Wet and Dry Periods and its Effects on Water Resources Changes in Bouin Plain

Introduction

In last two recent centuries, by industry development and quick increasing of population, restraining waters to make under the control waters that are evicted without use, was noticed and conclusion of this notice is quick developing of dam construction science. In recent years, especially in developed countries that huge part of surface waters is restrain there, they resulted that best way to struggle with water crisis is optimum water using and preventing of polluting water. It's clear that water crisis emerges more in years that drought happened and one of the result of drought is minimizing of rivers water level. With environment, minimizing of rivers water level make pollution density to increase and as result make oxygen solution to decrease that its consequences are fish and other marine's death and damaging rivers environment strongly.

Hence, knowing of watering potential and hydrologic condition of upstream watershed, for desire using of these sources and predicting of wetness and drought period and knowing of water sources changing in watershed to remove their problemsare necessary. In this case of study, effects of these periods in changing of basin water's sources is determined by determining drought and wetness periods.

Iranians were first people who invented Subterranean to compensate dehydration approximately 3500 years ago. Study of waters has been noticing in Iran since ancient times and prominent example of that is dam construction and different lines in direction of rivers water. Brat expressed rain as sources of groundwater in seventeenth centuries (1608-1680) and after that the relation of rainfall and level of groundwater reservoir was studied more accurate.

In field of drought's effect on groundwater in Iran, variety studies have been done, Maleki (1996), Khoshakhlagh (1997), Alikhani (1999) and Farajzadeh (1999) each one after doing researches, mentioned to maintain, water protecting and optimum management of water sources (Biabanaki,2004) in other investigations, it's determined that rainfall is main scale of drought meteorology (Gibbs et al and Palmer, 1967) and waterway's flow is the main factor of hydrologic drought too (Ben et al- Karl et al,1967). In this case of study, the condition of drought and wetness years and their relation with groundwater basin in Bouin's watershed has investigated by doing some steps that is coming in continue.

Area's Situation of Study:

Bouin's basin has 290.9516 km2 area with longitude coordinate of 50 degrees 02 minutes9 seconds to 50 degree 19 minutes 59 seconds east and latitude of 33 degree 11 minutes 45 seconds to 33 degrees 00 minute 32 seconds north.

This basin is ended up to Ghouzaei and Gharehdagh mountains from north, Panjpanjeh mountains from east, Aghdash mountain from south, Gharakh Ghazlar and Khoshkeh roud from south and Ghebleh, Sonboleh and Sorkh mountains from west.

Average height of Bouin's basin is equal to 2559 meter and its average gradient is equal to 12.07 percent. The most amount of vegetation of this basin are pastures with 185 km2 wide that is equal to 63.5 percent. Atmospheric precipitation in this area is usually snow and has the most rate of rainfall in winter (42 to 50 percent). By measuring the rate of rainfall in adjoining stations of area through the 25 years' statistical period (1976-2001), average amount of rainfall is equal to 479.2 millimeters and temperature is equal to 8.9 degrees of centigrade and according to Domarten method, it has semi-wet climate.Figure 1: Situation of basin in Isfahan province with map of Rain-mate and output of water way of Bouin's basin

Methods and Materials:

Method of Research:

After collecting statistics and information of physiography (area, perimeter, impact of waterway, gradient, average height, etc.), meteorology(condition of rainfall in area according to adjoining stations distribution such as 8 station of Aligoudarz, Aznavele, Kazemabad, Badijan, Fereydounshahr, Damaneh, Chadegan and Daran through the statistical period since (1976 to 2001) that based on rain gauge station of Aznaveleh that is near to area of case study, its statistics are used to determine changes of rainfall than average, the moving average changes of 3, 5, 7 and 9 year through the statistics period for area. Hydrology of surface waters and groundwater (average watering, height of runoff, hydraulic radius, determining special flow and runoff coefficient, statistics of groundwater's level changes in 1997-2003 years, etc.) meanwhile field view of basin to control data by using Excel, SPSS software's data were processed. Due to the effective factors in water flow such as area, gradient, shape of basin, average height, direction of hillside, factors of geology, soil and lands cover and also climate factors such as intensity and duration of rainfall and type of rainfall, flow of floodwater in three methods SCS, Fuller and manning was calculated for basins and artificial single hydrograph in return durations were drawn up. Experienced method of Manning usually uses when the target is estimating flow of floodwater after their stream. If floodwater goes out of substrate and enters to floodwater plains, velocity and area of each part can be calculated and their flow rate can obtain that results of their sum give flow rate of floodwater.Area is calculated based on hot water of recent floodwaters or based on historical evidence and velocity is obtained from Manning formula as following and has credit for uniform flow:

$V = K * 1/n \; R \; b2/3 * S \; ½$

K: constant coefficient that depends on using units and in metric systems is equal to 1.

V: average velocity of water in m/s.

Rh: hydraulic radius that is ratio of wetted surface to wetted environment (A/P).

S: gradient of energy line that is equal to gradient of water surface and it's in m/m that is actually equal to floor gradient and is obtained from length of main waterway.

n: roughness coefficient of substrate that depends on diameter of rivers substrate's material and should be used in way that approximately has same area and same shape in direct distance that gradient of water surface is measured. In addition, the roughness coefficient in this distance isn't variable and there isn't suddenly changes of length's gradient too.

One of the experienced methods to estimate of flood is Fuller formula (Mahdavi-1999). Experienced formulas of Fuller to achieve to maximum flow rate of flood explained as follows:

Q ave =CA 0.8

Q max = Q ave [1+0.8(logT)]

Q p= Q max (1+2.66A-0.3)

Q ave: most flood average in 24 hours of basin in m3/s.

Q max: maximum flood in 24 hours in return duration of T years in m3/s.

Q p: maximum probable flood in return duration of T years in m3/s.

C: constant coefficient, its amount is variable depends on gradient and cover of basin between 0.25 and 3.

A: area in km2.

SCS organization's method has been used to determine the artificial single hydrograph and floodwater. In this method, first peak time of basin's hydrograph was determined according to time of extra rainfall and amount of peak flow rate is calculated as follows relations:

Q p= (2.083 AQ)/tp

t p= D/2 + TL

D= 1/7 tc

Q p: peak flow rate

t p: peak time

Q: height of flow water

TL: delay time

D: duration time of extra rainfall

tc= time of concentration

Then amounts of Q p and t p in dimensions of dimensionless single hydrograph that was presented by Makos in year 1975, is multiplied to in order Q/Qp (dimensionless flow rate) and t/t p(dimensionless time) and dimension of single hydrograph will be obtained for each basin (Mahdavi,1999).

Also by using of rainfall's statistics through the 25 years' statistics duration (1976-2001) diagram of rainfall changes process and moving average of 3,5,7, and 9 years were drawn and

drought and wetness durations were determined. Several years' changes of groundwater's level were drawn by using of statistics of Isfahan zonal water organization and the rate of groundwater level's drop in basin was determined by that. By using of statistics of groundwater in recent 36 months (2000-2003), diagram of groundwater changes process has been drawn. To investigate how rainfall's change effects on groundwater's sources changes by using of gotten statistics from Isfahan's climatology and zonal water organization, the correlation coefficient is calculated between amounts of level of groundwater and amount of rainfall in 5, 4, 3, 2, 1, 0 and 6 months' delay times.