RESEARCH PAPER | Geology | Volume : 4 | Issue : 3 | Mar 2014 | ISSN - 2249-555X

Groundwater Fluctuation in Upper Bennihalla Basin, Karnataka

KEYWORDS: Groundwater, fluctuation, Upper Bennihalla basin, Karnataka

Davithuraj J	* Manjunatha S
CGWB, SUO, Belgaum, Karnataka 590 0019	Department of Geology, Karnatak Science College, Dharwad, Karnataka 580 003 * Corresponding author

ABSTRACT *"Groundwater is an important source in the Upper Bennihalla basin, Karnataka which falls under semi-arid climatic condition. Fourty one key wells were established for study of ground water fluctuation. In Pre monsoon most of the area had water level within 9 m bgl and Post monsoon the major area of water level fall in the zone between 3 and 6 m bgl and overall water level fluctuation of study area ranges from 0.66 to 13.05m bgl."*

INTRODUCTION

The fluctuation groundwater level study level will help us to understand the depletion and recharging conditions of an aquifer. Stress and strain in water level due to groundwater recharge, discharge and intensity of rainfall are reflected in groundwater level fluctuation with time (Gopinath & Seralathan., 2008). The mean annual rainfall over India is about 105 cm and exceeds the global average rainfall of 70 cm. Even then, about 80% of the Indian territories fall under semiarid conditions. This is because of spatial and temporal distribution of rainfall, overall variability of monsoon, topographic variations, prevailing semiarid to arid climatic conditions and varied nature of hydrogeology (S.N. Rai et al 2006). Moreover, overexploitation, excessive agriculture, untreated effluents and wastes have caused deterioration in groundwater quality. Whereas paucity of clean drinking water can affect the general health and life expectancy of people (Nash & McCall 1995), the use of poor quality water in irrigation can degrade the soils due to contamination (Palaniswami & Ramulu 1994; Datta et al., 2000; Patel et al., 2004; Marechal et al., 2006). The lowering of groundwater levels has resulted in reduction in individual well yield, growth in well population, failure of bore wells, drying up of dug wells and increase in power consumption (Imtiyaz & Rao 2008). Groundwater is often developed without proper understanding of its occurrence in time and space and is, therefore, threatened by overexploitation and contamination. For that reason, groundwater management is the key to combat the emerging problem of water security. Knowledge of water table depth is a crucial element in many hydrological investigations, including agricultural salinity management, landfill characterization, chemical seepage movement, and water supply studies (Buchanan & Triantafilis 2009). Hence, an attempt is made to study the groundwater fluctuation in the Upper Bennihalla basin Karnataka.

STUDY AREA

The upper Bennihalla basin is one of the important tributary of Malaprabha river, which is main tributary of Krishna river. The investigated area lies in between North Latitudes 15° 0'00" and 15° 32'48" and East Longitudes between 75°00" to 75° 29'45". The study area is surrounded by Gadag and Shirhattitaluks in the east, Dharwad and Kalghatgi taluks in the west. Shiggaon taluka in the Southwest and Navalgund taluk in the North. The study area falls in the semi arid region. The physiographically of the study area is characterized by gently undulating terrain with alternating ridges and slope elevation ranges form 660m above MSL. The climate of the study area is generally pleasant in the entire basin area. April and May are hottest months with average daily maximum temperature of about 38°C and average daily minimum temperature of about 20°C. The southwest monsoon sets in by June and ends by the middle of October. During this period the basin receives above 50% of the annual rainfall and the climate will be generally humid. Geologically, the study area is underlain by Dharwar schistose rocks and granitic gneiss. The northeastern part of the study area is occupied by granitic gneiss, which are mainly covered by thick black cotton soil, Shales, phyllites and altered greywackes of schistose rock are covered the rest of the area. The schistose formations strike in NNW-SSE direction and are dip varying from 35° to nearly vertical. Granitic gneiss strike in NNW- SSE direction and is highly weathered.

METHODOLOGY

Fluctuation of water levels in the wells in basin under study area have been observed for pre and post monsoon period for this 41 well have been selected and details of the wells inventory of these wells are given in the Table 1. The data collected for the year 2000. These pre and post monsoon water levels are plotted and are compared with the overall fluctuation of weighted mean rainfall. The location of key wells and hydrograph stations has been shown in the Figure 1.

RESULT AND DISCUSSION

Waterlevel fluctuation

Fluctuation of water levels in the wells in a basin under study area is due to the variation of recharge and discharge components in the ground water regime. Recharge components are precipitation, recycled water due to applied irrigation and percolation from surface water bodies. Discharge is mainly affected through processes like affluent seepage into the drainage courses withdrawal for domestic and industrial uses, irrigation draft and evapotranspiration. Fluctuation in the basin area is also affected by topographic configuration and geologic set up of the aquifers. The seasonal changes are observed because of monsoon received over the area.

