Inland Wetlands of India - Conservation Atlas



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वहाँ है खुशहाली ।।

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Inland Wetlands of India - Conservation Atlas

SACON





Sálim Ali Centre For Ornithology and Natural History, Coimbatore



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UNDP

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ஆ. இராசா
ए. राजा
A. RAJA



A. Raja

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Foreword

With judicious planning, wetlands could be utilized for the livelihoods of people while conserving bio-diversity. Recognition of the value of wetland and their prudent management can ensure both ecological security and economic benefits. In recent years demographic and urban pressures have witnessed vast tracts of wetlands being reclaimed for various development projects without regards to impacts on people's livelihoods, or ecological costs.

Realizing the crucial role of wetlands in the ecology and economy of rural India, and the unsustainable rate of diminution of water bodies, the Government of India has initiated several activities to identify, study and conserve wetlands since mid-1980s. One of the outcomes of these initiatives has been initiation of an exercise for identification of wetlands representing various bio-geographic regions of the country for long-term conservation and wise use. The Government of India with the assistance of the United Nations Development Programme (UNDP) had taken up inland wetlands conservation programme under Country Cooperation Framework - I (CCF-I). The major objective of this programme was to generate baseline information for prioritizing wetlands for long-term conservation and sustainable use. The project envisaged use of modern spatial technology tools to add value to the existing baseline information on wetlands, as also the updating of data on fresh initiatives. The Salim Ali Centre for Ornithology and Natural History (SACON) was entrusted with this task. The Study has identified 655 wetlands as potential sites for conservation over the entire country; of which 199 could be potential Ramsar Sites. The results of the Study have been brought out in a comprehensive Atlas on Inland Wetlands.

In order to ensure that Wetlands are formally recognized as ecological entities of value, one of the tasks before my Ministry would be formation of the National Wetland Conservation Strategy in consultation with relevant stakeholders. Sustained efforts are required for conserving wetlands as critical entities of the eco-system with immense productivity and economic value.

A nation-wide data and information contained in this Wetlands Atlas produced by SACON in collaboration with the Department of Space would go a long way in fulfilling the requirements for conservation planning of inland wetlands. I am confident that the different line agencies such as Ministry of Water Resource, Ministry of Rural Development, State Governments, NGOs and individuals involved in wetland conservation, will benefit from this publication.

(A. RAJA)

14th June, 2004



V.S. Vijayan



B. Sinha



E. Barucha



Achanya

भारतीय अन्तरिक्ष अनुसंधान संगठन
अन्तरिक्ष विभाग
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Preface



G Madhavan Nair
Chairman

Wetlands are one of the most important ecosystems. Nevertheless, all over the world, little conservation attention has so far been accorded to these vital components of the water cycle. It is estimated that wetlands, world over, provide annually around 70 billion US$ worth of goods and services. In India too, wetlands are the means for livelihood and well being of millions of rural population. By the very nature, wetlands are dynamic entitles that change with time and space. Therefore, a key aspect of wetland conservation relies on generating information on the location and characterization of wetlands, at frequent intervals of time. Thus, the issues of what and where to conserve are of paramount significance. One of the important dimensions, therefore, is spatial characterization of the wetlands, by way of mapping.

Space Application Centre (SAC) of ISRO has carried out systematic inventory of waterlands in the country, for the first time, in 1990s, under the aegis NNRMS, sponsorship from Ministry of Environment and Forests (MoEF), Government of India. Subsequently, the present task of evolving a viable conservation plan for inland wetlands has been carried out by Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore, at the behest of MOEF and sponsorship from UNDP. The five Regional Remote Sensing Service Centres (RRSSCs) of Department of Space were also associated in the project - 72 priority Districts across the country have been covered using IRS -1C, 1D - LISS-III data (23.5 m spatial resolution). The study has addressed various aspects related to drawing up long-term conservation plans for the wetlands, also taking into account the flora and fauna. A comprehensive Atlas containing District-wise Maps, showing the wetlands, broad land use/cover around them, and other attribute information has been brought out by SACON for wide dissemination among user community. With the availability of higher resolution data from the RESOURCESAT, and CARTOSAT in near future, the monitoring and management of the wetlands in the country would be further facilitated.

I am sure, this effort of SACON will go a long way in providing scientific inputs towards wetland conservation in the country. I congratulate the team members involved in this effort.

