Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1002.363>

Wetlands Inventory of Upper Chhokara Nalla Watershed in Chhattisgarh

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ABSTRACT

Wetlands are ecosystems whose formation, processes and characteristics are ascertained by water. Wetlands are critically important ecosystems providing significant social, economic and ecological advantages to the mankind. The importance of wetlands in Chhattisgarh is also exemplified by the most staple food of the state “rice”. Chhattisgarh is also known as “Rice bowl of India” and wetlands play an important role in the cultivation of rice. Therefore, the study has been carried out with the objective to prepare inventory of wetlands of upper Chhokara Nalla watershed (UCW). The watershed is located between 21°13’ to 21°14’ N Latitude and 81° 42’ to 81° 46’ E longitude covering an area of 1731 ha and falls in the Survey of India toposheet No. 64 G (1:250,000). The resource mapping of UCW includes Digital Elevation Model, Contour map, Drainage map etc. Wetlands inventory has been prepared from interpretation of Google Earth Pro Image in conjunction with different maps, followed by ground thruthing. The inventory includes number of wetlands, physico-chemical analysis of water samples, estimation of depth of wetlands, pre and post monsoon water spread area, estimation of volume of wetlands etc. Total numbers of 37 different wetlands have been identified inside UCW. Out of total area of wetlands (110.37 ha), river and streams occupies 42.82 ha (38.79%), reservoirs and barrages cover 6.30 ha (5.70 %), tanks and ponds occupy 5.69 ha (5.15 %) while abandoned quarries pond have a total area 56.56 ha (51.26 %). The Percentage of wetlands inside the UCW was found to be 6.37% of the total watershed area, which is satisfactory. However, when uses are concerned, most of the wetlands are underutilized and there is potential for its judicious utilization.

Keywords

Wetlands, Wetlands inventory, Remote sensing, GIS, Upper Chhokara Nalla watershed, Google Earth Pro

Article Info

Accepted:
26 January 2021
Available Online:
10 February 2021

Introduction

Wetland ecosystems are beauty of nature and wealth for future. These are diverse ecosystems that link people, wildlife and environment in special and interdependent ways through the essential life-support functions of water (Maltby and Barker, 2009).

Wetlands are important natural feature that modifies the human history as well as culture. Wetlands are the area of earth surface that taught the human beings the art of cultivation about 10000 years back. The wetland and human beings are in tandem from time immemorial. It is true to say that human beings are moulded and human cultures were

modified in the vicinity of wetlands (Wade and Lopez-Gunn, 1999).

As per the Ramsar International Wetland Convention (1971) definition (Article: 1.1) wetlands are areas of marsh, fen, peat land, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters. In addition, the Ramsar Convention (Article: 2.1) provides that wetlands may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water not deeper than six meters at low tide lying within wetlands.

The information collected through wetland inventories is nowadays regarded as a necessary prerequisite for wetland conservation and management at a holistic level, involving planning on a national, regional and international scale (Dugan 1990, Hollis *et al.*, 1992, Taylor *et al.*, 1995, Hughes 1995, Naranjo 1995, Scott and Jones 1995). An inventory is regarded by Dugan (1990) as the first step in assembling an information base for wetland management. Strategically developed wetland inventory (or inventories) should provide managers and /or policy makers with the information base that they require not only to manage individual wetlands or threats, but to also place the conservation value of wetlands within the context of broad scale (catchment, regional or even national) land use and sustainable development priorities. Inventories are useful in the first stages of developing effective wetland conservation programs (Taylor *et al.*, 1995, Hughes 1995, Naranjo 1995, Scott and Jones 1995, Wilen and Bates 1995). They can assist in the identification of conservation priorities, establish the basis for monitoring the ecological status of wetlands, promote awareness of wetland sites and management

issues, and facilitate exchange of information and comparisons between sites and regions. As importantly, information gathered for inventories can also illustrate the economic value of wetlands and provide valuable data for resource utilisation decisions. Inventories are particularly valuable for assessing wetland loss and degradation (Taylor *et al.*, 1995, Hughes 1995, Lu 1995, Wilen and Bates 1995). Information on rates of wetland loss and reasons for this loss have proved invaluable for promoting awareness and developing conservation and restoration programs (Hollis and Jones, 1991, Hughes 1995, Wilen and Bates 1995).

The importance of wetlands in Chhattisgarh is also exemplified by the most staple food of the state “rice”. Chhattisgarh is also known as “Rice bowl of India” and wetlands play an important role in the cultivation of rice. Wetlands contribute to the economy of Chhattisgarh; firstly through agricultural production, forestry and fisheries; secondly and increasingly for water supply (for domestic use as well as for irrigation). Other economic and ecological benefits of wetlands include groundwater replenishment, maintenance of water tables for agriculture, flood control, shoreline protection and stabilisation, climate change mitigation, sediment and nutrient retention, water purification and habitats for biodiversity. Tourism in wetlands is also becoming increasingly important.

