Research Article Impact Factor: 4.226 ISSN: 2319-507X
Viraj Pandya, IJPRET, 2019; Volume 7 (6): 194-198 IJPRET

INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

SPECIAL ISSUE FOR
2nd NATIONAL CONFERENCE ON
"Recent Trends and Development in Civil Engineering"

CURVE NUMBER BASED WATERSHED MODEL: A REVIEW

VIRAJ PANDYA[1], PUSHPRAJSINH SISODIYA[1], JAYPALSINH VAGHELA[1], DHARMIK PRAJAPATI[1], KAUSHAL RAVAL[2]

1. U.G student, civil engineering department, SVBIT, Vasan, Gujrat-382650 Dist. Gandhinagar, Vasan, Gujarat- 382650.
2. Assistant Professor, civil engineering department, SVBIT, Vasan, Gujrat-382650 Dist. Gandhinagar, Vasan, Gujarat- 382650

Accepted Date: 22/12/2018; Published Date: 01/02/2019

Abstract: Wet mountainous watersheds are characterized by variable source area runoff, the runoff generated from surface saturated source areas being the prominent component in most cases. However, often subsurface stormflow, generated by various different mechanisms, also contributes significantly to stream quick flow. The model presented in the present study has been developed to simulate runoff processes in such watersheds, considered to have two quick flow and a delayed flow components. The lumped watershed model used has been developed in stages, starting from the curve-number method, by drawing inferences at every stage and changing the model structure in accordance with the inferences. The data on stream flow and rainfall from five catchments in the Western Ghat regions of Karnataka, in South India, have been used in the study. The simulations of the model have been interpreted to infer that the subsurface pipe flow component forms a very significant part of quick flow in the region. Ongoing development, user improvements and new applications of the curve number method are described. The basics of the methods are summarized and put in to prospective, and recent findings and enhancements are summarized.

Keywords Water, Rainfall, Runoff, Catchment Area, Planning, Erosion, Soil

Corresponding Author: VIRAJ PANDYA

Access Online On:
www.ijpret.com

How to Cite This Article:
Viraj Pandya, IJPRET, 2019; Volume 7 (6): 194-198

PAPER-QR CODE

INTRODUCTION

As essentially the only member of its genre, and as an openly available rainfall-runoff method with auspicious agency origins and a long history of prior use, the curve number method is applied in an off-the-shelf fashion to perform to a variety of roles in surface water hydrology. Since its origin as an agency method in the mid 1950s, it has evolved via testing with field data, application adjustments, insights, and institutional alterations to the method, leading to a more credible representation of rainfall-runoff hydrology. Although often being found lacking in form, function and parameters it continues to be widely used, and with apparently satisfied users. This continued use of the method occurs is driven by the inertia of prior use, convenience, authoritative agency origins, and lack of suitable alternatives. [1]

Watersheds are so very important that there are companies and agencies all over the country to help take care and protect the watersheds. Many agencies work alongside with people involved in environmental protection and government officials. There are also many jobs that can be found to help take data entries and collect samples to keep track of the watershed health.[1]

A watershed is the area of land where all of the water that falls in it and drains off of it goes into the same place or common outlet. A watershed is also defined by topographic divides between two or more adjacent catchment basins, such as a ridge or a crest.[1]

Why watershed important

The surface water features and storm water runoff within a watershed ultimately drain to other bodies of water so watershed is important. It is essential to consider these downstream impacts when initial and implementing water quality protection and restoration actions. Unfortunately various forms of pollution, including runoff and erosion, can interfere with the health of the watershed.[2]

Therefore, it is important to protect the quality of our watershed. Watersheds sustain life, in more ways than one. According to the Environmental Protection Agency, more than $450 billion in foods, fibers, manufactured goods and tourism depend on clean, healthy watersheds. That is why proper watershed protection is necessary to you and your community. Earth is covered in 70% water and unfortunately 40-50% of our nation's waters are impaired or threatened. "Impaired" means that the water body does not support one or more of its intended uses.[2]

This could mean that the water is not suitable to drink, swim in or to consume the fish that was caught there. The leading causes of pollution in our waterways are sediments, bacteria (such as Coli) and excess nutrients (such as nitrogen and phosphorus). Although nutrients sound like things that belong in a healthy environment, they can cause big problems in a poorly managed watershed.[2]

For instance, sediment can suffocate fish by clogging their gills and the presence of bacteria alone can indicate that other viruses and germs can be found in the water as well. Erosion, runoff of animal waste and overflowing of combined sewers are just a few ways these pollutants reach our waters.[2]

LITERATURE REVIEW

M. Kh. Askar(2014) say that This research aims to determine the runoff depth using the Soil Conservation Service Curve Number (SCS-CN) method with Geographic Information Technique (GIS). A rainfall-runoff model is a mathematical model describing the rainfall-runoff relations of a catchment area, drainage basin or watershed. Remote sensing technology can augment the conventional methods to a great extent in rainfall-runoff studies. The role of remote sensing in runoff calculation is generally to provide a source of input data or as an aid for estimating equation coefficients and model parameters. The study was carried out in the Gomal River watershed about 540 km2 catchment areas, Latitude: 36.5155556°, Longitude: 43.5144444°. The area within the boundary of the Kurdistan region starts from north of Shahia to south west of Dohuk City. A SCS-CN method was applied for estimating the runoff depth in the semi-arid Gomal watershed. Hydrologic stream flow, soil group, slopes and land use maps were generated in a GIS environment. The curve number method was used to estimate the runoff depth for selected storm events in the watershed. Effect of slope on CN values and runoff depth was determined by using the WMS 7.1 program. The max rainfall depth with different return period was calculated and the mean annual rainfall depth for the year 1947 to 2005 of Mosul metrological station was used to calculate the runoff depth of the catchment area. The results of the WMS 7.1 program showed that the CN curve number for the area is about 80. The average annual runoff depth is equal to 311.14 mm Keywords: remote sensing, geographical information systems, watershed, SCSCN rainfall-runoff modelling, WMS 7.1 program.[3]

