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# Runoff Modeling Using the GIS-Based Curve Number Method

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**Abstract**: To achieve full managment for water resource, accurate records about the quantity and rate of runoff into streams and rivers is crucial since runoff data is required to address watershed development and management challenges. The SCS-CN (Soil Conservation Service–Curve Number) approach calculates hydrological parameters according to the values of soil type and land cover. For any drainage system, these inputs are utilized to create CN grids in a Geographical Information System (GIS) context. The study region is 2,945.33 km² and is situated between the Maysan and Al-Kut administrations in Iraq, north of the Ali Al-Gharbi district. Thus, estimating the CN is the aim of this investigation by utilizing both of soil type and land use/cover with the Digital Elevation Model. The five classes that resulted from the reclassifications were 94.05% agricultural, 2.64% water, 2.54% bare soil, 0.77% urban, and 0.01% forest. The textures of loam soil and sandy clay loam soil are responsible for around 8.44% and 91.56%, respectively, of the watershed area. Since the lowest value indicates minimal runoff, conversely, the estimated CN grid fluctuated between 71 and 100. On the other hand, the area covered by water is indicated by 98 to 100. The predicted CN value ratios were 71-80, 81-90, and 91-100, which were, respectively, 1.44%, 35.08%, and 63.48%. Given that these values closely match the observed runoff. The study region is 2,945.33 km² and is situated between the Maysan and Al-Kut administrations in Iraq, north of the Ali Al-Gharbi district.

**Keywords:** Catchment delineation, Soil conservation curve number, GIS, Soil map, Land use/cover

## Introduction

Water resources are essential for agricultural productivity, economic stability, and environmental sustainability, particularly in semi-arid areas with limited and erratic seasonal rainfall (Price, 2018). As the main inputs to rivers are rainfall, aquifers, and reservoirs, surface runoff is essential to the hydrologic cycle and calls for accurate estimation techniques for planning and climate variability resistance. Strong modeling is even more important in areas like southeast Iraq, where problems with water scarcity are being exacerbated by rising temperatures, decreasing rainfall, and growing population pressures (Iraq, 2022; Al-Taei et al., 2023). Among different hydrological models for calculating direct runoff from rainfall events, Soil Conservation Service Curve Number (SCS CN) considered as a common approach (Soulis, 2021). Three main variables are integrated in this method: antecedent moisture condition (AMC), hydrologic soil group (HSG), and land use and land cover (LULC) (Ajmal et al., 2020). The researchers (Rashid, 2022; Ahmed & Suleimany, 2023; Aziz et al., 2023) highlight the significant role that advancements in GIS have played in hydrological modeling. Tools such as ArcMap and its hydrologic extensions, including HEC-GeoHMS, have greatly improved the spatial analysis capabilities in this field. As a result, it is now possible to accurately distribute hydrologic characteristics and generate highly detailed



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Curve Number (CN) maps, even in data-scarce or ungauged basins. Digital Elevation Model (DEM) preprocessing, which includes watershed definition, sink filling, and flow direction mapping, is the first step in hydrological modeling. By establishing the watershed's boundaries, stream networks, and slope characteristics, these procedures create the terrain framework. The significance of precise terrain representation for runoff forecasts has been demonstrated by the successful application of this method in basins in Morocco (Meghougha) (Khaddor et al., 2015), India (Doddahalla) (Ibrahim-Bathis & Ahmed, 2016), Al-Adhaim (Hamdan et al., 2021), Iraq (Rawanduz) (Ahmed & Suleimany, 2023), Lesser Zab (Salman & Hamdan, 2023), and Bhutan (Wangchu) (Dahal & Kojima, 2025). Soil categorization into hydrologic soil groups (A–D) after terrain delineation yields crucial data on soil permeability and infiltration capacity (Jasim & Walli, 2023). Particularly in complicated or data-constrained locations like Kurdistan and Southern Iraq, the incorporation of soil texture data into GIS platforms—occasionally supplemented with machine learning classifiers—has greatly increased the accuracy of HSG mapping (Abraham et al., 2020; Salman & Hamdan, 2023). Surface variability that affects runoff behavior is also captured by LULC mapping. Changes in agriculture, urbanization, and deforestation all directly affect CN values and, thus, flood risk (Alzghoul & Al-Husban, 2021). LULC is frequently classified using supervised techniques using remote sensing products such as Landsat and Sentinel (Haile et al., 2024). The necessity for recent and high-resolution land cover data in hydrologic modeling is further supported by studies conducted in Kalaya, Morocco; Babur, Ethiopia; and Painesville, USA, which have all shown how LULC dynamics can significantly change CN distributions over time (Gebremichael et al., 2021; Karmouda et al., 2023). The CN grid is computed by combining the DEM, HSG, and LULC layers using raster overlay techniques, such as Raster Calculator and Zonal Statistics (Abdul Wahab & Al-Abadi, 2025). Each pixel's or sub-basin's hydrological potential is represented by this spatially dispersed CN map. The method has been verified in a variety of hydroclimatic settings, such as Saudi Arabia, Ethiopia, and Iraq, where the model results have demonstrated a high degree of agreement with observed hydrographs (Al-Mukhtar & Al-Yaseen, 2019; Sulaiman et al., 2019; Muneer et al., 2020; Al-Ghobari & Dewidar, 2021). CN-based simulations have successfully replicated peak flows and flood volumes when used in HEC-HMS, particularly in ungauged basins or semi-arid areas (Hamdan et al., 2021; Dahal & Kojima, 2025). With its semi-arid climate, sparse hydrometric infrastructure, and rapidly shifting land use, southeast Iraq makes a compelling argument for using this integrated approach. The ability of GIS-based CN mapping to enhance regional flood prediction, water harvesting design, and climate change adaptation has previously been demonstrated in northern Iraq (e.g., Rawanduz and Garmian) (Msaddek et al., 2020; Aziz et al., 2023). Therefore, the aim of this work is to enhance flood resistance planning and water resources managing in the future in the Ali Al-Gharbi district, as a common water-stressed areas. The resulting map can be utilized to simulate runoff patterns within the HEC-HMS model for studying the flood that occurred from 1 March 2019 to 31 May 2019 via integrated soil classification, land cover layers, complete DEM data, and satellite imagery to generate a high-resolution CN grid for a watershed in southeast Iraq.

