Evaluation of the severity of flooding in sub basin of Ivar watershed

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Abstract: In watershed management, determine the severity of flooding trends and comparisons made be done to determine the priorities and policies is of paramount importance. Including critical issues in hydrological studies, the topic of flood and flooding in the area and therefore need to examine the maximum instantaneous flow rate of the river regime. In this study, in order to classify the area in terms of flooding the amount rain and snow in April and March, vegetation, soil hydrological groups the area and slope area factors, was considered. Then the total value with a coefficient based on the importance and impact of the flood for each of the hydrologic units have been estimated And thus severity of flooding in each sub basins became quantify And weight was given to each factor And based on the final score, the severity of flooding in basin categorized in five classes: very low, low, medium, high and very high. I'8, I10, I'3 and I'9, I'4 Sub basins have highest and lowest intensity of flooding respectively.
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1. Introduction

Including critical issues in hydrological studies, the topic of flood and flooding in the area and therefore the necessity of examine instantaneous peak flow of regime of the river.

Flood is natural disasters in the world that, causing huge losses each year. So that the serious problems in the way of economic development and prosperity has created, financial losses and casualties in many countries has created. According to the statistics over the last twenty years of the twentieth century flood is deadly natural disasters in the world. In During this period, more than any other disasters such as earthquakes, human capital and financial resources is destroyed by flood. Floods in Iran due to specific climate and topography, especially with inappropriate spatial and temporal distribution of precipitation, the most important threatening factor is human, capital and human resources that many physical and financial waste has led in recent years.

So that makes the destruction of bridges and roads, homes, cut power lines and communications, damage to agricultural land, industrial facilities and also has human migration (Avaran and et al., 2006). Due to the damage and major problems caused by floods pay attention to this phenomenon and the influencing factors is very important to. It is also important attention to this point that the formation of flood is complex, physical and climatic features such as area, rainfall and slope are effective in its formation that in calculating flood some of these factors are used in different ways.

Generally calculating flood using various return period with statistical of hydrometric stations and analyzing the statistics is done. But in the absence of the stations or with incomplete and short-term statistics, indirect methods used to estimate flood. In Iran because of this problem, using indirect methods to estimate discharge flood is important. One of these methods is using of empirical relations. This relationship based on one or more of the factors affecting the formation of flood which in the absence or lack of statistics used to estimate the peak of discharge flood. Using these relations because of ease of use, quick estimates and the application of the limiting factors, is justified and important. Generally study the results and identify factors contributing to the onset or exacerbation of flood damage and apply technical and management measures to reduce the risk or the amount of damages (Avarand 2006).

2. Materials and methods

Ivar watershed with an area of about 5,500 hectares, in North of Khorasan province, Jajrom city and within longitudes of 56°8′58′′to 56°15′53′′ and latitude of 36°58′3′′ to 37°4′26′′ (Asghari et al. 2016). The main occupation of the people of the region, agriculture, animal husbandry and carpet weavingn. In The Domarten climate classification, climate of the is dry. Minimum and maximum altitude is 1031 and 1603 meters, the annual average rainfall in

Ivor is 168 mm (Shojaei et al. 2016). The average annual temperature is 1/14, the average annual minimum temperature is 8/7, average annual maximum temperature is 1/22, absolute annual minimum is 1/8 in January and the absolute maximum annual is 1/40 ° C in the summer months. East winds Prevailing wind is 3/17 percent of the total amount.

In this study to evaluate the severity of flooding, first by using field survey and mapping base maps and different studies in field of flood and ARC GIS software was used to evaluate flooding in Ivar watershed. In order to assess the severity of flooding trends Each of the six factors for time of rainfall, accumulated snow depth, slope area, land, vegetation and the land form of area were divided into four groups according to their subject. Then the total value by a coefficient based on the importance and impact of the flood have been estimated for each of the hydrologic units Thus, the and intensity of flooding in sub basins be quantity and the sub basins are compared in terms of the severity of flooding.

3. Results

Time of Rainfall

In the cold months, rainfall with intensity in the study area are infrequent and cannot be combined with severe storms. And at the same time with warming the air (from mid-March onwards) due to the creation of appropriate conditions in the atmosphere, severe storms occur and consequently the severe flooding occurs. Due to the changes in these parameters in the Ivar Jajarm, the rain classification is as follows (Table 1).

Table 1. Soil hydrological groups to flooding

Permeability A class	7.5-11.5 mm/h	1score
Permeability B class	3.5-7.5mm/h	2score
Permeability C class	1.5-3.5mm/h	3score
Permeability D class	0.5-1.5mm/h	4score

Vegetation

The barren lands with sparse vegetation against the atmosphere Abscission have differently react over the lands which are covered with dense vegetation. Therefore with increasing of density vegetation the intensity of surface runoff that contributes to flooding will be decrease. The effect of vegetation on the flood, vegetation studies was used and numerical amount and scores of vegetation classification in accordance with the following table (Table 2).

Table 2. Vegetation classification for flooding

Canopy coverage percent	dance	More than50	1score
Canopy coverage percent	Semi-dance	Between 40-50	2score
Canopy coverage percent	Semi-sparse	Betwen30-40	3score
Canopy coverage percent	sparse	Less than30	4score

Form of basin effect on amount of runoff and particularly from of hydrograph. Whatever The area is stretched, concentration time is Further and thereby the time peak is longer. For investigating the effect Form of land on the amount of flooding of sub basins, Compactness coefficient was used that is calculated from cartography studies. The impact of these factors on the flood, compactness coefficient in sub basins has been classified as follows (Table 3):

Table 3. Compactness coefficientt for flooding

compactness coefficientt	Very close to rectangle	More than1.7	1score
compactness coefficientt	Close to rectangle	1.5-1.7	2score
compactness coefficientt	Very close to circle	1.2-1.5	3score
compactness coefficientt	Close to circle	1.1.2	4score

Coefficient of effective factors

Since the six factors examined in this study do not have the same effect in reducing or increasing floods and flooding on areas, affecting coefficient of the flood respectively the importance of these factors, Independent coefficient is considered by experts as follows (Table 4).

