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Watershed and Yield Formulas

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List of 13 Watershed and Yield Formulas

Watershed and Yield

Watershed Simulation

1) Actual Evapotranspiration given Runoff

$$fx \quad E_{et} = P_{mm} - Q_V - \Delta Sm$$

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

$$ex \quad 9.5m^3/s = 35mm - 19.5m^3 - 6m^3$$

2) Change in Soil Moisture Storage given Runoff

$$fx \quad \Delta Sm = P_{mm} - Q_V - E_{et}$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$ex \quad 1.5m^3 = 35mm - 19.5m^3 - 14m^3/s$$

3) Equation for Runoff

$$fx \quad Q_V = S_r + I$$

[Open Calculator !\[\]\(f1c5da15572e3e09d343161be98f508d_img.jpg\)](#)

$$ex \quad 12.05m^3 = 0.05m^3/s + 12m^3/s$$

4) Net Groundwater Outflow given Runoff

$$fx \quad I = Q_V - S_r$$

[Open Calculator !\[\]\(166772600a13ad0a433053f90fe45649_img.jpg\)](#)

$$ex \quad 19.45m^3/s = 19.5m^3 - 0.05m^3/s$$



5) Runoff given Precipitation

$$fx \quad Q_V = P_{mm} - E_{et} - \Delta S_m$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 15m^3 = 35mm - 14m^3/s - 6m^3$$

6) Surface Runoff using Runoff

$$fx \quad S_r = Q_V - I$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 7.5m^3/s = 19.5m^3 - 12m^3/s$$

Yield of Catchment

7) Abstraction in Time given Yield of Catchment

$$fx \quad A_b = Y - R_o - \Delta S_v$$

[Open Calculator !\[\]\(b792654f2cef9719eabeb6c5be00811e_img.jpg\)](#)

$$ex \quad 116 = 186 - 50m^3/s - 20$$

8) Change in Storage Volumes given Yield of Catchment

$$fx \quad \Delta S_v = Y - R_o - A_b$$

[Open Calculator !\[\]\(84f47badaad7772cd95667a7c387a639_img.jpg\)](#)

$$ex \quad 21 = 186 - 50m^3/s - 115$$

9) Natural Flow given Yield of Catchment

$$fx \quad R_N = Y - V_r$$

[Open Calculator !\[\]\(c15650232aa6660c9deb34f3b82dcb72_img.jpg\)](#)

$$ex \quad 176m^3/s = 186 - 10m^3/s$$



10) Observed Runoff Volume at Terminal Gauging Station given Yield of Catchment

$$fx \quad R_o = Y - A_b - \Delta S_v$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 51m^3/s = 186 - 115 - 20$$

11) Volume of Return Flow given Yield of Catchment

$$fx \quad V_r = Y - R_N$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 12m^3/s = 186 - 174m^3/s$$

12) Yield of Catchment by Water Balance Equation

$$fx \quad Y = R_N + V_r$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 184 = 174m^3/s + 10m^3/s$$

13) Yield of Catchment given Observed Runoff Volume at Terminal Gauging Station

$$fx \quad Y = R_o + A_b + \Delta S_v$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 185 = 50m^3/s + 115 + 20$$






Variables Used

- **A_b** Abstraction in Time
- **E_{et}** Actual Evapotranspiration (*Cubic Meter per Second*)
- **I** Net Ground Water Flowing Outside Catchment (*Cubic Meter per Second*)
- **P_{mm}** Precipitation (*Millimeter*)
- **Q_v** Runoff Volume (*Cubic Meter*)
- **R_N** Natural Flow Volume (*Cubic Meter per Second*)
- **R_o** Observed Flow Volume (*Cubic Meter per Second*)
- **S_r** Surface Runoff (*Cubic Meter per Second*)
- **V_r** Volume of Return Flow (*Cubic Meter per Second*)
- **Y** Yield of Catchment
- **ΔS_m** Change in Soil Moisture Storage (*Cubic Meter*)
- **ΔS_v** Change in Storage Volumes



Constants, Functions, Measurements used

- **Measurement: Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement: Volume** in Cubic Meter (m³)
Volume Unit Conversion 
- **Measurement: Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
Volumetric Flow Rate Unit Conversion 



Check other formula lists

- [Empirical Equations of Runoff Volume Formulas](#) 
- [SCS-CN Method of Runoff Volume Formulas](#) 
- [Rainfall-Runoff Correlation and Strange's Tables Formulas](#) 
- [Watershed and Yield Formulas](#) 

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