

CHAPTER 2

HYDROLOGY

2.11 Impervious Area Calculations

2.11.1 Urban Modifications

Several factors, such as the percentage of impervious area and the means of conveying runoff from impervious areas to the drainage system, should be considered in computing CN for urban areas. For example, do the impervious areas connect directly to the drainage system, or do they outlet onto lawns or other pervious areas where infiltration can occur?

The curve number values given in Table 2.6.2-2 are based on directly connected impervious area. An impervious area is considered directly connected if runoff from it flows directly into the drainage system. It is also considered directly connected if runoff from it occurs as concentrated shallow flow that runs over pervious areas and then into a drainage system.

It is possible that curve number values from urban areas could be reduced by not directly connecting impervious surfaces to the drainage system. The following discussion will give some guidance for adjusting curve numbers for different types of impervious areas.

2.11.2 Connected Impervious Areas

Urban CNs given in Table 2.6.2-2 were developed for typical land use relationships based on specific assumed percentage of impervious area. These CN values were developed on the assumptions that:

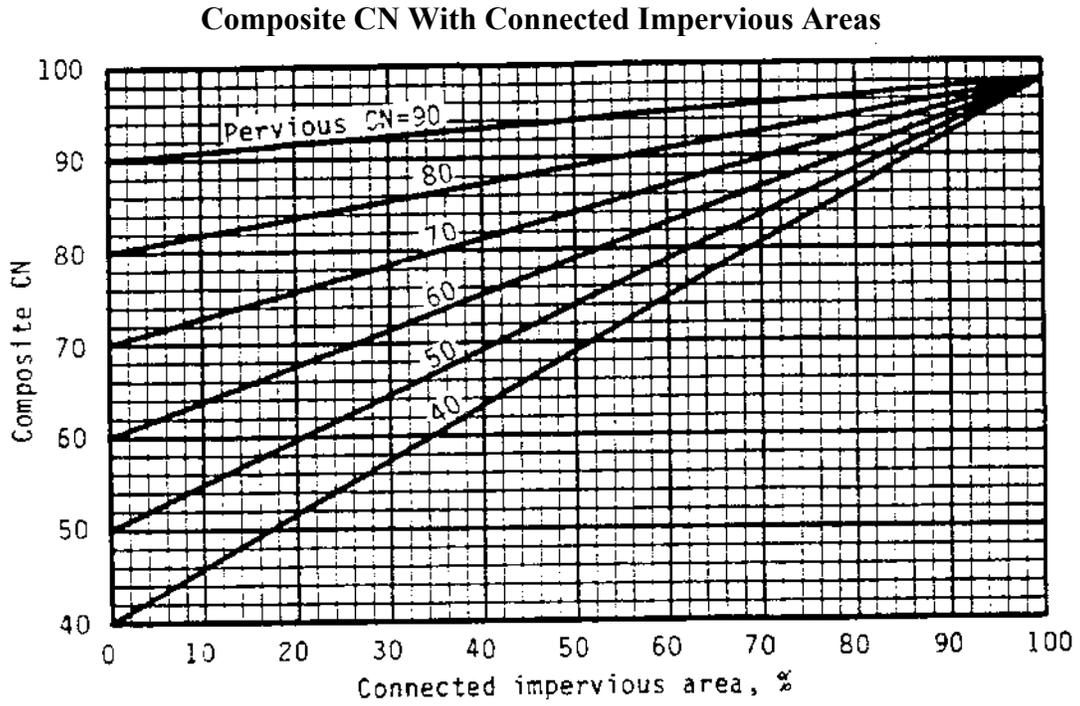
- 2.11.2.1 pervious urban areas are equivalent to pasture in good hydrologic condition, and
- 2.11.2.2 impervious areas have a CN of 98 and are directly connected to the drainage system.

Some assumed percentages of impervious area are shown in Table 2.6.2-2.

If all of the impervious area is directly connected to the drainage system, but the impervious area percentages or the pervious land use assumptions in Table 2.6.2-2 are not applicable, use Figure 2.11.2-1 to compute a composite CN. For example, Table 2.6.2-2 gives a CN of 70 for a 1/2-acre lot in hydrologic soil group B, with an assumed impervious area of 25

percent. However, if the lot has 20 percent impervious area and a pervious area CN of 61, the composite CN obtained from Figure 2.11.2-1 is 68. The CN difference between 70 and 68 reflects the difference in percent impervious area.

