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Hydrology of Various Land Use in Shangshe Catchments of Dabie Mountains,China

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1. Preface

The Yangtze basin is the home of 400 million people ,making it one of the most densely populated river basins on earth. It is also the most densely populated ten percent of Chinese territory that produces 70 percent of its agricultural and industrial product. With such a density population, the human pressure on the land is everywhere. Dabie mountain s of Anhui province, which lies in the middle of the Long River watershed in south east China, holds the area of 13808 km^2, 46 percent of which belonging to Yangtze River watershed and 54 percent belonging to Huaihe watershed, contributing a lots to middle Yangtze River and Huaihe River's flood and soil sediment . So researcher on discharge distribution of different land using types in Dabie Mountains is of special importance both to evaluate the amount of discharge and to guide the practice of Yangtze protective forest cultivation.

2. The research place

Experimental plot that holds an area of 5 km^2 lies in Shangshe village, Yuexi prefecture, Anhui province of Middle East China (figure 1). Belonging to subtropical monsoon climate, the variance of geographical distribution in temperature and precipitation is very small in the small village . It's average temperature is 14.6℃, lowest temperature -12℃,and it's highest temperature is 30℃.The annual sunshine time is more than 1200 hours, the average annual precipitation of which is 1400 millimeters, and it's non-frost season is 212 days. Soil in the catchments is mountainous yellow-brown earth developing from gneiss and its average effective depth is 60-100 millimeters. Forest coverage in the catchments is 69 percent. The main arbors are Pine, Chinese fir, bamboo and nut tree.

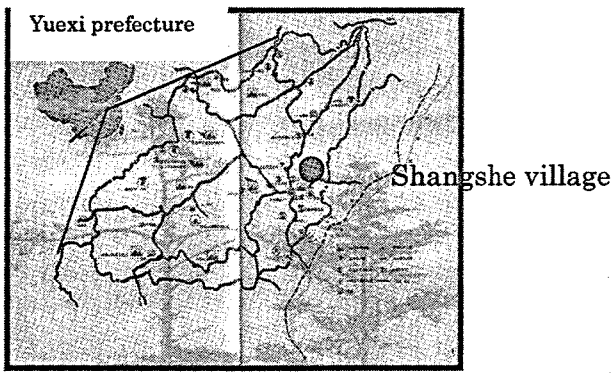


Figure 1 .Location of the Shangshe Catchments in Yuexi prefecture of china

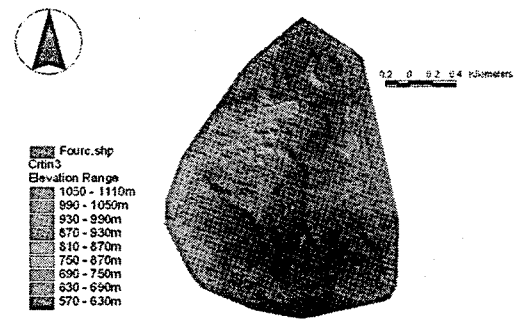


Figure .2 Distribution of the gauges

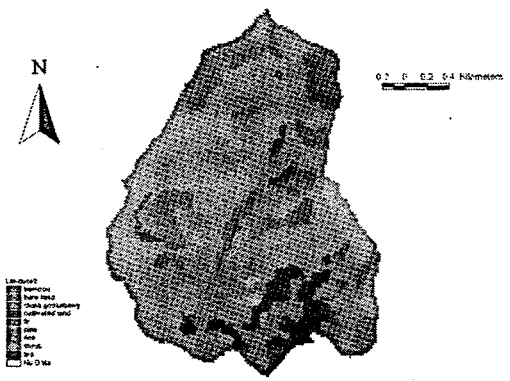


Figure .3 Land use distribution in the Shangshe catchments

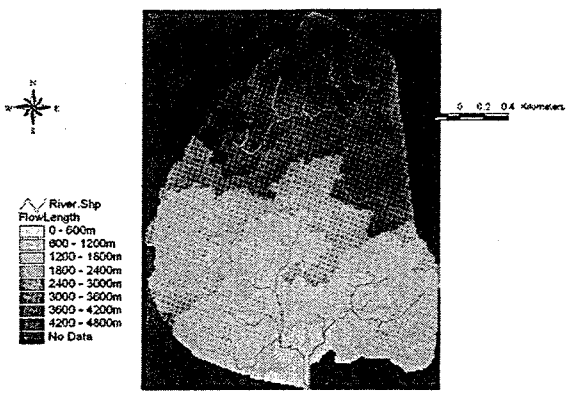


Figure .4 Flow length distribution in the catchments.

