

Int. J. Forest, Soil and Erosion, 2012 2 (4): 163-164

ISSN 2251-6387 [PRINT] 2251-824X [Online]

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Research Paper

**The Role of Plant cover (Forest) in decreasing runoff in North of Iran (Polrud basin)**

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Received: 2012-03-04

Accepted: 2012-03-28

**Abstract:** Plant cover in every zones, especially in mountainous area decrease the rate of surface runoff and caused to reduce soil erosion as well as infiltration and considerably decreased flood water destruction. This study evaluated the role of plant cover on reducing Max discharge in Khorasan Poshteh (Polrud basin) which situated in north of Iran , of one small forestry basin in an area about 2.535 km<sup>2</sup>. After evaluation physiological, geological , pedological and plant covers parameters, from totally 150 precipitation data and discharge collected in the study area , 41 precipitation which has suitable intensity and duration selected and used in linear regression, relation between rain intensity and special discharge with correlation coefficient being about 0.85. Analyzed information showed that in forestry basin concerning with 70 percent plant cover has highly effect on reducing Max discharge, runoff which derived from precipitation in a forestry unit calculated 45.2 percent and study showed that the highest factor on increasing the rate of discharge could be slope in the forestry area.

**Keywords:** Plant cover, Special discharge, Runoff, Physiological parameter

**Introduction**

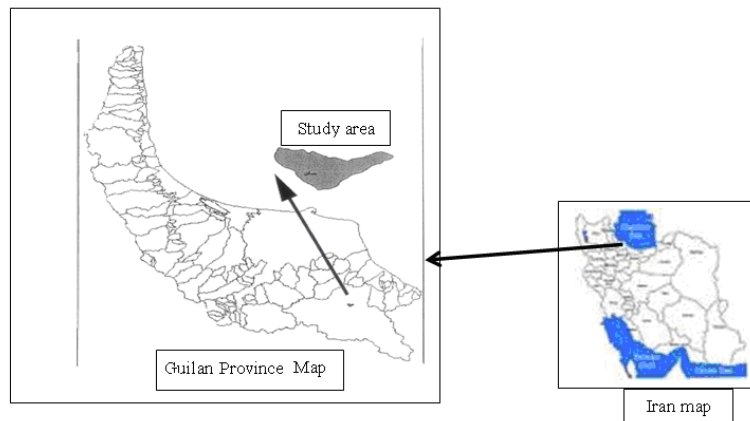
Vegetation reduces the rate of surface run-off and soil erosion in mountainous areas and caused more water infiltration into the soil, so vegetation has significant effect on the reduction of devastating floods. Studies have shown in Mashhad that with low vegetation increased congestion reaches the watershed discharge and surface run-off increased average 50 percent (Alizadeh 1975). Australian research has shown that coverage of grassy- wheat plants in watersheds and slope more than 10% can runoff coefficient reduces the amount of 75-81 percent (Solimani & Habibnejad, 2002). Amount of runoff in the basin Kasilian of Mazandaran over a period of 15-20 years, 10-15 percent has been reduced because to tree cutting (Sadeghi 1995). Research shows that rainfall in forested areas 1-5 percent higher than its surroundings. rain absorbed in the forest are 5.6 more than the agricultural lands and 40 more than the barren lands. Aghazamani J (1989). Research showed that the parameters of area, mean annual precipitation, elevation basins and drainage density have a pivotal role in the calculation of maximum discharges (Khojyni 1999).

The main purpose of implementing this project to evaluate the role of vegetation in preventing and reducing the flood peak for precipitation in the region with different frequency. Knowledge about the effective of vegetation is in reducing the flood (Khojyni 1999, Savoli, 1991).

**Materials and methods**

The study area is one of the sub-basin Polrud in north of Iran in the Rudsar city (Figure 1), Reserch area surface is about 2.353km<sup>2</sup> area and elevation (*min- max*) is of 980-1600m. Average annual precipitation is 346.8mm that maximum in November and lowest in June. Most precipitation is often as snow and in winter, the climate is of type mountain cold.

