The Manning Equation

$$Q = \left(A \times R^{2/3} S^{1/2}\right) \div n$$

After Manning (1891)

Where:
Q = discharge ($m^3 s^{-1}$)
A = wetted area (m^2)
R = hydraulic radius (m)
S = bed slope
n = roughness coefficient Manning's n

Manning R. (1891) On the Flow of Water in Open Channels and Pipes. *Transactions, Institution of Civil Engineers of Ireland* 20: 161-207.

The Dingman & Sharma Equation

$$Q = 1.56 \times A^{1.173} \times R^{0.4} \times S^{(-0.0543 \times \log S)}$$

After Dingman & Sharma (1997)

Where:
Q = discharge ($m^3 s^{-1}$)
A = wetted area (m^2), $0.41 < A < 8520$
R = hydraulic radius (m)
S = bed slope, $0.00001 < S < 0.0418$.

Dingman S.L. and Sharma K.P. (1997) Statistical development and validation of discharge equations for natural channels. *Geomorphology* 199(1-2): 13-35.

The Golubtsov Equation

$$Q = 4.5 \times A \times D^{2/3} \times (S + 0.001)^{0.17}$$

After Golubtsov (1969)

Where:
Q = discharge ($m^3 s^{-1}$)
A = wetted area (m^2)
D = maximum depth (m)
S = bed slope (slope >= 0.004)

Golubtsov V.V. (1969) Hydraulic resistance and formula for computing the average flow velocity of mountain rivers. *Soviet Hydrology (from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI) 33:30-41[* 5*]*: 500-510.

The Riggs Equation

$$Q = 1.55 \times A^{4/3} \times S^{(0.05-[0.056 \times \log S])}$$

After Riggs (1976)

Where:
Q = discharge (m^3s^{-1})
A = wetted area (m^2)
S = bed slope

Riggs H.C. (1976) A simplified slope-area method for establishing flood discharge in natural channels. *Journal of Research, US. Geological Survey* 4: 285-291.

The Williams Equation

$$Q = 4 \times A^{1.21} \times S^{0.28}$$

After Williams (1978)

Where:
Q = discharge (m^3s^{-1})
A = wetted area (m^2)
S = bed slope

Williams G.P. (1978) Bankfull discharge of rivers. *Water Resources Research* 14: 1141-1154.