Pre Monsoon

Depth to water level map has been prepared based on pre monsoon water level for this basin area and shown in Fig-2. In general depth to water levels showing that most of the area had water level varied from less 4 m bgl to more than 34 m bgl. There are isolated pockets of more than 18 m bgl in Kundgol, Kusugal, Tarlghata, Hire Harkuni and Gudgeri area. However, major area had water level within 9 m bgl.

Post Monsoon:

The monitoring ground water regime during the month of November is particularly important in order to assess the status of ground water levels during the post monsoon. The depth to water level map has been prepared for post monsoon (Fig.3). It depicts that major area water level fall in zones between 3 and 6 m bgl with few isolated pockets in Kundgol, Kusugal, Gudgeri Hire Harkuni, Elival and Tarlghata having depth to water of more than 15 m bgl.

Volume : 4 | Issue : 3 | Mar 2014 | ISSN - 2249-555X

Iso fluctuation map has been prepared and shown in Fig-4. From the map it is evident that in the major parts of the basin area, the fluctuation ranges from 0.60 to 13.05 m. However, there is only one location showing fluctuation of water level > 10 m that is observed in Kusugal which can be considered due to influence of local features, changes in the regime and also due to topographical control.

CONCLUSIONS

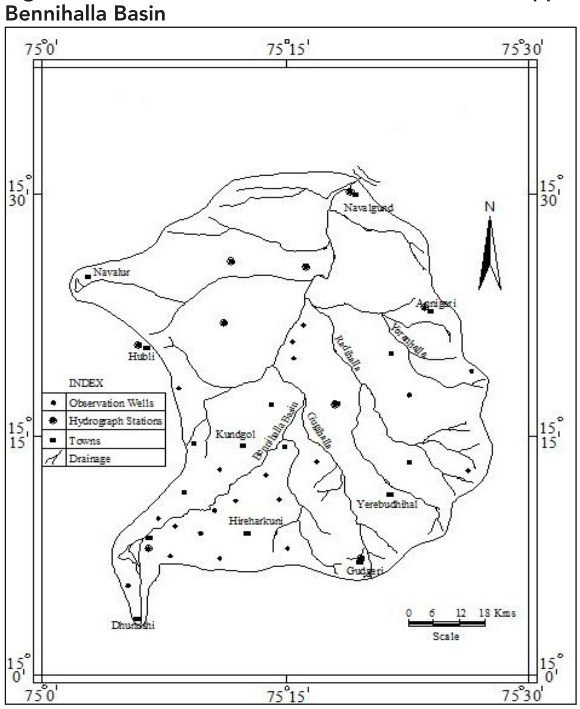
The main source of ground water occurring in the basin area is through precipitation and return flow from applied irrigation. Ground water in the study area occurs under phreatic condition and semi confined condition in weathered and jointed formations. Depth to water level maps indicating that major area had water level within 9m bgl and.3 to 6m bgl for pre-monsoon and post-monsoon respectively. The water level fluctuation ranges from 2 to 13.05 m.