(G MADHAVAN NAIR)

BANGALORE
May 06, 2004

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Acknowledgements

This Atlas is a culmination of an extremely important and topical national project of truly participatory nature. It would not have been successful but for the whole-hearted support, active participation and cooperation of a large number of committed conservationists and well wishers of both wetlands and SACON. It is very gratifying to acknowledge the initiative taken by the Ministry of Environment and Forests (MoE & F), Government of India for choosing SACON to be the implementing agency of this important landmark national project. In particular, Mr. Viswanath Anand, the then Secretary, MoEF and his successors Messrs. P V Jayakrishnan and K C Misra and, Dr Prodipto Ghosh; Mr Vinod Vaish, the then Special Secretary and his successors Mr A K Kundra; Mr A M Gokhale, Additional Secretary and his successor Ms Veena Chhotray; Mr R H Khwaja, Joint Secretary and Chairperson of the Steering Committee and his successors Mr. D D Verma and Ms Veena Upadhyaya; Mr Ujjwal Choudhary, the then Director (IC Division) and his successor Mr S K Joshi and their colleagues were of great help. Dr Siddharth Kaul, Director, MoEF, the National Sub-Programme Director of the project is to be thanked specially for the keen interest he took for the entire project period.

We record our heartfelt gratitude to the UNDP for making this project possible by way of some exceptional enthusiasm and foresight of several key officials. In particular, we are indebted to Mr Keshav Desi Raju, the then Assistant Resident Representative, and his successors Mr Pradeep Monga, and P Venkataramana ; Tor Skudal, Sudarshan Rodriguez, Dr Ravi Chellam, Sunil Arora, and Usha Rao (Programme Officers) and Ms. Manju Narang, Division Assistant.

Image processing of select districts of the project would not have been possible but for the involvement of the scientists of the Department of Space, Government of India. We particularly thank Dr M L Manchanda, the then Head and his colleagues, Drs KP Sharma, M Kudrat, Shri Sudhir Kumar, Mr H S Srivastava and Mrs. Sujimol of Regional Remote Sensing Service Centre (RRSSC), Dehra Dun; Dr P P Nageshwara Rao, formerly Head, Regional Remote Sensing Service Centre, Bangalore; Dr J R Sharma, Head and his colleagues Dr Dibyendu Dutta and Mr Rajendra N Gaikwad of RRSSC, Jodhpur; Dr A Jayaraman, Head, RRSSC, Kharagpur; Dr Y V N Krishnamurthy, Head and his colleagues Drs Subrata N Das, S Srinivasa Rao and A O Varghese and, Shri Ashish Kumar Sharma of the RRSSC, Nagpur; the late Dr R S Ayyangar, the then Head, Maharashtra Remote Sensing Application Centre (MRSAC), Nagpur, his successor Dr A K Sinha and their colleagues Drs Shirish A Ravan, S S Tikekar, V M Ghare, Mrs Tutu Sengupta. We have benefited from discussions with Dr P S Roy, Deputy Director (Applications), National Remote Sensing Agency, Hyderabad.

In addition, we owe special appreciation and thanks to key project staff responsible for remote sensing, GIS and mapping work of the project Thakur Praveen Kumar, Mrs. Tanushree Sengupta, Mr. Sunil Thakur, Ms. Pallavi Yadav, Mr. Shashank S. Rai, Mr. Nikhil V. Lele, Mr. Anil K. Jamwal, Mr. Tarun Pratap Singh and Mr. Sujoy Banerjee. The atlas would not have crossed the last mile except for the very dedicated and untiring efforts of Sujoy for his meticulous and careful checking. The fieldwork would have been impossible, especially within such time frame, but for the active, enthusiastic and willing cooperation of the 15 State Coordinators. The Resource Personnel and participants of the waterfowl census were by the last count exceeded 500 and indicative of the extensive participation. We record our sincere thanks to all of them individually for the contribution they made for the success of this project. We owe special thanks to Dr B M Parasharya and Mr Uday Vora (Gujarat); Dr Kulshreshtha and Harsh Vardhan (Rajasthan); Dr Erach Bharucha, his team and Mr M G Gogate, Principal Chief Conservator of Forests and his colleagues (Maharashtra); Dr Arun Kumar and his colleagues, ZSI, Dehra Dun (Uttar Pradesh and Uttaranchal); Mr. A.R.Wani, Mr. Kushrid Ahmed (Jammu & Kashmir); Drs P C Bhattacharjee and Anwaruddin Choudhary (Assam and Northeast); Messrs Kushal Mookherjee, Sujan Chatterjee and Dipankar Ghosh (West Bengal); Drs R J Ranjit Daniels and Jayashree Vencatesan (Tamil Nadu); Mr S A Hussain, Dr T V Ramachandra and Dr Subramanya S (Karnataka); Mr Aasheesh Pittie and, Mr Hitesh Malhotra, Chief Wildlife Warden and his colleagues from the Wildlife Department (Andhra Pradesh).

