

# Measurements for water

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Waterbalans: Discharge slope area

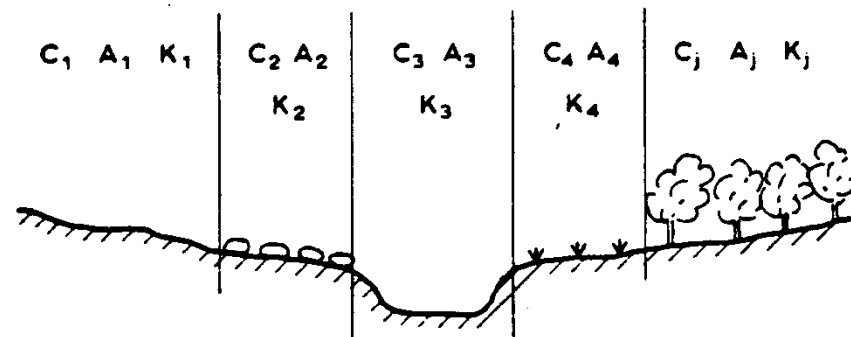


## **Slope area** method for estimation

- 1) actual discharge
- 2) flood surveying (afterwards)



## Slope Area, based on Chezy



$$Q_j = \bar{u}_j \cdot A_j = C_j A_j \cdot R_j^{1/2} \cdot i^{1/2} = K_j \cdot i^{1/2}$$

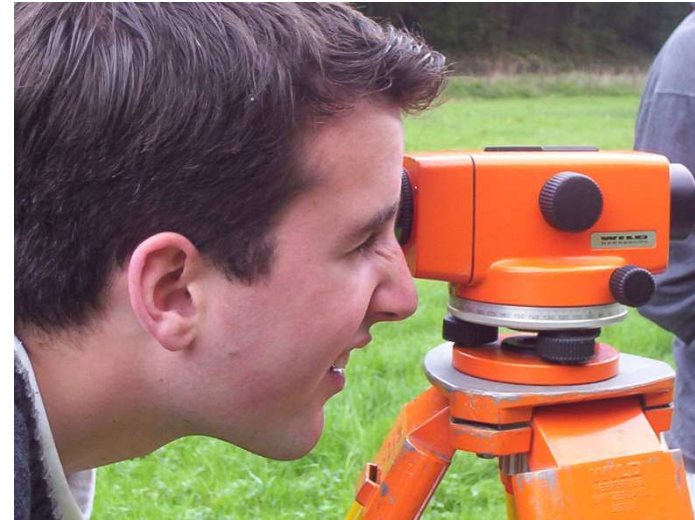
Determine



Slope



Cross section



## and Roughness coeff.

**Table 7.1** Values of Manning's  $n$  and Chezy's  $C$

Type of channel and description	Manning's coefficient $n$	Chezy's coefficient $C$			
		$R_h = 1 \text{ m}$	$R_h = 2.5 \text{ m}$	$R_h = 5 \text{ m}$	$R_h = 10 \text{ m}$
Excavated or dredged					
(1) Earth, straight and uniform					
a. Clean, recently completed	0.016 to 0.020	63 to 50	72 to 58	81 to 65	91 to 73
b. Clean, after weathering	0.018 to 0.025	55 to 40	64 to 46	72 to 52	81 to 59
c. With short grass, few weeds	0.022 to 0.033	45 to 30	53 to 35	59 to 40	67 to 44
(2) Rock cuts					
a. Smooth and uniform	0.025 to 0.040	40 to 25	46 to 29	52 to 33	59 to 37
b. Jagged and irregular	0.035 to 0.050	29 to 20	33 to 23	37 to 26	42 to 29
Natural streams					
Minor streams (top width at flood stage less than 30m) on plains: clean, straight, full stage, no rifts or deep pools	0.025 to 0.033	40 to 30	46 to 35	52 to 40	59 to 44
Flood plains					
(1) Pasture, no brush					
a. Short grass	0.025 to 0.035	40 to 29	46 to 33	52 to 37	59 to 42
b. High grass	0.030 to 0.050	33 to 20	39 to 23	44 to 26	49 to 29
(2) Cultivated areas					
a. No crop	0.020 to 0.040	50 to 25	58 to 29	65 to 33	73 to 37
b. Mature row crops	0.025 to 0.045	40 to 22	46 to 26	52 to 29	59 to 33
c. Mature field crops	0.030 to 0.050	33 to 20	39 to 23	44 to 26	49 to 29

Riggs formula:  
Simplified slope area method:

$$\log Q = 0.188 + 1.33 \log A + 0.05 \log i - 0.056 (\log i)^2$$