First reserch arae were selected a sub- basin in Polrud (North Iran) then using of rain gauge and limnograph for measurement of rain and discharge in zone. After evaluation physiological, geological parameters and collecting data measured of rain and discharge calculated max discharge from precipitation acceptable linear regression method. (Tables 1, 2)



**Figure 1.** The geographical position of Gilan state in Iran

**Table 1.** physiological Parameter studied basin (Polrud basin)

physiological Parameters	Value
Erea (km <sup>2</sup> )	2.535
Perimeter (km)	8.176
Main channel length (km)	3.5
Sub-channel length (km)	2.1
Total channel length (km)	5.6
Network congestion	2.2
Bifuration ratio	2.5
Average slope%	39
Form factor	6.6
Max height (m)	1600
Min height (m)	980

**Table 2.** Geomorphology Parameter studied basin (Polrud basin)

Geomorphological Characteristics	Value
Geravilios- coefficient	1.44
Horton- coefficient	0.207
Shyom- coefficient	0.513
Miler- coefficient	0.476
time of concentration (B&W) h	1.08
time of concentration (Kirpich) h	0.34
Drainage density (km/km <sup>2</sup> )	2.21



Figure 2. Forest of study area



Figure 3. Runoff measurement at the output of basin

### Results:

From total precipitation harvested in the region, 41 precipitations that has suitable intensity and duration selected then were considered and analyzed.

In this basin, timing and intensity of rainfall obtained as well as measure discharge rate and accounting special discharge as a result regression relation between rain intensity and special discharge with correlation coefficient being about ( $R^2=0.85$ ) obtained ( $Q=0.1236i-0.017$ ). (Figure 4)

Attentive with infiltration rate (0.27 cm/h) and slope 39 percent, in this basin discharge rate is low and 45.2 percent of the total rainfall in the basin as runoff will be out, and reminder in basin absorbed.

The average runoff volume ratio is 0.50 the coefficient of runoff changes for forest basin above was 96 percent achieved against.

### Discussion:

The existence of vegetation about 70 percent with shrubs, bushes and litter in the area reduced the effects of more rain and increased water infiltration and reduce flow has an average 45.2 percent of the total rainfall in this area as surface runoff will be out. Studies show that the average percentage of the total rainfall of forest land 57 percent is into surface water flow (Kyvard 1969). The other studies also show that the forest land to happen flood water less or may don't occur.

In this studies water way is low-water and dry often. At the time of rain is water flow has been slow to form and state of rebellion can not be seen, increasing and decreasing runoff is slow and consecutively.

This while descending value (rain, snow) in the forests is more means more descending in your keeping. Research in forest Haye France by the France researchers have shown that the amount of rainfall in the forest 20 percent higher than the rest of it is.

Comparative research conducted on surface water flow in forest lands and other lands have shown that over pasture and forest land, agricultural water use to water and annual water flow in the forest is more also forests can reduce the severity of floods in the rain and severe persistent. Forests reduce the melting snow.

Vegetation and humus in this basin is most effective reduced discharge and regulatory flood. If land-use changes in this region to continue as non-normative form of agriculture, excessive livestock grazing and creating a road network, as a result will reduce infiltration flood in the soil and increase runoff. Kadyr (1992) research confirms this.

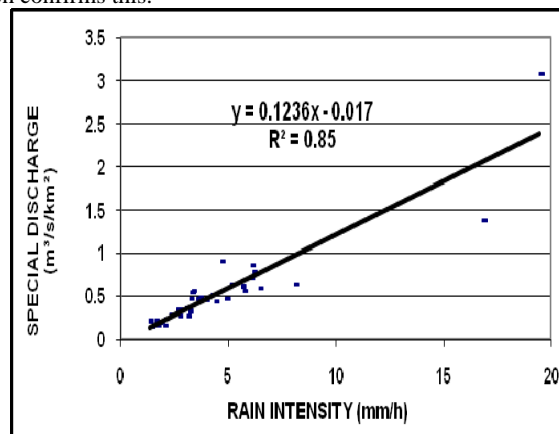


Figure 4. Comparison of rainfall intensity and special discharge in forest areas (Polrud basin)

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