

SCS Curve Number Method

The SCS curve number method is a simple, widely used and efficient method for determining the approximate amount of runoff from a rainfall even in a particular area. Although the method is designed for a single storm event, it can be scaled to find average annual runoff values. The requirements for this method are very low, rainfall amount and curve number. The curve number is based on the area's hydrologic soil group, land use, treatment and hydrologic condition. The 2 former being of greatest importance.

The general equation for the SCS curve number method is as follows:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \quad (1)$$

Q = runoff (in)
 P = rainfall (in)
 S = potential maximum retention after runoff begins
 I_a = initial abstractions

$$I_a = 0.2 S \quad (2)$$

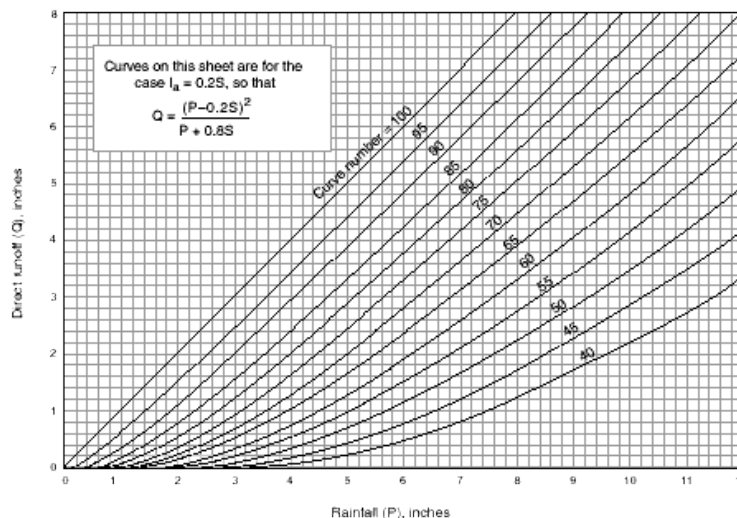
$$Q = \frac{(P - 0.2 S)^2}{(P + 0.8 S)} \quad (3)$$

$$S = \frac{1000}{CN} - 10 \quad (4)$$

The initial equation (1) is based on trends observed in data from collected sites, therefore it is an empirical equation instead of a physically based equation. After further empirical evaluation of the trends in the data base, the initial abstractions, I_a, could be defined as a percentage of S (2). With this assumption, the equation (3) could be written in a more simplified form with only 3 variables. The parameter CN is a transformation of S, and it is used to make interpolating, averaging, and weighting operations more linear (4).

With the following chart, the amount of runoff can be found if the rainfall amount (in inches) and curve number is known.

There are two advantages of using L-THIA over a manual method. One, the availability of the data. L-THIA provides the rainfall data for any area in the United States. Two, L-THIA completes this calculation for every rainfall event for thirty years and then reports the average annual runoff value.



Land Use Description on Input Screen	Description and Curve Numbers from TR-55					
	Cover Description	% Impervious Areas	Curve Number for Hydrologic Soil Group			
			A	B	C	D
Agricultural	Row Crops - Straight Rows + Crop Residue Cover-Good Condition (1)		64	75	82	85
Commercial	Urban Districts: Commercial and Business	85	89	92	94	95
Forest	Woods (2) - Good Condition		30	55	70	77
Grass/Pasture	Pasture, Grassland, or Range (3) - Good Condition		39	61	74	80
High Density Residential	Residential districts by average lot size: 1/8 acre or less	65	77	85	90	92
Industrial	Urban district: Industrial	72	81	88	91	93
Low Density Residential	Residential districts by average lot size: 1/2 acre lot	25	54	70	80	85
Open Spaces	Open Space (lawns, parks, golf courses, cemeteries, etc.)(4) Fair Condition (grass cover 50% to 70%)		49	69	79	84
Parking and Paved Spaces	Impervious areas: Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	100	98	98	98	98
Residential 1/8 acre	Residential districts by average lot size: 1/8 acre or less	65	77	85	90	92
Residential 1/4 acre	Residential districts by average lot size: 1/4 acre	38	61	75	83	87
Residential 1/3 acre	Residential districts by average lot size: 1/3 acre	30	57	72	81	86
Residential 1/2 acre	Residential districts by average lot size: 1/2 acre	25	54	70	80	85
Residential 1 acre	Residential districts by average lot size: 1 acre	20	51	68	79	84
Residential 2 acres	Residential districts by average lot size: 2 acre	12	46	65	77	82
Water/ Wetlands		0	0	0	0	0

Color Key

Basic Input Value	Detailed Input Value	Basic and Detailed Input Type Value
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Notes:

(1) Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue on the land surface (good \geq 20%), and (e) degree of surface roughness.

(2) Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

(3) Good: $>$ 75% ground cover and lightly or only occasionally grazed.

(4) CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.