## Methodology

### Study Area

The northern part of Ali Al Gharbi district in Iraq was selected as the study region, which is bounded by the northern and southern governments of Maysan and Al-Kut. The basin lies between latitudes 32°00′ and 32°38′ North and longitudes 46°00′ and 46°45′ East and is a basin that contains the Al-Saniyah and Al-Kharabah marshes. The watershed is 505.84 km in length overall, with an area of 29453.30 km². See Figure 1.

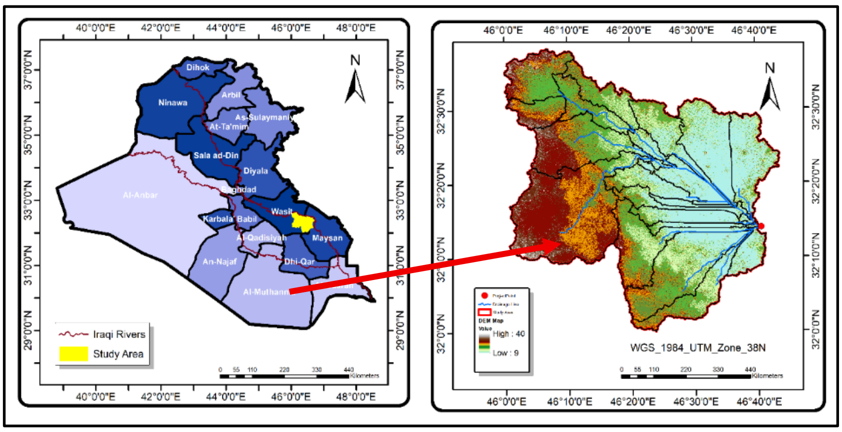

Figure 1. Study area position

**Gis Software**

Software has been utilized within the framework of our research:

A- ArcGIS is an all-inclusive geographic information system (GIS) made specifically for collaborating with geographic data and maps. It offers a strong framework for producing, evaluating, organizing, and disseminating geographical data, allowing users to efficiently see intricate geographic linkages and patterns (Kennedy, 2009). Because ArcGIS can analyze geographical data and is compatible with HEC-HMS software, we decided to use it for data preparation.

B-Arc Hydro is an ArcGIS-compatible geographic and temporal data model for water resources. A data model gives a standardized structure to save information, which is how it differs from a simulation model, while the latter lacks hydrologic process simulation methods. Usually, at least one simulation model is combined with the data model, which transfers information and data from Arc Hydro to the model and returns the outcomes to Arc Hydro. Thus, the later offers a way to connect simulation models via a shared data storage platform. A collection of ArcGIS tools named Arc Hydro Tools is used to practice the Arc Hydro model. It starts with a DEM and fills in several fields in an Arc Hydro geodatabase for a river basin (Maidment, 2002; Shamsi, 2008).

C-HEC-GEOHMS: For hydrologists and engineers with little knowledge of GIS, the Geospatial Hydrologic Modeling Extension (HEC-GEOHMS) is a geospatial hydrology toolkit. Utilizing ArcGIS and the Spatial Analyst further extension, HEC-GeoHMS generates a number of hydrologic modeling datasets for the Hydrologic Engineering Center's Hydrologic Modeling System, HEC-HMS (Yu & Zhang, 2023). The Spatial Analyst extension (ESRI) and ArcGIS are provided by the Environmental Systems Research Institute, Inc. The program users can perform geographical analysis, describe watershed characteristics, visualize spatial data, and draw boundaries for streams and subbasins. The user interfaces, options, tools, controls, and context-sensitive online support of HEC-GEOHMS enable the user to swiftly create hydrologic inputs for HEC-HMS. Figure 2 presented the hydrological modeling in Arc Hydro tools and HEC-GEOHMS (Jyothi, 2016).