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Contents

Introduction

The wetland habitats, extant in various bioclimatic and biogeographic zones in India, are some of the richest and fascinating biomes. Natural wetlands of India include high altitude Himalayan lakes; wetlands and marshy expanses in sub-Himalayan and Gangetic plains; saline and seepage wetlands of arid and semi-arid regions; and the wetlands of Deccan and coastal regions. In addition, a large number of man-made wetlands contribute to sustaining a significant component of aquatic biodiversity. Wetlands, variously estimated to be occupying 1-5 per cent of geographical area of the country, support about a fifth of the known biodiversity. However, there is a looming threat to the aquatic biodiversity as they are often under a regime of unsustainable human pressures leading to extensive loss of wetlands and wetland biodiversity. The situation warrants radical remedial measures to stem these mounting losses. Towards achieving this goal, the Ministry of Environment and Forests, Government of India has initiated several measures including identification of over 30 wetlands across the country for long-term conservation. Out of these, 19 have been declared as Ramsar sites. For a country of the size of India with its two global hot spots of biodiversity, these few sites represent a small feature of the enormous aquatic biodiversity. Consequently, there is a greater need now, than ever to identify more wetlands representing various biogeographic zones of the country for long-term conservation. One of the immediately needed measures towards this direction is to document the full range of aquatic ecosystems and their biodiversity.

The very purpose of the Conservation Atlas is to provide such basic information that is required for prioritization of wetlands for conservation at various levels. The individual wetland sites, however, need to be described at a greater depth, based upon the district and state level information. The information provided in the atlas is targeted for stakeholders in both wetland habitat and species conservation.

Thematic details of the Atlas:

The Atlas is organized to provide a profile of state - wise status of wetlands and some key elements of aquatic biodiversity for all of mainland India. Andaman & Nicobar, and Lakshadweep Islands are not included, as they are primarily of interest as coastal wetland areas. The profile provides percentage of wetland area at district level for 13 states. The percentage values are categorized in five classes at 0.5 per cent interval, beginning with 0. The fifth and final category shows wetland area in excess of 2 per cent. In addition, the profile provides tabular information on geographical area, wetland extent and percentage area under wetlands for each district. Major wetland habitat features for select districts are also provided. A profile of biodiversity for the state comprising of distribution of aquatic plants, fishes, turtles and birds is given.

Based on the past inventory data on a coarse scale of 1 : 250000, a bird's eye-view of the distribution of wetlands for 218 districts is provided. Since the boundaries of districts keep changing, for administrative reasons, the latest status of districts as of 2001 is given in Appendix 1.

The size of wetlands is depicted in seven different categories at an interval of 100 hectares. Information on important attributes such as per cent subsidence of water spread, pre/post monsoon wetland area and number of wetland is also given. This information is provided for 218 districts for all states, barring Arunachal Pradesh, Bihar, Gujarat, Jammu & Kashmir, Kerala, Orissa and Tamil Nadu. A Geographic Information System (GIS) approach was taken to generate the distribution of wetlands from the basic data from various Remote Sensing Centres in the country. A value addition process was attempted, combining spatial and point data from sources such as the Digital Chart of the World (DCW), geographical name content from National Imagery and Mapping Agency (NIMA) and others. The Atlas also provides for 10 different states, a comprehensive integrated wetland and land use map of 72 districts, originally processed at 1:50000 scale. However, in the Atlas, since entire district is to be shown, the scale chosen was 1:500000. In addition, land use, wetland types, turbidity and aquatic vegetation are shown. For select districts, various attributes such as number of wetlands, area, types as well as turbidity, summer recession, magnitude of contamination in terms of heavy metals and pesticides for fishes are given. A map of prioritized Inland wetlands for each state is provided along with details of location, nearest town, biodiversity rank, socio-economic use grade and bio-geographic provinces. The various parameters selected for assigning biodiversity rank and socio-economic use grade are given in Prasad *et al.* (2004). However, many of these criteria, except birds, size and socio-economic uses could not be used for prioritization because of the non-availability of information.