Materials and Methods

The study area upper Chhokara Nalla watershed is located between 21°13' to 21°14' N Latitude, and 81° 42'to 81° 46' E longitude, covers an area of 1731 ha in Raipur District Chhattisgarh as shown in fig. 1. The altitude of the watershed varies from 290 to 310 m above (Fig. 2 shows the method for preparation of wetlands inventory).

Table.1 Wetlands inventory for Serikhedi pond in side of Upper Chhokranala Watershed 2016

S No.	Wetlands Name	Area (ha)	Average Depth(m)	Storage capacity(m ³)	Catchment (ha)	Location	Climate
	1	2	3	4	5	6	7
1	Serikhedi Pond (A)	2.55	3.5	89250	34	81° 43' 39.91" E Longitude 21° 13' 59.41" N Latitude	Sub-tropical
2	Serikhedi pond (B)	1.50	3	45000	10	81° 43' 39.91" E Longitude 21° 13' 59.41" N Latitude	
3	Serikhadi Pond (C)	0.34	3	10200	5	81° 43' 56 65" E Longitude 21° 13' 41.71" N Latitude	

Continue

Wetlands Names	Post –Monsoon (water spread area)	Per-Monsoon (water spread area)	Ownership	Use	Water Quality		
1	8	9	10	11	12		
					pH	BOD ppm	Turbidity ppm
Serikhedi Village Pond(A)	1.75	1.30	Govt.	Recharge, aquatic life, Drinking water for cattle	7.8	8.9	10.4
Serikhedi pond (B)	0.90	0.51	Govt.	Recharge, aquatic life	7.4	8.3	10.2
Serikhadi Pond (C)	0.24	-	Govt.	Recharge	7.6	8.6	10.3

Table.2 Wetlands inventory for Bhari Dam in site of Upper Chhokranala Watershed 2016

S No.	Wetlands Name	Area (ha)	Average Depth(m)	Storage capacity(m ³)	Catchment (ha)	Location	Climate
	1	2	3	4	5	6	7
1	Bhari Dam	6.30	3	189000	1661	81° 43' 09.14" E Longitude 21° 13' 52.22" N Latitude	Sub-tropical

Continue.....

Wetlands Names	Per –Monsoon (water spread area)	Post-Monsoon (water spread area)	Ownership	Use	Water Quality		
1	8	9	10	11	12		
					pH	BOD ppm	Turbidity ppm
Bhari Dam	0.13	4.67	Govt.	Recharge, downstream flow	6.8	7.1	9

Table.3 Wetlands inventory for Nakti Village in site of Upper Chhokranala Watershed 2016

S No.	Wetlands Name	Area (ha)	Average Depth (m)	Storage capacity (m ³)	Catchment (ha)	Location	Climate
	1	2	3	4	5	6	7
1	Nistari Pond	1.30	4	152000	101	81° 44' 03.34" E Longitude 21° 12' 34.34" N Latitude	Sub-tropical
2	Nallah Nakti	0.31	2	6200	356	81° 43' 46.17" E Longitude 21° 12' 31.73" N Latitude	
3	Nakti Abandoned Quarries -1	0.88	4	35200	113	81° 44' 00.91" E Longitude 21° 12' 18.65" N Latitude	
4	Nakti Abandoned Quarries -2	0.15	2	3000	111	81° 44' 02.28" E Longitude 21° 12' 17.25" N Latitude	
5	Nakti Abandoned Quarries -3	0.57	3	17100	63	81° 44' 12.17" E Longitude 21° 12' 14.11" N Latitude	
6	Nakti Abandoned Quarries -4	2.43	3	72900	64	81° 44' 07.13" E Longitude 21° 12' 09.30" N Latitude	
7	Nakti Abandoned Quarries -5	2.00	2	40000	62	81° 44' 09.91" E Longitude 21° 12' 05.63" N Latitude	
8	Nakti Abandoned Quarries -6	4.75	8	380000	30	81° 43' 50.15" E Longitude 21° 12' 07.18" N Latitude	
9	Blue Water	4.00	20	800000	213	81° 44' 23.88" E Longitude 21° 12' 03.80" N Latitude	

Continue...