Table – 1: Hydrogeological data of the basin area

S. No.	Village	M.P. (m agl)	Depth m bgl	Depth to curbing m bgl	Diameter (m)	Depth to water level		
						Pre monsoon (m bgl)	Post monsoon (m bgl)	Fluctuation (m)
1	2	3	4	5	6	7	8	9
1	Dhunshi	0.65	19.40	5.10	1.5x1.5	8.05	2.55	4.85
2.	Kunnur	GL	5.10	2.00	9.70	4.30	1.25	3.05
3.	Tadas	0.45	8.90	4.35	2.50	5.70	1.10	4.60
4.	Jigalur	0.50	9.70	7.00	2.50	9.50	2.30	7.20
5.	Kunkur	0.70	8.05	5.75	3.10	6.50	2.80	3.70
6.	Timapur	0.60	12.95	10.15	3.00	11.05	2.10	8.95
7.	Mattikati	0.50	7.75	6.00	3.50	6.95	3.35	3.60
8.	Ingali	GL	11.80	8.30	4.60	10.25	8.86	1.39
9.	Tarlghata	0.50	35.65	2.45	7.40	31.10	26.78	4.32
10	Kamadali	GL	18.45	1.80	2.5x2.5	16.25	10.75	5.50
11.	Shirur	0.40	14.25	10.15	3.50	13.20	10.05	3.15
12.	Elival	0.60	13.20	8.50	2.40	12.40	9.00	3.40
13.	Kundgol	GL	30.40	3.00	3.10x2.70	22.90	14.46	8.44
14.	Saushi	GL	19.20	4.50	3.5x3.5	17.25	14.70	2.55
15.	Gugeri	GL	29.50	3.60	3.3x3.3	29.25	21.85	4.40
16.	Madhalli	0.50	18.20	10.15	5.0x5.0	14.75	12.10	2.65
17.	Yelvati	0.90	10.50	3.65	5.75x5.75	8.10	4.70	3.40
18.	Nilgund	0.40	6.70	2.75	9.50	5.38	3.45	1.93
19.	Anneg-eri	0.50	13.60	5.00	4x4	10.75	7.30	3.45
1	2	3	4	5	6	7	8	9
20.	Ingahalli	GL	13.45	3.30	3.75	8.45	4.60	3.85
21.	Yerigubbi	0.30	9.10	6.50	8.00	7.20	6.30	0.90
22.	Behatti	0.45	19.25	7.10	2.65x2.65	12.45	9.40	6.85
23.	Kusugal	0.40	30.20	21.10	6.50	29.80	16.75	13.05
24.	Halihal	0.10	17.30	6.50	4.5x4.5	9.70	3.10	6.60
25.	Shrigubbi	0.20	10.75	7.55	6.0	9.80	5.60	4.20
26.	Hire Budihal	1.80	6.31	3.50	2.60	5.99	5.19	0.80
27.	Hebsur	1.20	7.33	4.75	3.80	4.76	3.61	1.15
28.	Bankanhalli	GL	9.40	4.20	4.16	9.37	6.55	2.82
29.	Chakalabi	0.60	14.70	6.55	4.42	14.23	13.63	0.60
30.	Baradwad	0.40	7.67	3.50	3.42	6.23	5.47	0.76
31.	Kolivad	2.20	5.15	2.55	3.10	5.00	4.23	0.77
32.	Hire Harkuni	GL	35.80	18.75	5.20	34.70	30.08	4.62
33.	Hoskatti	0.55	6.55	3.55	2.90	6.48	3.25	3.23
34.	Guranahalli	0.50	18.32	13.25	3.10	18.10	16.25	1.85
35.	Chicknarti	0.50	10.40	4.50	2.82	8.80	5.82	2.98
36.	Katpatti	1.00	6.72	2.55	3.90	5.58	3.55	2.03
37.	Devanur	0.30	26.65	17.65	6.00	14.71	9.25	5.46
38.	Hanchinal	0.60	8.85	3.25	3.50	7.62	3.75	3.87
39.	Navalgund	0.75	16.30	6.45	3.00	13.31	10.24	3.07
40.	Hubli	GL	11.45	5.30	3.50	8.42	3.42	5.00
41.	Navalur	0.50	13.30	6.10	3.50	8.68	4.88	3.80

M.P: Measuring Point m agl: Meter above ground level m bgl: Meter below ground level

Figure No. 1: Location of observation wells in the upper Bennihalla Basin



Volume : 4 | Issue : 3 | Mar 2014 | ISSN - 2249-555X

Figure No. 2: Depth to water level of upper Bennihalla basin for pre-monsoon (May-2000)

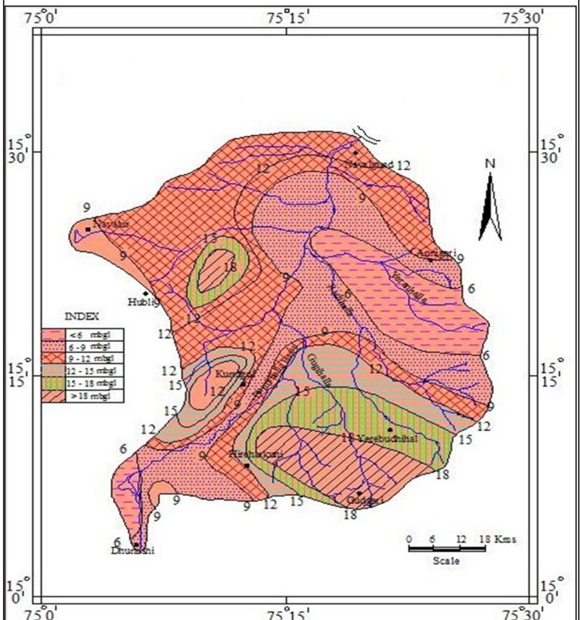


Figure No. 3: Depth to water level of upper Bennihalla basin for post-monsoon (November 2000)