3. Materials and appliances

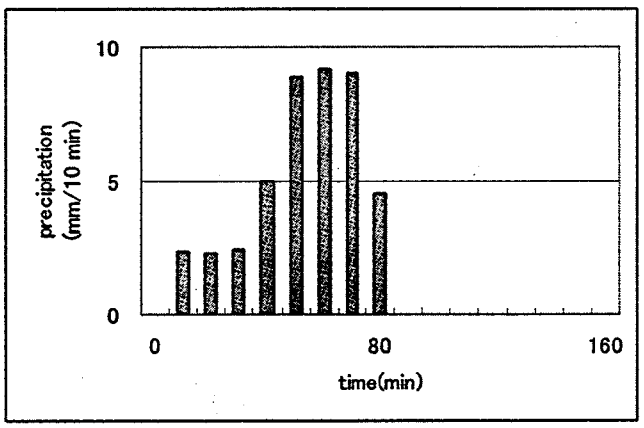
In the Shangshe catchments a rectangle weir equipped with a water level autographic appliance was built at the river outlet, four 45 degree triangle weirs were set up in typical pine forest, Chinese fir forest, cultivated land and tea garden water collecting area respectively (figure.2). With each weir a rain gauge and an autographic one were also put up to survey precipitation and rainfall intensity. For each rainfall that led to surface runoff, water samples were taken from each weir according to the variance of water level and time (10 min interval) to measure sand rate with an oven and electric scale. The area of each water collecting area is: 1,pine forest, 8600 m^2;2 , Chinese fir forest,8900 m^2;3,cultivated land 7600m^2; 4,tea garden 5900m^2;5,the river out let of Shangshe catchments which is 5.1 km^2 (figure.2).

4. Single rainfall hydrology of various land use in Shangshe catchments

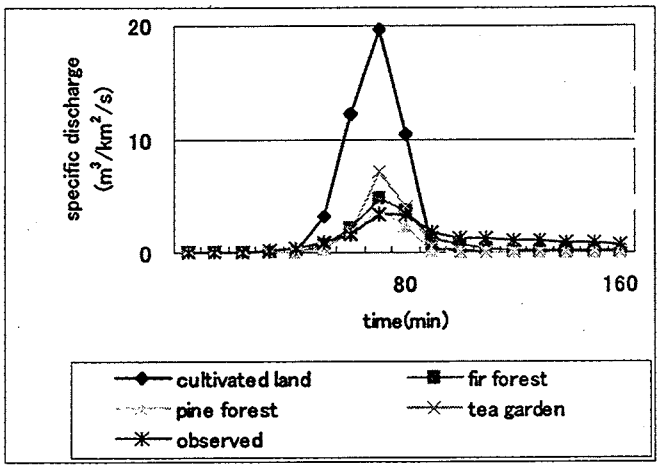
Figure 5 (b) shows the rainfall runoff response of various land use in the catchments, in which cultivated land shows highest peak specific discharge (20 $m^3/s/ km^2$); Figure 5 (d) shows the rainfall sediment discharge response of various land use in the catchments, in which cultivated land shows highest peak specific sediment discharge (1300 kg/s/ km^2); by dividing the catchments into various runoff flow length (Figure 4) , with the method of Unit hydrograph, Figure 5 (c) shows the simulated hydrograph at the river out let, calculated from the hydrograph of various land use, the land use distribution and the flow length distribution.

5. Conclusion

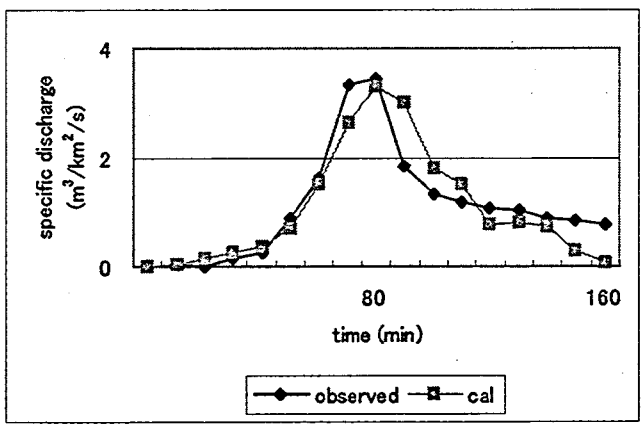
The percentage of sediment discharge from the cultivated land was very high in this area. The specific discharge from cultivated land was also high, but the specific discharge from the tea garden, the fir forest and the pine forest shows about 20 - 40 percent of that of the cultivated land. The simulated total hydrograph that was calculated by using land use distribution and the observed hydrograph of each land use, showed good agreement with observed hydrograph at the river outlet.



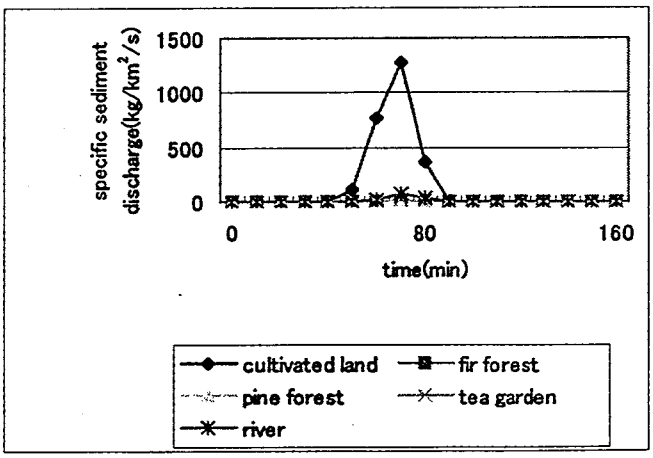
(a) Precipitation



(b) Specific discharge of various land use



(c) specific discharge observed at the river outlet compared with calculated



(d) specific discharge observed of various land use

Figure 5 Single event hydrology of various land use in Shangshe catchments on 22th,June 2000.