The various wetland attributes of the select districts and state-wise depiction of prioritized wetlands, terrestrial Protected Areas and Important Bird Areas are also given. The Atlas provides a synoptic view of 198 proposed Ramsar sites for the entire country. A description of the meta-database of wetlands consisting of products of digital satellite data image processing, and vector layers of various thematic feature is also given.

A view of different map themes at their full resolution is provided. There are, in addition, six appendices dealing with administrative name changes of various districts from 1991 to 2001, wetland classes and their legend, state-wise distribution of fresh water turtles, endemic aquatic plant species, threatened and near threatened birds and threatened fresh water fishes. The distribution shown is based on available geo-referenced locations. It is not to be construed that a particular taxon is confined only to these localities. This information denotes the geo-referenced GIS data layer only. Finally, it may be added that there is much scope for improving on the information content of the Atlas. For example, watershed boundaries could be used to provide a spatial context for soil and water conservation programmes. The threat perceptions on location specific wetland and species loss may be highlighted. However, all of these would require a larger layout of resources, which is beyond the scope of this project. Nevertheless, it is hoped that this publication will prove to be a worthwhile initiative in our collective attempts to secure long-term wetland conservation in India.

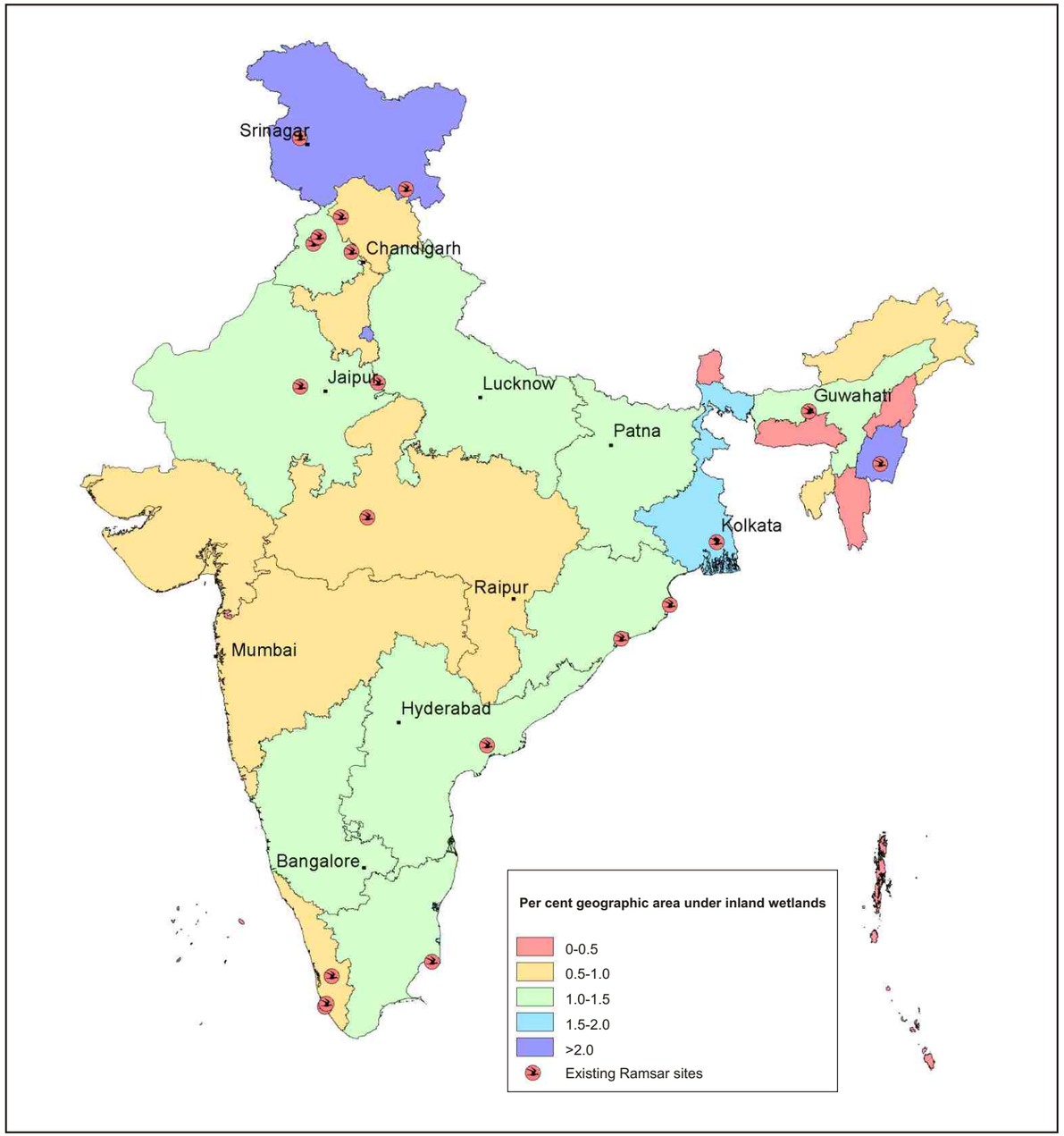

B. Sinha


Acharya


B.C. Chaudhary


Ameen Ahmed

AERIAL EXTENT OF INLAND WETLAND COVER IN INDIA



SL.NO.	NAME OF THE STATE	TOTAL AREA OF THE STATE (KM^2)	TOTAL WETLAND EXTENT(KM^2)	PERCENT OF WETLAND AREA
1	ANDAMAN & NICOBAR ISLANDS	8293	32.03	0.39
2	ANDHRA PRADESH	275069	3719.08	1.35
3	ARUNACHAL PRADESH	83743	562.65	0.67
4	ASSAM	78438	1012.25	1.29