Table 4. Coefficient of of effective factors severity of flooding

factor	rainfall	Melting snow water equivalent	Slop area	vegetation	Land sex	landform
coefficient	3	2.2	2	2	1.7	1.5

Due to the amount of each of the above factors that result of adding scores by a co impact efficient The numerical value of severity of flooding calculated and results with above scores for each factor in Table 5 and flooding map is presented in Figure 1.

Table 5. Determine the severity of flooding in the area Ivar Jajarm

Sub basin	area	Hydrologic groups	Compact coefficient	Rainfall	snow	vegetation	Slop area	Total score	the severity of flooding
I'9	1/037	3/4	4/5	3/0	2/2	8/0	2/0	23/1	Very low
I'4	1/054	3/4	1/5	6/0	2/2	8/0	2/0	23/1	Very low
I'6	0/368	3/4	4/5	6/0	2/2	8/0	2/0	26/1	low
I11	1/854	3/4	1/5	9/0	4/4	8/0	2/0	28/3	middle
I1	2/068	3/7	1/5	9/0	4/4	8/0	2/0	28/6	middle
I'10	1/612	3/4	4/5	9/0	2/2	8/0	2/0	29/1	middle
I'1	0/097	3/4	1/5	9/0	6/6	8/0	2/0	30/5	middle
I7	5/358	4/1	1/5	9/0	6/6	8/0	2/5	31/7	middle
I3	2/946	4/0	1/5	9/0	6/6	8/0	2/6	31/7	middle
I6	1/904	3/4	3/0	9/0	6/6	8/0	2/0	32/0	high
I8	1/751	3/4	3/0	9/0	6/6	8/0	2/0	32/0	high
I2	7/799	3/8	4/5	9/0	4/4	8/0	2/4	32/0	high
I'5	0/028	3/4	6/0	9/0	4/4	8/0	2/0	32/8	high
I'2	1/716	3/4	1/5	12/0	6/6	8/0	2/0	33/5	high
I5	5/357	5/4	1/5	9/0	6/6	7/6	3/4	33/5	high
I'7	1/054	3/9	4/5	9/0	6/6	8/0	2/0	34/0	high
I4	5/139	4/0	4/5	9/0	6/6	8/0	2/9	35/0	high
I9	2/990	4/0	1/5	12/0	6/6	8/0	3/0	35/2	high
I'8	5/178	3/8	1/5	12/0	8/8	8/0	2/0	36/1	very high
I10	4/584	5/2	4/5	12/0	2/2	8/0	4/5	36/4	very high
I'3	1/106	3/4	3/0	12/0	8/8	8/0	2/0	37/2	very high

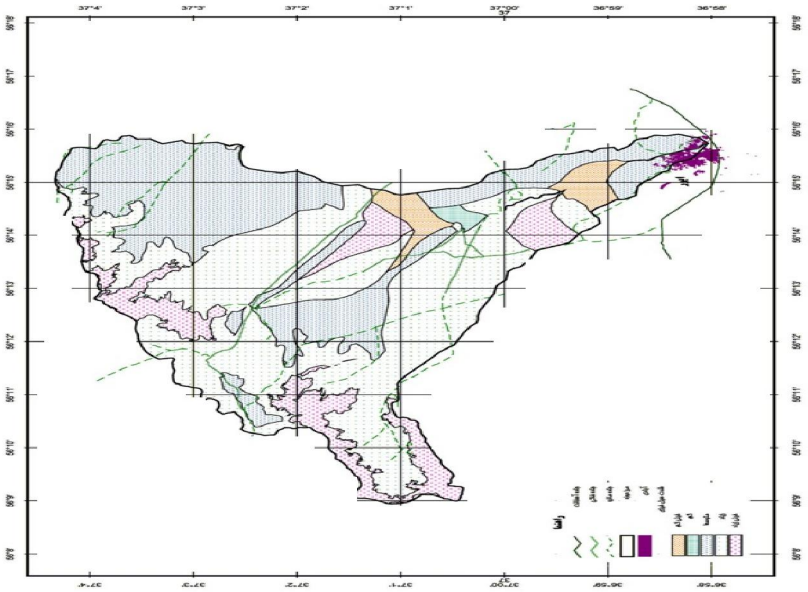

Figure 1. Flooding map in Ivar watershed

4. Conclusion

In the management of catchment areas to determine the severity of flooding trends and comparisons made in this regard in determining priorities and policy shall be done, is very important. Often classification in the sub-basins of the severity of flooding due to the features and characteristics of the study area with extent and higher slope and loss concentration time have more severity of flooding. In addition, numerous other factors are involved in the creation of floods. The factors are in two categories: natural factors such as slope and land form, drainage, soil and vegetation cover And the other human factors such as Excessive livestock grazing, land use change, construction of new buildings and manipulation river And obviously that a variety of factors, Definitively don't allow you to set a specific index for the severity of flooding in the region. In order to classify the area in terms of flooding factors such as the amount of rain and snow In April and March, vegetation, soil hydrological groups, land form and slope were considered and weight was given to each factor. And based on the final score, the basin in terms of the severity of flooding in five classes: very low, low, medium, high and very high categorized. Sub I'8, I10 and I'3 have the highest intensity of flooding and I'9 and I'4 sub basins have the lowest intensity of flooding.

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