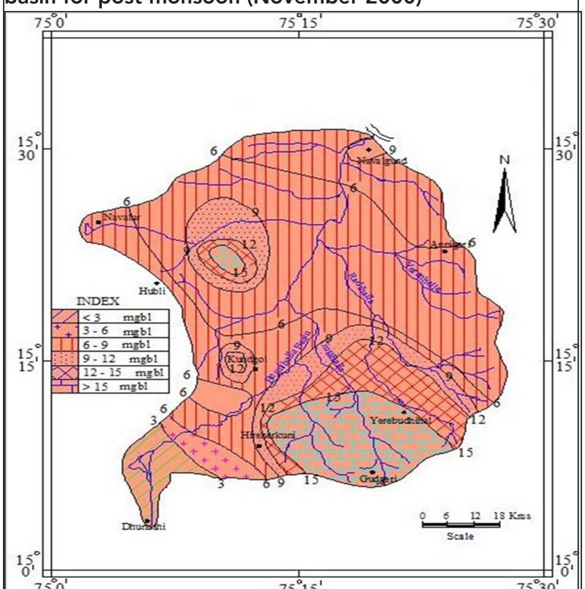
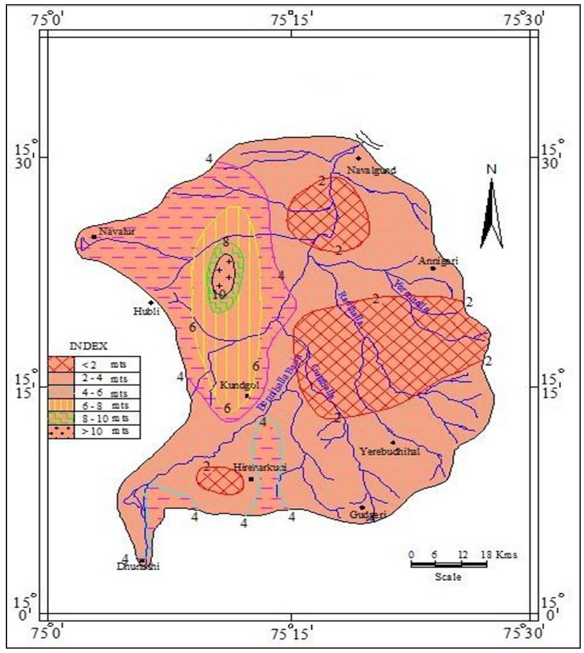


Figure No. 4: Water level fluctuation of upper Bennihalla basin



REFERENCE

[1]Buchanan, S. and Triantafilis, J. (2009), "Mapping water table depth using geophysical and environmental variables." Journal of Groundwater." 47, 80-96. | | [2]Datta, S.P. Biswas, D.R., Saharan, N., Ghosh, S.K. and Rattan, R. K. (2000), "Effect of long-term application of sewage effluents on organic carbon, bio-available phosphorus, potassium and heavy metals status of soils and uptake of heavy metals by crops." Journal of Ind. Soc. Soil Sci., 48, 836–839. | | [3]Gopinath, G., and Seralathan, P. (2008), "Studies on Longterm Variability of Groundwater Level in the Hard Rock Crystalline Terrains of a Central Kerala River Basin." IE (I) Journal AGriver. 89, 4753. | | [4]Imtiyaz, M., and Rao, D.J.M. (2008), "Influence of overexploitation on groundwater ecosystem in hardrock terrain, Proceedings of International Groundwater Conference." Jaipur, India. 88. | | [5]Marechal, J.C., Dewandel, B., Ahmed, S., Galeazzi,L., and Zaidi, F. K. (2006), "Combined estimation of specific yield and natural recharge in a semi-arid groundwater basin with irrigated agriculture." Journal of Hydrology, 329, 281– 293. | | [6]Nash, H., and McCall, G.J.H. (1995), "Groundwater quality." In 17th Special Report, Chapman and Hall, London. | | [7] Rai, S.N., Manglik A., and V.S. Singh (2006), "Water table fluctuation owing to time-varying recharge, pumping and leakage." 324,1, 350-358. | | [8]Palaniswami, C., and Ramulu, U. S. (1994), "Effects of continuous irrigation with paper factory effluents on soil properties." Journal of Indian Soc. Soil Sci., 42, 139–140. | | [9]Patel, K.P., Pandya R.R., Maliwal, G.L., Patel, K.C., Ramani, V. P., and George V. (2004), "Heavy metal content of different effluents and their relative availability in soils irrigated with effluent waters around major industrial cities of Gujarat." Journal of Indian Soc. Soil Sci., 52, 89–94.