Richard H. at all (2009) say that Ongoing development, user improvements, and new applications of the Curve Number method are described. The basics of the method are summarized and put into perspective, and recent findings and enhancements are summarized. Major issues of recent concern and attention are the initial abstraction ratio, Ia/S (or λ); land slope effects on CN; parameterization from field data; the use of small plot and infiltration data; aligning the CN method with process-based models; concern for the use of CNs with some forested watersheds; and departures from the original method. Based on this information, suggested topics for research, development, and investigation in rainfall-runoff processes-centered around CN procedures – are offered. [4]

Ashish Bansode(2014) say about Rainfall and runoff are important components contributing significantly to the hydrological cycle, design of hydrological structures and morphology of the drainage system. Estimation of the same is carried out to determine and forecast its effects. Estimation of direct rainfall-runoff is always efficient but is not possible for most of the location in desired time. Use of remote sensing and GIS technology can be useful to overcome the problem in conventional methods for estimating runoff. In this paper, modified Soil Conservation System (SCS) CN method is used for runoff estimation that considers parameter like slope, vegetation cover, area of watershed. [5]

P.N.Tandon(2014) say that The rainfall runoff is one of the most frequently used events in hydrology. Numerous methods have been developed by different researchers to simulate the rainfall runoff process. Firstly, a relationship between direct runoff and the mean a real rainfall was developed and validated using statistical model. Understanding the basic relationships between rainfall, runoff and soil loss are studied for effective management and utilization of water resources and soil conservation planning. Curve Number (CN) method is also a widely used method for estimating infiltration characteristics of the watershed, based on the land use property and soil property. In this paper, five methods of rainfall runoff relationship has been studied for the Morbe dam catchment watershed apart from which suggested to use curve number method or Inglis method by changing factor used. The rainfall and runoff data ranging from year 1958 to 2011 had been utilized for detail analysis. This study investigated the response of stream flow to rainfall on gauged, small watersheds of the Morbe dam watershed project using methods to estimate runoff. Even calibrated curve numbers contain large uncertainties, thus requiring statistical proof that estimated runoff adequately agrees with observations. Estimation of the runoff is required in order to determine and forecast its effects. [6]

David C. Garen at all (2005) say Although the curve number method of the Natural Resources Conservation Service has been used as the foundation of the hydrology algorithms in many nonpoint source water quality models, there are significant problematic issues with the way it has been implemented and interpreted that are not generally recognized. This usage is based on misconceptions about the meaning of the runoff value that the method computes, which is a likely fundamental cause of uncertainty in subsequent erosion and pollutant loading predictions dependent on this value. As a result, there are some major limitations on the conclusions and decisions about the effects of management practices on water quality that can be supported with current nonpoint source water quality models. They also cannot supply the detailed quantitative and spatial information needed to address emerging issues. A key prerequisite for improving model predictions is to improve the hydrologic algorithms contained within them. The use of the curve number method is still appropriate for flood hydrograph engineering applications, but more physically based algorithms that simulate all streamflow generating processes are needed for nonpoint source water quality modeling. Spatially distributed hydrologic modeling has tremendous potential in achieving this goal.[7]

CONCLUSION

After review all the research papers with the help of different software like scs curver number method we calculate rain fall run-off and design the watershed model of particular area. To solve the problem related with water wastage.

REFERENCES

1. https://dep.wv.gov/WWE/watershed/Pages/watershed_management.aspx
2. http://www.mywatershedwatch.org/about-watersheds/why-are-watersheds-important/
3. Askar, M. Kh. "Rainfall-runoff model using the SCS-CN method and geographic information systems: a case study of Gomal River watershed." WIT Transactions on Ecology and the Environment 178 (2013): 159-170.
4. Woodward, Donald E., et al. "Runoff curve number method: examination of the initial abstraction ratio." World water & environmental resources congress 2003. 2003.
5. Ashish Bansode, K. A. Patil, "General review of rainfall-runoff modeling: model calibration, data assimilation, and uncertainty analysis." Hydrological modelling and the water cycle. Springer, Berlin, Heidelberg, 2009. 1-24.
6. P.N.Tandon, P.T. Nimbalkar "Runoff curve number method: examination of the initial abstraction ratio." World water & environmental resources congress 2003. 2003.
7. Garen, David C., and Daniel S. Moore. "CURVE NUMBER HYDROLOGY IN WATER QUALITY MODELING: USES, ABUSES, AND FUTURE DIRECTIONS 1." JAWRA Journal of the American Water Resources Association 41.2 (2005): 377-388.
8. Chunlu Liu, Yan Li, Jun Li. "Geographic information system-based assessment of mitigating flash-flood disaster from green roof systems", Computers, Environment and Urban Systems, 2017