Wetlands Name	Post-Monsoon (water spread area) (ha)	Pre –Monsoon (water spread area) (ha)	Ownership	Use	Water Quality		
1	8	9	10	11	12		
					pH	BOD ppm	Turbidity ppm
Nistari Pond	0.95	0.90	Govt.	Recharge, aquatic life, Religious-Cultural activities	7.8	8.5	9.6
Nall Nakti	0.18	0.18	Govt.	Recharge Religious-Cultural activities	7.0	8.2	9.3
Nakti Abandoned Quarries -1	0.42	0.20	Govt.	Religious-Cultural activities	7.1	8.3	9.4
Nakti Abandoned Quarries -2	0.10	-	Govt.	Religious-Cultural activities	7.2	8.2	9.5
Nakti Abandoned Quarries -3	0.17	-	Govt.	Religious-Cultural activities	7.3	8.4	9.6
Nakti Abandoned Quarries -4	1.48	0.64	Govt.	Religious-Cultural activities	7.2	8.5	9.9
Nakti Abandoned Quarries -5	0.33	0.22	Govt.	Religious-Cultural activities	7.0	8.6	9.7
Nakti Abandoned Quarries -6	1.26	1	Govt.	Religious-Cultural activities	6.5	7.0	6.5
Blue water quarry	2.91	2.46	Govt.	Recreation	6.2	6.5	6.0

Table.4 Wetlands inventory for Mandir Hasod Village in site of Upper Chhokranala Watershed 2016

S No.	Wetlands Name	Area (ha)	Average Depth(m)	Storage capacity(m ³)	Group of Catchment (ha)	Location	Climate
	1	2	3	4	5	6	7
1	Mandir Hashod Abandoned Quarries -1	2.35	20	470000	225	81° 45' 10.75" E Long 21° 12' 46.19" N Lat	Sub-tropical
2	Mandir Hashod Abandoned Quarries -2	2.20	20	440000		81° 45' 14.25" E Long 21° 12' 52.81" N Lat	
3	Mandir Hashod Abandoned Quarries -3	1.75	20	350000		81° 45' 05.99" E Long 21° 12' 50.24" N Lat	
4	Mandir Hashod Abandoned Quarries -4	0.30	20	60000		81° 45' 01.22" E Long 21° 12' 49.82" N Lat	
5	Mandir Hashod Abandoned Quarries -5	0.40	20	80000		81° 44' 51.19" E Long 21° 12' 45.26" N Lat	
6	Mandir Hashod Abandoned Quarries -6	2.35	20	470000		81° 44' 46.76" E Long 21° 12' 51.26" N Lat	
7	Mandir Hashod Abandoned Quarries -7	2.19	20	438000		81° 44' 42.52" E Long 21° 12' 53.71" N Lat	
8	Mandir Hashod Abandoned Quarries -8	1.75	20	350000		81° 44' 45.08" E Long 21° 12' 57.66" N Lat	
9	Mandir Hashod Abandoned Quarries -9	0.94	20	188000		81° 44' 42.17" E Long 21° 13' 01.69" N Lat	
10	Mandir Hashod Abandoned Quarries -10	1.77	20	354000		81° 44' 46.24" E Long 21° 13' 02.72" N Lat	
11	Mandir Hashod Abandoned Quarries -11	1.33	20	266000		81° 44' 56.93" E Long 21° 13' 02.79" N Lat	

12	Mandir Hashod Abandoned Quarries -12	2.85	20	570000		81° 45'03.03" E Long 21°13' 04.50"N Lat
13	Mandir Hashod Abandoned Quarries -13	3.72	20	744000		81°45'56.03" E Long 21°13'11.81"N Latitude
14	Mandir Hashod Abandoned Quarries -14	2.43	20	486000		81°44'01.39" E Long 21°13'12.46" N Lat
15	Mandir Hashod Abandoned Quarries -15	1.24	20	248000		81°44'56.03" E Long 21°13'11.81" N Lat
16	Mandir Hashod Abandoned Quarries -16	3.62	20	652000		81°45'06.82" E Long 21°13'16.01" N Lat
17	Mandir Hashod Abandoned Quarries -17	2.66	20	532000		81°45'00.78" E Long 21°13'19.74" N Lat
18	Mandir Hashod Abandoned Quarries -18	1.85	20	370000		81°45'00.31" E Long 21°13'24.10" N Lat
19	Mandir Hashod Abandoned Quarries -19	1.35	20	270000		81°45'02.32" E Long 21°13'28.49" N Lat
20	Mandir Hashod Abandoned Quarries -20	2.57	20	514000		81° 45'03.03" E Long 21°13' 04.50"N Lat
21	Mandir Hashod Abandoned Quarries -21	1.34	20	268000		81°45'56.03" E Long 21°13'11.81"N Latitude
22	Mandir Hashod Abandoned Quarries -22	6.96	20	1392000		81°44'01.39" E Long 21°13'12.46" N Lat
23	Mandir Hashod Abandoned Quarries -23	5.51	20	1102000		81°44'56.03" E Long 21°13'11.81" N Lat
24	Mandir Hashod Abandoned Quarries -24	2.1	20	420000		81°45'06.82" E Long 21°13'16.01" N Lat