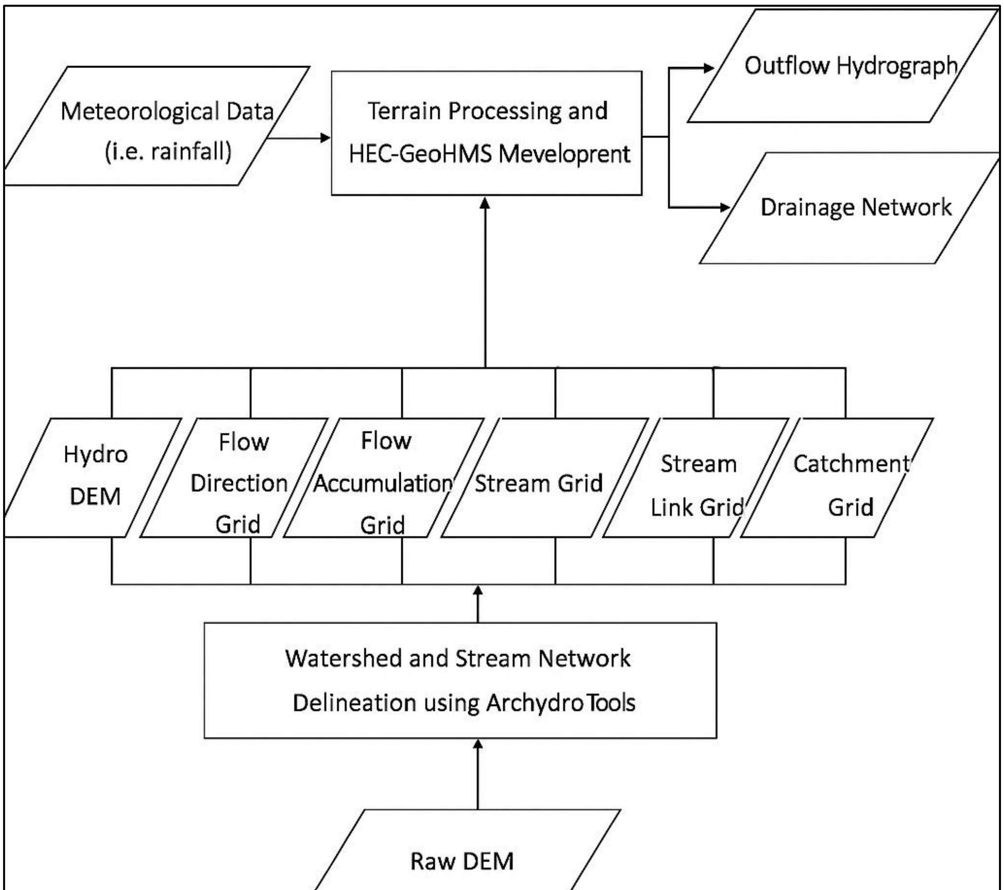


Figure 2. Flow chart of HEC-GEOHMS (Jyothi, 2016)

## Method

### Watershed Delineation Using the Digital Elevation Model (DEM)

The DEM from the US Geological Survey (USGS) website (https://earthexplorer.usgs.gov/) is considered for identifying the drainage pattern, slope, gradient, and basins. Geometric correction was started by projecting the Datum WGS 1984 (Zone 38) Universal Transverse Mercator (UTM) data processing systems onto the DEM [30 m] horizontal spatial resolution. During the flood study period from March 1 to May 31, 2019, the Shuttle Radar Topography Mission's Digital Elevation Model (SRTM) was made publicly available, mosaiced, and processed at a horizontal spatial resolution of 1 arc-second (30 meters). Using Arc Hydro tools and Hec-GeoHMS in ArcGIS (v 10.7.1), the process was completed to generate watersheds and sub-basins from each DEM. Watershed delineation and sub-basin creation were accomplished by sequentially following the stages listed below: Fill Sinks, Flow Direction, Flow Accumulation, Stream Definition, Stream Segmentation, and Catchment Grid Delineation. Using the following three tools, all of the generated raster data was transformed into vector format: Catchment polygon processing, Drainage line, Adjoint catchment Processing, Drainage point, Batch point generation, and Batch watershed generation (Borgohain et al., 2023), as shown in Figure 3 for our study area.

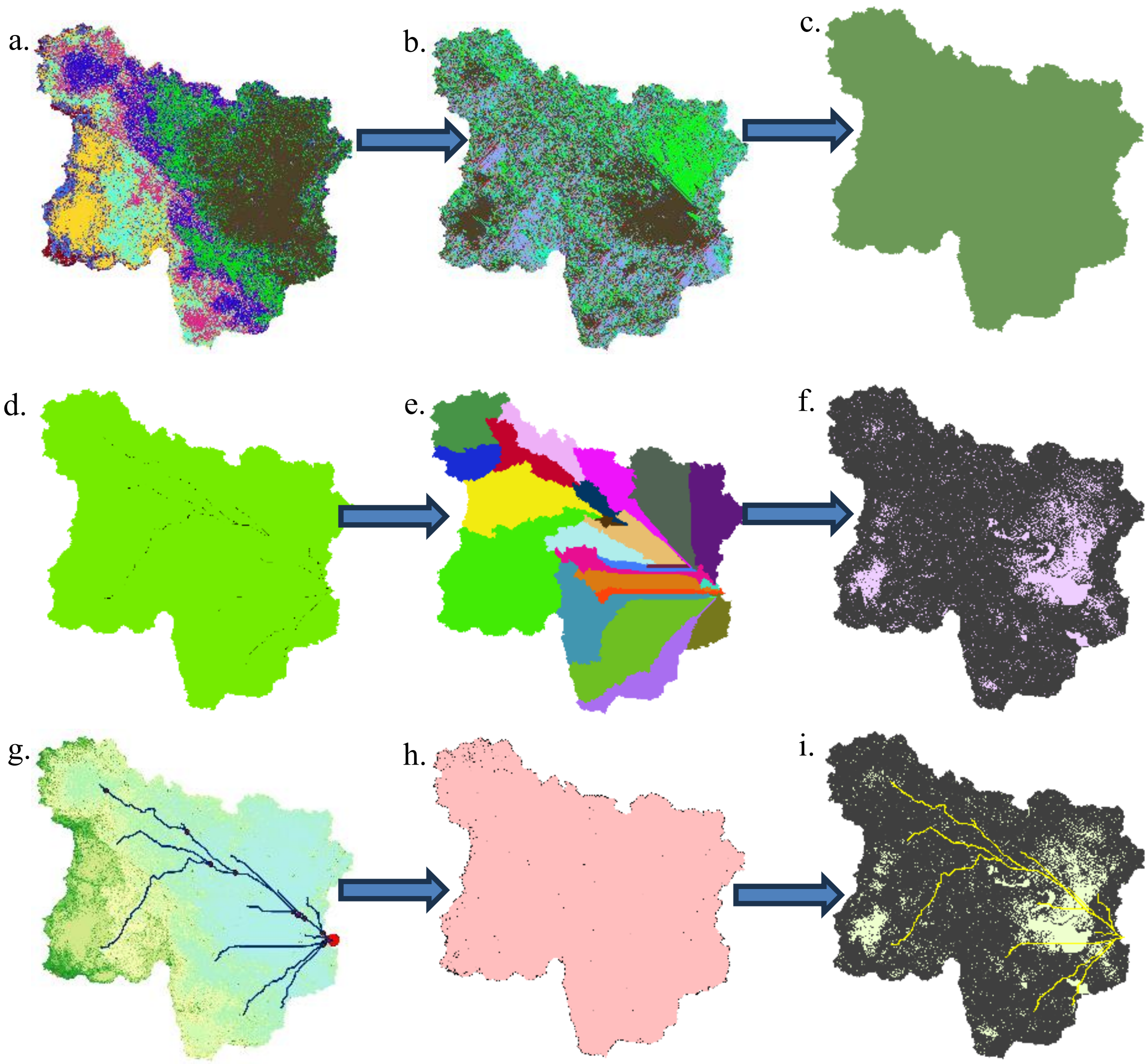


Figure 3. (a) Fill Sinks; (b) Flow direction; (c) Flow accumulation; (d) Stream Definition, Stream Segmentation (e) Catchment Grid Delineation (f) Catchment polygon processing (g) Drainage line (h) Adjoint catchment Processing (i) Drainage point, Batch watershed generation