Figure 2.11.2-1



2.11.3 Unconnected Impervious Areas

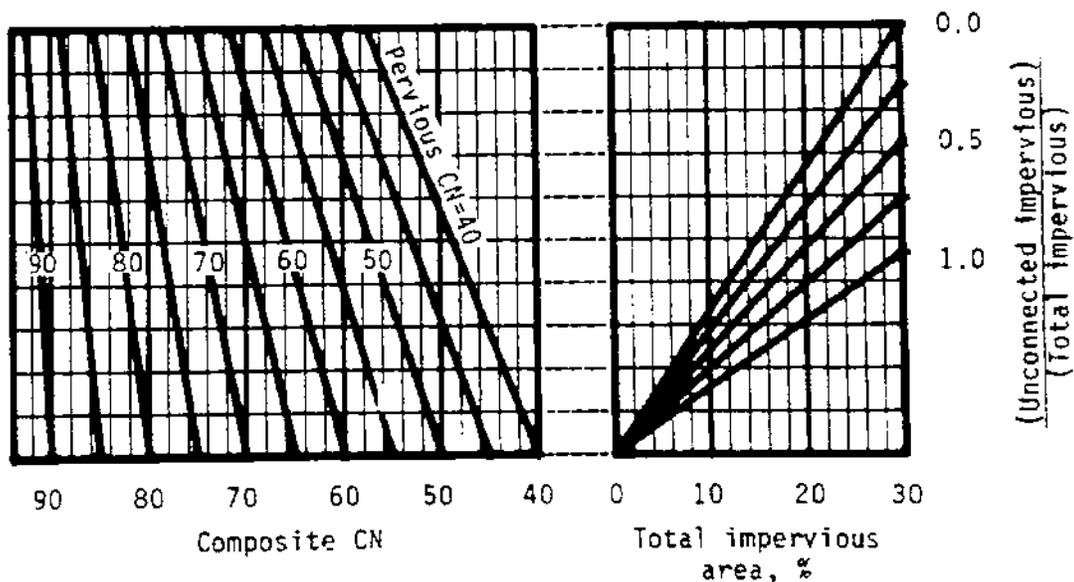
Runoff from these areas is spread over a pervious area as sheet flow. To determine CN when all or part of the impervious area is not directly connected to the drainage system, (1) use Figure 2.11.3-1 if total impervious area is less than 30 percent or (2) use Figure 2.11.2-1 if the total impervious area is equal to or greater than 30 percent, because the absorptive capacity of the remaining pervious areas will not significantly affect runoff.

When impervious area is less than 30 percent, obtain the composite CN by entering the right half of Figure 2.11.3-1 with the percentage of total impervious area. Then move left to the appropriate pervious CN and read down to find the composite CN. For example, for a 1/2-acre lot with 20 percent total impervious area (75 percent of which is unconnected) and pervious CN of 61, the composite CN from Figure 2.11.3-1 is 66. If all of the impervious area is connected, the resulting CN (from Figure 2.11.2-1) would be 68.

Figure B-2

Composite CN with Unconnected Impervious Areas

(Total Impervious Area Less Than 30%)



2.11.4 Composite Curve Numbers

When a drainage area has more than one land use, a composite curve number can be calculated and used in the analysis. It should be noted that when composite curve numbers are used, the analysis does not take into account the location of the specific land uses but sees the drainage area as a uniform land use represented by the composite curve number.

Composite curve numbers for a drainage area can be calculated by entering the required data into a table such as the one presented in Table 2.11.4-1.

| (1) | (2) | (3) | (4) | (5) |
|----------|--------------|------|------------------------------|-----------------------------------|
| Land Use | Curve Number | Area | % of Total Composite Area | Curve Number (Col. 2 X Col. 4) |

The composite curve number for the total drainage area is then the sum of the composite curve numbers from column 5.

The different land uses within the basin should represent a uniform hydrologic group represented by a single curve number. Any number of land uses can be included but if their spatial distribution is important to the hydrologic analysis then sub-basins should be developed and separate hydrographs developed and routed to the study point.

END OF SECTION 2.11