Wetlands Name	Post –Monsoon (water spread area)(ha)	Pre-Monsoon (water spread area)(ha)	Ownershi p	Use	Water Quality		
1	8	9	10	11	12		
					pH	BOD ppm	Turbidity ppm
Mandir Hashod Abandoned Quarries -1	1	1.28	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -2	0.86	0.94	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -3	0.59	0.62	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -4	0.1	0.14	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -5	0.18	0.29	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -6	1.0	1.26	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -7	0.92	1.10	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -8	0.25	0.62	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -9	0.30	0.33	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -10	0.21	0.45	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -11	0.61	0.65	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -12	0.10	1.13	Govt.	No use	6.1	6.4	6

Mandir Hashod Abandoned Quarries -13	0.61	1.73	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -14	1.11	1.18	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -15	0.49	0.62	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -16	2.16	2.44	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -17	1.1	1.25	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -18	0.93	0.93	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -19	0.17	0.24	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -20	1.58	1.37	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -21	0.71	0.73	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -22	1.25	4.73	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -23	2.85	3.41	Govt.	No use	6.1	6.4	6
Mandir Hashod Abandoned Quarries -24	-	1.21	Govt.	No use	6.1	6.4	6

Table 5 Wetlands inventory for Upper Chhokranala Watershed 2016

S No.	Wetlands Name	Number of streams	Total Area (ha)	Average Depth (m)	Length (m)	Catchment (ha)	Use	Climate	
	1		2	3	4	5	6	7	
1	First order streams	8	21.4	2	13798	686.4	Irrigation	Sub-tropical	
2	Second order streams	2	20.42	3	7685	1730	Irrigation		
3.	Third streams order	1	1.00	4	0.33	1731	Irrigation		

Table.6 Area estimates of Wetland in Upper Chhokranala Watershed (2016)

S. No	Wetland Category	Number of wetlands	Total Wetland Area	% of wetland area
Inland Wetland–Natural				
1	Lakes/ Ponds	-	-	-
2	Ox-bow lakes/cut off meanders	-	-	-
3	Riverine Wetlands	-	-	-
4	Waterlogged	-	-	-
5	River/stream	1*	42.82	38.79
6	Karst	-	-	-
7	High altitude wetland	-	-	-
Inland Wetland-Man–made				
7	Reservoirs/Barrages	1	6.30	5.70
8	Tanks/Ponds	4	5.69	5.15
9	Waterlogged	-	-	-
10	Salt pan	-	-	-
11	Abandoned Quarries	31	56.56	51.24
Sub total		37	110.37	100
Total Area of watershed			1731 ha	

Fig.1 Location Map of the Study area

Fig.2 Methodology for preparation of wetlands inventory

Fig.3 Total Wetlands area inside Upper Chhokranalla Watershed

Fig.4 Type wise distribution of wetlands in Upper Chhokranalla Watershed

Fig.5 Wetlands identified in side Upper Chhokranalla Watershed 2016 (Source: Google Earth Image)

Results and Discussion

Field survey and Google Earth image interpretation work was carried out to document and inventorize the wetlands of Upper Chhokara Nalla Watershed. Total numbers of Thirty Seven different wetlands have been identified in the Upper Chhokara Nalla Watershed. These Wetlands are marked in the UCW map (Fig. 5) and are given in Table 1 - 6. There are 37 wetlands (110.37 ha) inside the catchment area of 1731 ha in the Upper Chhokara Nalla Watershed. River and streams occupied 38.79% of the wetlands, reservoirs and barrages cover 5.70 ha, and tanks and ponds 5.15 ha have a total area of 6.30 ha. Abandoned Quarries ponds have a

total area 56.6 ha. Details of estimates of wetlands in Chhokara Nalla Watershed are given in Table 6 and fig. 3 and 4.

In conclusions, percentage of wetlands inside the Upper Chhokara Nalla Watershed was found to be 6.37% of the total area, which is satisfactory. However, when uses are concerned, most of the wetlands are underutilized and there is potential for its judicious utilization.

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How to cite this article:

Bharti Sahu and Jitendra Sinha. 2021. Wetlands Inventory of Upper Chhokara Nalla Watershed in Chhattisgarh. *Int.J.Curr.Microbiol.App.Sci.* 10(02): 3302-3318.
doi: <https://doi.org/10.20546/ijcmas.2021.1002.363>