### Features of Sub-Watersheds' Morphology

The HEC-GeoHMS sub-watersheds project setup menu determines the sub-watersheds' area, perimeter, longest flow path, concentration time, and storage coefficient, among other attributes. This facilitates the process of extracting river slopes, length, and elevations upstream and downstream in basins and streams, in addition to the copying of all terrain preprocessing data to the HEC-HMS project. The HEC-GeoHMS model processing is used for estimation the hydrologic characteristics, including the time of concentration beginning values, percentage impervious area, and curve numbers are estimated. The main physical attributes of sub-basins that can help extract are the longest flow path, basin centroid, centroid elevation, centroidal longest flow lengths, and basin slopes (Tassew et al., 2019). Figure 4. Shown is the HEC-GeoHMS model processing after complete Arc Hydro tools processing.

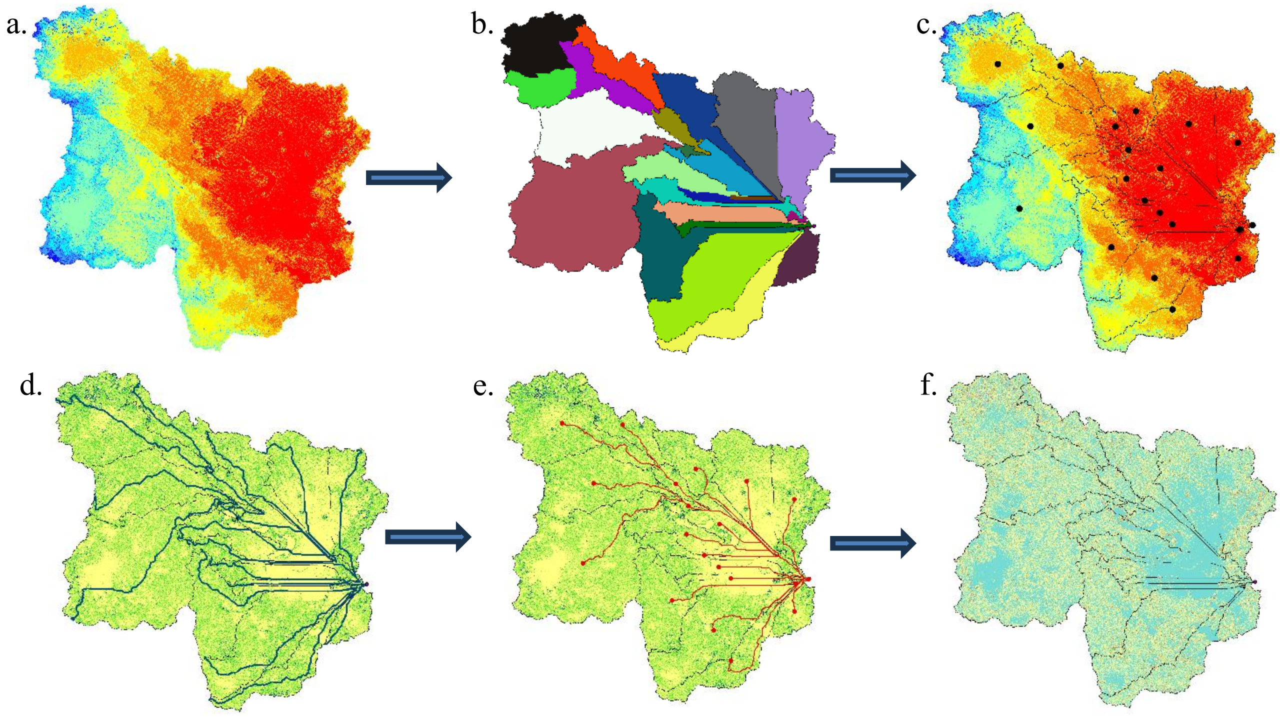


Figure 4. HEC-GeoHMS model processing (a) digital elevation model (b) sub-basins (c) longest flow path (d) basin centroid (e) centroidal longest flow lengths (f) basin slopes