5	BIHAR AND JHARKHAND	163877	1680.56	1.03
6	CHANDIGARH	114	42.59	37.36
7	DAMAN & DIU; DADRA & NAGAR HAVELI	603	0.38	0.06
8	DELHI	1483	47.16	3.18
9	GOA	3702	20.45	0.55
10	GUJARAT	196024	1691.96	0.86
11	HARYANA	44212	274.53	0.62
12	HIMACHAL PRADESH	55673	547.65	0.98
13	JAMMU & KASHMIR	101387	4024.06	3.97
14	KARNATAKA	191791	2447.17	1.28
15	KERALA	38863	321.09	0.83
16	LAKSHADWEEP	32	0.00	0.00
17	MADHYA PRADESH AND CHHATTISGARH	420192	2941.18	0.70
18	MAHARASHTRA	307577	2753.24	0.90
19	MANIPUR	22327	529.58	2.37
20	MEGHALAYA	22429	12.57	0.06
21	MIZORAM	21087	1.47	0.01
22	NAGALAND	16579	9.18	0.06
23	ORISSA	155707	1627.46	1.05
24	PONDICHERRY	480	9.47	1.97
25	PUNJAB	50362	674.97	1.34
26	RAJASTHAN	342239	3449.64	1.01
27	SIKKIM	7096	19.83	0.28
28	TAMIL NADU	130058	1615.11	1.24
29	TRIPURA	10486	98.97	0.94
30	UTTAR PRADESH AND UTTARANCHAL	294411	3149.25	1.07
31	WEST BENGAL	88752	1412.81	1.59

Acharya

Source: Census of India 2001 and Wetlands of India (SAC), Ahmedabad

Maps not to scale

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Acharya

ANDHRA PRADESH

ANDHRA PRADESH

Habitat features

Andhra Pradesh has 1493 wetlands of the size 56.25 ha and above, covering an area of 3719.08 km^2(APSRSAC, 1997 & SAC, 1998). Thus, 1.35% of the total geographic area of the state is constituted by wetlands. Wetland distribution in sixteen districts is given in pages 4 to 7.

In the nine districts of Andhra Pradesh, assessed by SACON, 4553 wetlands of the size two ha and above, covering 3457.17 km^2 have been reported. Smaller wetlands of two ha and above are more in abundance than the larger wetlands. These are shown in pages 8 to16. Most of the wetlands have low or medium turbidity, except those in Nellore district, which have large area with high turbidity. Satellite imageries of most of the wetlands show low vegetation.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	13	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	2	5	12	19	N.A.	N.A.
Turtles	N.A.	N.A.	1	1	N.A.	2	1
Birds	N.A.	N.A.	N.A.	N.A.	6	8	N.A.

