20	0.22	0.27	3.73	0.58	0.32	1.76
13	147.78	65.10	65.38	12	15	14.06	4	0.44	0.23	0.18	0.22	0.75	1.34	0.98	0.44	1.51
14	168.67	71.37	63.18	11	15	24.15	3.333	0.38	0.09	0.21	0.19	0.29	3.46	0.61	0.42	1.55
15	105.92	58.54	44.90	7	9	18.54	3.5	0.43	0.08	0.12	0.21	0.31	3.27	0.63	0.39	1.60
16	90.46	61.62	65.38	5	6	16.95	5	0.72	0.07	0.10	0.36	0.31	3.18	0.63	0.30	1.83
17	232.22	114.88	77.80	14	21	28.96	2.93	0.34	0.09	0.12	0.17	0.28	3.61	0.59	0.22	2.13
18	255.55	100.11	99.71	13	16	30.58	4.25	0.39	0.06	0.16	0.20	0.27	3.66	0.59	0.32	1.77
19	95.46	60.01	15.26	3	4	17.48	2.5	0.16	0.04	0.07	0.08	0.31	3.12	0.63	0.33	1.73
20	46.33	46.30	38.70	9	13	11.60	3	0.84	0.28	0.28	0.42	0.34	2.90	0.66	0.27	1.92

Table 3 Stream order of Pahuj watersheds

Watershed no.	I Order	II Order	III Order	IV Order	V Order	Total no. Of streams
1	2				1	3
2	14	5		2	1	22
3	8	2		1		11
4	9	2		1		12
5	8	1		1		10
6	11	1		1		13
7	33	5	4	1		43
8	28	9	2	1		40
9	10	1	1			12
10	9	2	1			11
11	21	6		1		28
12	22	6	1	1		30
13	12	2	1			15
14	11	3	1			15
15	7	2				9
16	5	1				6
17	14	5	1		1	21
18	13	2		1		16
19	9	2	1		1	4
20	3	1				13

Table 4 Calculation of compound factor and prioritized ranks

Watershed number	Rb	Dd	Fu	T	Lo	Rf	Bs	Re	Rc	Cc	Compound Factor	Prioritized Rank
1	20	6	13	20	6	19	2	19	20	1	12.6	18
2	18	10	17	18	10	17	18	3	2	19	13.2	19
3	15	11	4	11	11	13	6	14	14	7	10.6	10
4	12	17	12	12	17	10	10	11	4	18	12.3	17
5	5	16	15	8	13	9	11	10	13	8	10.8	12
6	1	15	16	14	16	7	13	8	7	14	11.1	14
7	8	12	14	16	12	1	20	1	1	20	10.5	9
8	14	8	8	7	7	2	19	2	3	17	8.7	5
9	2	20	10	9	20	11	9	12	16	5	11.4	15
10	13	7	11	10	8	12	8	13	19	2	10.3	8
11	4	3	5	4	3	4	16	5	9	12	6.5	1
12	9	5	3	3	4	3	17	4	11	11	7	2
13	7	4	2	5	5	20	1	20	18	3	8.5	4
14	11	14	7	2	15	8	12	9	17	4	9.9	6
15	10	9	9	15	9	14	7	15	15	6	10.9	13
16	3	2	18	17	2	16	5	17	8	13	10.1	7
17	17	18	6	13	18	6	14	7	5	16	12	16
18	6	13	19	6	14	5	15	6	10	10	10.4	11
19	19	19	20	19	19	15	4	16	12	9	15.2	20
20	16	1	1	1	1	18	3	18	6	15	8	3

Table 5 Pair comparison matrix of features

	Compound Factor	Slope	Drainage density	Soil type	Field Capacity	Rainfall	Normalised weight
Compound Factor	1	2	4	5	7	9	41.9
Slope	1/2	1	2	4	5	7	25.7
Drainage density	1/4	1/2	1	2	4	5	15.0
Soil type	1/5	1/4	1/2	1	2	4	8.9
Field Capacity	1/7	1/5	1/4	1/2	1	2	5.2
Rainfall	1/9	1/7	1/5	1/4	1/2	1	3.2
CR	0.0306						