**Land Use Map**

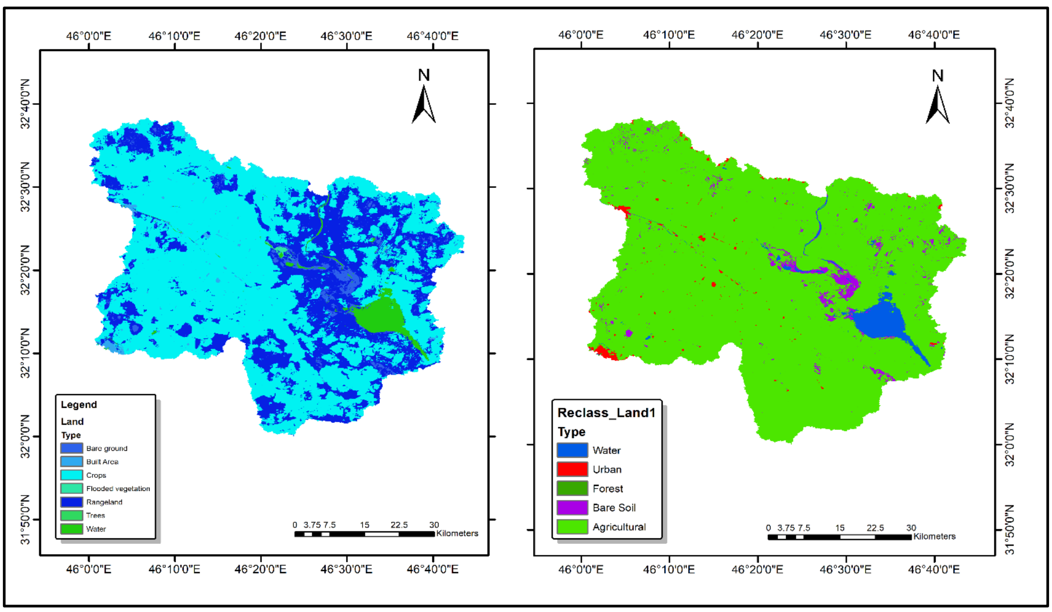


Figure 5. Reclassified watershed region land use map

Using ESRI data from 2019–2020, which corresponds to the flood study period, a 10 m-resolution land use map was generated, encompassing the whole watershed. Using the "Reclassify tool" from the Arc Toolbox's spatial analyst tools, the grid legend was reclassified to a common category legend. As presented in Figure 5, the watershed's identified land uses are water, urban regions, forest, bare soil, and agriculture.

**Soil Data Processing**

The classification of hydrologic soil groups (HSGs) is identified based on the lowest rate of infiltration that bare soil can produce after increased wetness. Runoff curve values are calculated using the HSGs (A, B, C, and D) as one component. The four organizations listed below were formed by SCS soil scientists. The FAO worldwide soil grid was downloaded for this study, and the relevant shapefile for the study region was utilized to derive the soil data raster. After this raster was converted to the proper coordinate system of UTM zone 38, it was then converted into polygons using the suitable Arc Toolbox tool. The watershed's soil grid processing details are displayed in Figure 6.

Table 3. Surface definitions of the hydrologic soil group (HSG) (Hamza et al., 2007)

| Group | Description |
|---|---|
| A | well-drained and deep. mostly gravels and sands. soils with greater rates of infiltration. |
| B | well-drained, relatively deep, and characterized by textures that range from fine to coarse. a moderate rate of infiltration in the soils. |
| C | shallow sandy loam and clay loam. The rate of water conveyance in these soils is modest. |
| D | clay soils that, when completely wet, swell considerably. Soils have a significant propensity for runoff and a very slow rate of infiltration. |

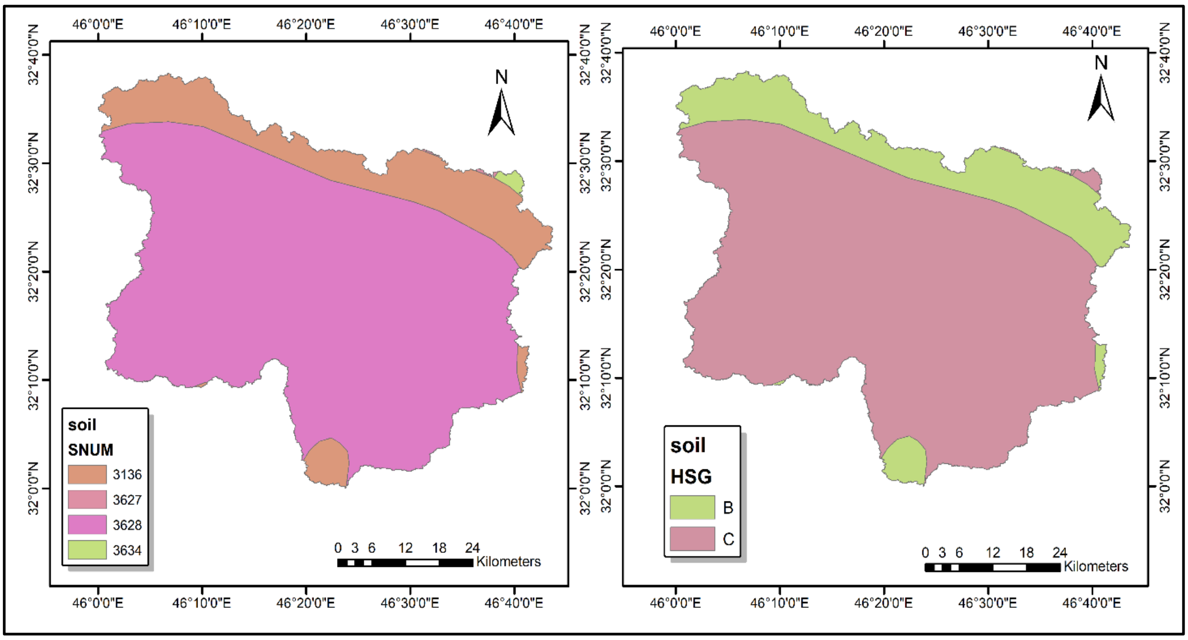


Figure 6. Soil grid

HWSD Viewer offers a variety of soil properties for depths up to one meter. This allows the soil grid's attribute table to provide a lot of defined fields that appear in the viewer and offer important soil information. These fields contained the soil's pH values as well as the proportions of clay, silt, sand, and gravel. Additionally, the soil unit's name, dominant soil group, type, texture, and other details (Abraham et al., 2019).

**Curve Number Generation and Calculation**

The CN is created in ArcGIS by integrating the land use, soil, CN table, and the basin's DEM. ArcGIS determines the CN by applying the characteristics of union processing to one of the land and hydrological soil categories. The CN table that contains values of the curves for different combinations of land uses and soil hydrologic groups is constructed based on the SCS TR55 report from 1986. Figure 7 depicted different ways conducted for CN grid producing.

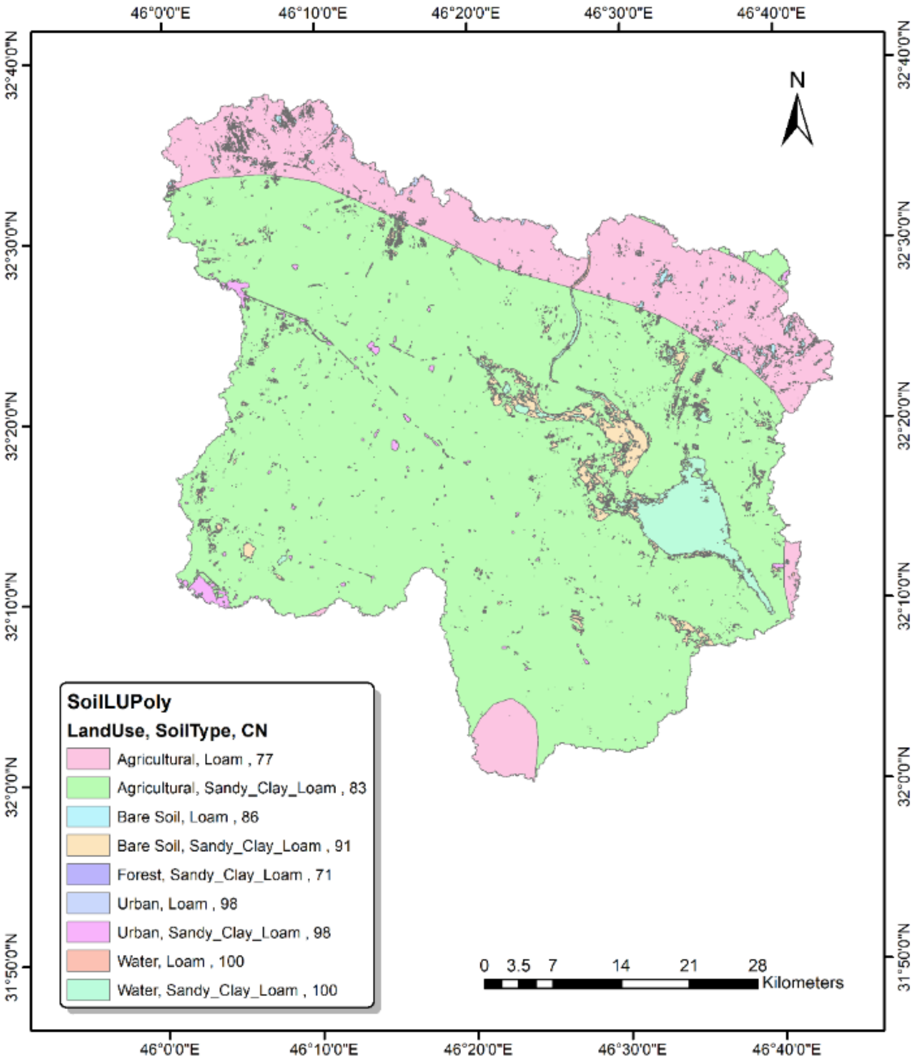

Figure 7. The watershed characteristics grid

The SCS curve number approach was based on an empirical equation that assesses land use and soil type (SCS, 1972). The empirical equation that follows is used by the SCS-CN model to estimate runoff (Cai et al., 2020; Muneer et al., 2020; Psomiadis et al., 2020):

$$Q = \frac{(P - Ia)^2}{(P - Ia + S)} \qquad \dots (1)$$

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

$$S = \frac{25400}{CN} - 254 \qquad \dots (3)$$

$$CN = \frac{25400}{S + 254} \qquad \dots (4)$$

Where P is the rainfall, I is the initial abstraction, S is the potential maximum retention, and Q is the runoff depth. LULC, soil type, antecedent moisture, and even slope are all taken into account in this formulation. This modeling study describes the watershed soil and land use factors using the CN, which is applied for the determination of rainfall surplus in the HEC-HMS. The soil's hydrological group, land use, and beginning moisture conditions all affect the CN values, which range from 100 to 71, see Figure 8.

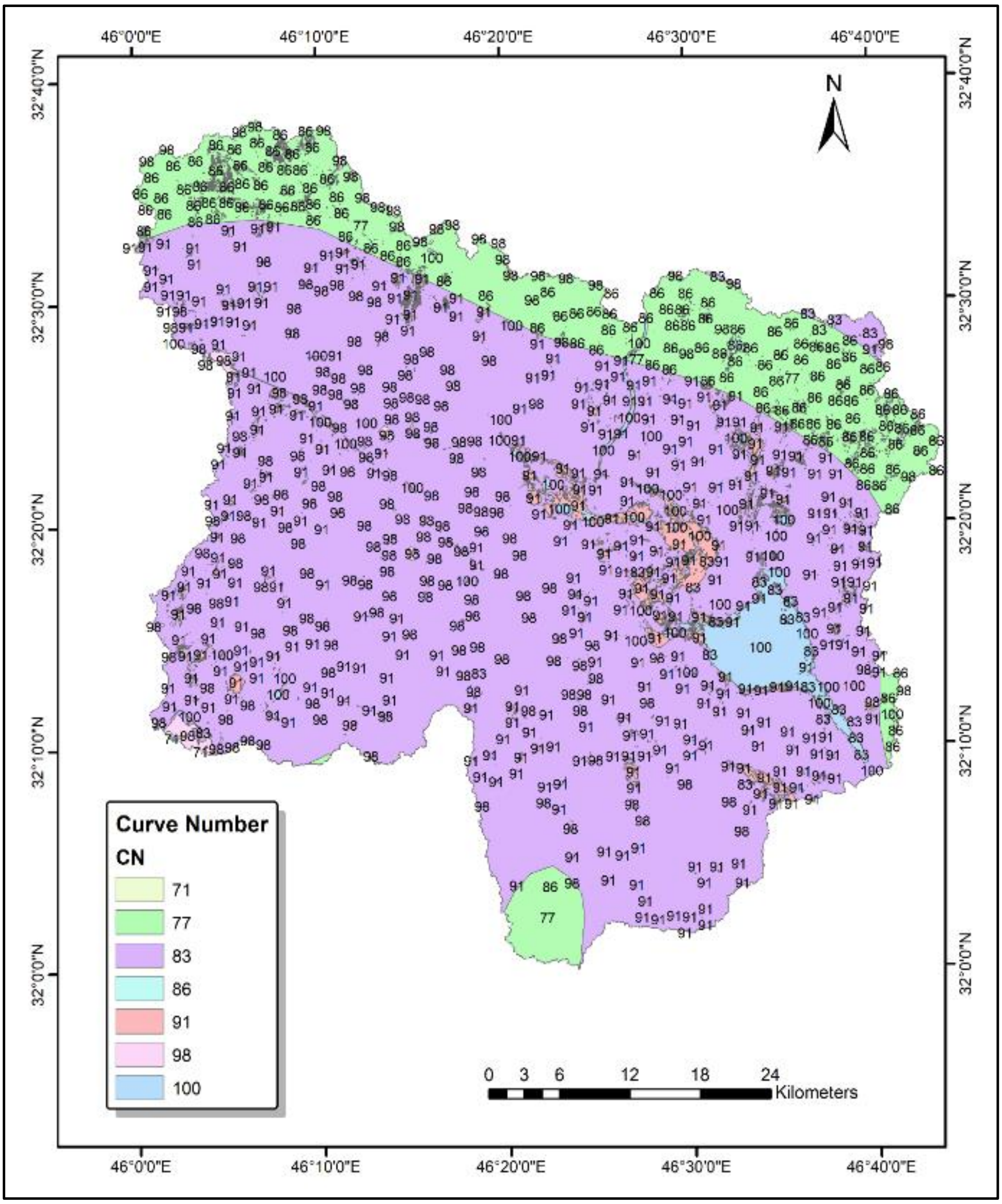


Figure 8. CN Map

## Results and Discussion

According to this study, the watershed's CN values range from 71 to 100, with moderately high to extremely high values falling within this range. Higher CN values in this range indicate places with shallow vegetation cover up to the bare area, residential area, and submerged lands with water, while lower CN values in this range indicate forest lands with a fairly low, thick plant cover. The land use/cover classes in the watershed and the types of soil are two factors that need to be presented to make sense of these high CN intervals. These characteristics also significantly affect the CN values. This watershed included five land use/land cover classes: water, urban areas, forests, bare soil, and agriculture.

Consequently, Table 2 records the percentage distributions of each classified location, where 94.05% of the watershed area was covered by the major class of land use/cover, which is agricultural and includes crops, flooded vegetation, and rangeland. The second major class was water, which makes up 2.64% of the watershed area. The rest 3.315% of the watershed area contributes to the other land use/land cover classes. The researcher who conducted his analysis in the same area as our study (Ali et al., 2023) came to the same conclusions regarding land use/land cover.

Table 2. The land use/cover area in the study Watershed

| No. | Type | Percentage (%) |
|---|---|---|
| 1 | Agricultural | 94.05% |
| 2 | Water | 2.64% |
| 3 | Bare Soil | 2.54% |
| 4 | Urban | 0.77% |
| 5 | Forest | 0.01% |

This study clearly shows that the use of RS data, GIS, and HEC-GeoHMS creates a very robust, straightforward, focused, and known system for the evaluation of the CN grid; otherwise, it appears to be extremely hard to make development despite following this methodical procedure because of the simulated absence of necessary data. The type of soil is the other crucial element. The corresponding hydrological soil groups according to the USDA classification are group "B," which has an infiltration of (3.8 – 7.6) mm/hr, and group "C," which has a final infiltration limit of (1.3 – 3.8) mm/hr (Bhattacharjee & Das, 2018). This is because the dominant soil types were the loam soil texture, which makes up about 8.44% of the watershed area, and the sandy clay loam soil texture, which makes up about 91.56% of the watershed area (Mohammadi, 2023). The same results were achieved for the type of soil in our study by the researcher, ( Ali et al., 2023) who carried out his investigation in the same area.

In addition to the aforementioned explanation, it should be noted that approximately 94.05% of the watershed's land is covered by rangeland, flooded vegetation, and crops. This results in poor soil water absorption for crop growth requirements, which raises the watershed's possible runoff limits. The created CN map displays two primary values as a result of the aforementioned. With roughly 94.05% of the entire watershed area falling within the agricultural lands class, the CN's first major value is equal to 77. The water class that makes up around 2.64% of the entire watershed area is represented by the second main value of the CN, which is equal to 100.

This study clearly shows that the use of RS data, GIS, and HEC-GeoHMS creates a very robust, straightforward, focused, and predictable system for the evaluation of the CN grid; otherwise, it appears to be very difficult to make progress without following this methodical procedure because of the experimental lack of necessary data.

## Conclusion

The process of creating a CN map for any watershed utilizing RS data, ArcGIS, and HEC-GeoHMS is a very efficient method that is easy to use and produces results that are extremely accurate. It may be used with time, effort, and cost-saving ideas. The watershed's primary soil type and land use/cover classes have an impact on its moderately high to high CN, which ranges from 71 to 100. In medium-sized residential areas, the expected CN value ratios were 71-80 (high runoff and low infiltration rates), 81-90, and 91-100 (low runoff and high infiltration rates), which were, respectively, 1.44%, 35.08%, and 63.48%. Due to the impacts of the watershed's predominant soil type and land use/cover classifications, loamy soil and sandy clay loam soil are the two most common forms of soil, accounting for 31.68% and 68.32% of the total soil, respectively. This information is crucial for rainfall-runoff modeling, which uses the SCS-CN technique to forecast runoff parameters and maximum discharge. 94.05% of the watershed area is made up of agricultural lands (crops, flooded vegetation, and rangeland), making it the largest land use/land cover class. The water class, which accounts for about 2.64% of the watershed area's water, is the second largest class. According to this study, the CN grids from the FAO and USGS are a suitable method to study the flood that occurred in 2019 for the period from 1 March to 31 May.

## Scientific Ethics Declaration

* The authors declares that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors

## Conflict of Interest

* The authors declare that they have no conflicts of interest

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## References

Abdul Wahab, F. A. J., & Al-Abadi, A. M. (2025). Annual groundwater recharge estimation in Nineveh Plain, Northern Iraq using Chloride Mass Balance “CMB” method. *Misan Journal for Academic Studies*, *38*,1-14.

Abraham, S., Huynh, C., & Vu, H. (2020). Classification of soils into hydrologic groups using machine learning. *Data, 5*(1), 2.

Ahmed, I. D., & Fattah Sheikh Suleimany, J. M. (2023). Preparation of curve number grid map of Rawanduz River Basin in KRI using GIS techniques. *Polytechnic Journal, 12*(2), 129–135.

Ajmal, M., Waseem, M., Kim, D., & Kim, T.-W. (2020). A pragmatic slope-adjusted curve number model to reduce uncertainty in predicting flood runoff from steep watersheds. *Water, 12*(5), 1406.

Al-Ghobari, H., & Dewidar, A. Z. (2021). Integrating GIS-based MCDA techniques and the SCS-CN method for identifying potential zones for rainwater harvesting in a semi-arid area. *Water, 13*(5), 702.

Ali, A. A., Al-Abbadi, A. M., Jabbar, F. K., Alzahrani, H., & Hamad, S. (2023). Predicting soil erosion rate at transboundary sub-watersheds in Ali Al-Gharbi, Southern Iraq, using a RUSLE-based GIS model. *Sustainability, 15*(3), 2357.

Al-Mukhtar, M., & Al-Yaseen, F. (2019). Modeling water quality parameters using data-driven models: A case study of Abu-Ziriq Marsh in Southern Iraq. *Hydrology, 6*(1), 24.

Al-Taei, A. I., Alesheikh, A. A., & Darvishi Boloorani, A. (2023). Land use/land cover change analysis using multi-temporal remote sensing data: A case study of the Tigris and Euphrates river basins. *Land, 12*(5), 1017.

Alzghoul, M., & Al-Husban, Y. (2021). Estimation of runoff by applying the SCS curve number method in a complex arid area: Wadi Al-Mujib watershed. *Human and Social Sciences, 48*(1), 1–16.

Aziz, S. F., Abdulrahman, K. Z., Ali, S. S., & Karakouzian, M. (2023). Water harvesting in the Garmian region (Iraq) using GIS and remote sensing. *Water, 15*(3), 520.

Borgohain, A., Khajuria, V., Garg, V., Koti, S. R., & Bhardwaj, A. (2023). Comparison of geomorphological parameters detected using MERIT and FABDEM products. In *Proceedings of ECWS-7 2023* (pp. 59–66).

Cai, D., Ge, Q., Wang, X., Liu, B., Goudie, A. S., & Hu, S. (2020). Contributions of ecological programs to vegetation restoration in arid and semiarid China. *Environmental Research Letters, 15*(11), 114046.

Dahal, D., & Kojima, T. (2025). Evaluating the performance of hydrological models for flood simulation in the Wangchu River Basin, Bhutan. *Preprints*.

Gebremichael, S. G., Yismaw, E., Tsegaw, B. D., & Shibeshi, A. D. (2021). Determinants of water source use, quality of water, sanitation and hygiene perceptions among urban households in North-West Ethiopia. *PLoS ONE, 16*(4), e0249942.

Haile, T., Goitom, H., Degu, A. M., Grum, B., & Abebe, B. A. (2024). Simulation of urban flood inundation from a potential dam break: The case of Midimar Embankment Dam, Northern Ethiopia. *Sustainable Water Resources Management, 10*(2), 46.

Hamdan, A. N. A., Almuktar, S., & Scholz, M. (2021). Rainfall-runoff modeling using the HEC-HMS model for the Al-Adhaim River Catchment, Northern Iraq. *Hydrology, 8*(2), 58.

Hamza, M. H., Added, A., Rodríguez, R., Abdeljaoued, S., & Ben Mammou, A. (2007). A GIS-based DRASTIC vulnerability and net recharge reassessment in a semi-arid aquifer. *Journal of Environmental Management, 84*(1), 12–19.

Ibrahim-Bathis, K., & Ahmed, S. A. (2016). Rainfall-runoff modelling of Doddahalla watershed using HEC-HMS and SCS-CN. *Arabian Journal of Geosciences, 9*(3), 170.

International Organization for Migration. (2022). *Migration, environment, and climate change in Iraq*. IOM.

Jasim, A. K., & Walli, H. A. (2023). Bivariate map of zinc pollutant (Zn) in Sea Al-Najaf via GIS. *IOP Conference Series: Earth and Environmental Science, 1215*(1), 012034.

Kennedy, M. (2009). *Introducing geographic information systems with ArcGIS: A workbook approach*. John Wiley & Sons.

Maidment, D. R. (Ed.). (2002). *Arc Hydro: GIS for water resources*. ESRI Press.

Mohammadi, B. (2023). Modeling various drought time scales via a merged artificial neural network with a firefly algorithm. *Hydrology, 10*(3), 58.

Msaddek, M., Kimbowa, G., & Garouani, A. E. (2020). Hydrological modeling of Upper Oum Er-Rabia Basin using HEC-HMS. *Computational Water, Energy, and Environmental Engineering, 9*(4), 159–184.

Psomiadis, E., Soulis, K. X., & Efthimiou, N. (2020). Using SCS-CN and earth observation for assessing hydrological effects of land cover changes. *Water, 12*(5), 1386.

Soulis, K. X. (2021). Soil conservation service curve number (SCS-CN) method: Current applications and future perspectives. *Water, 13*(2), 143.

Yu, X., & Zhang, J. (2023). Applicability of the HEC-HMS model for flood simulation under basin urbanization. *Water, 15*(12), 2249.

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