Prioritized Sites

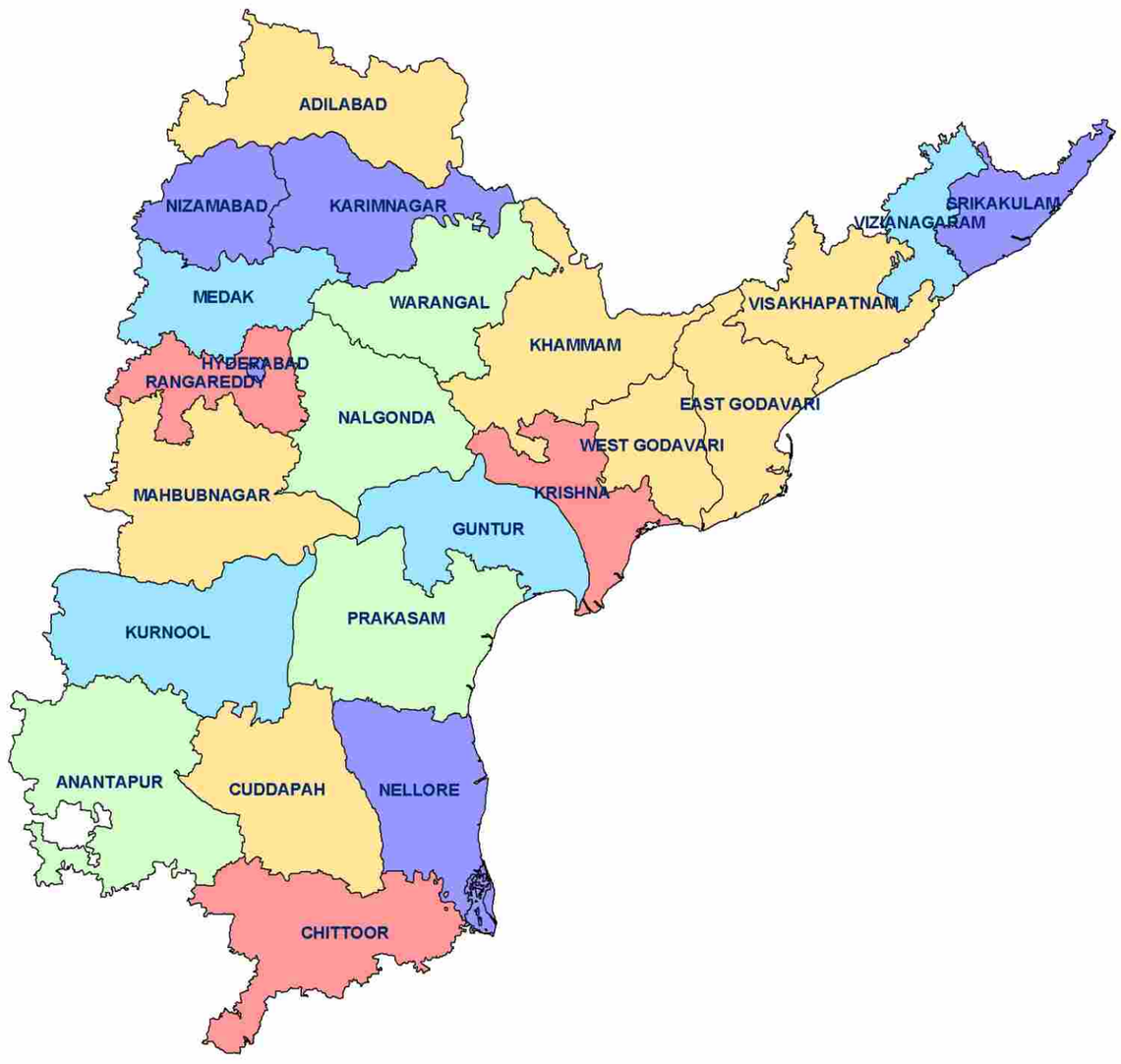
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
55	10	10	16	19

Twenty wetlands are recommended to be declared as Ramsar sites (page 215).

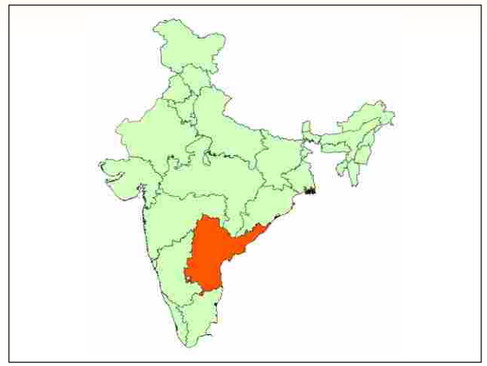


Ashish Pitty

A profile of wetlands in Andhra Pradesh



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
ADILABAD	16128	149.14	0.92
ANANTAPUR	19130	241.34	1.26
CHITTOOR	15151	59.93	0.40
CUDDAPAH	15359	121.78	0.79
EAST GODAVARI	10807	107.16	0.99
GUNTUR	11391	201.31	1.77
HYDERABAD	217	46.12	21.25
KARIMNAGAR	11823	250.43	2.12
KHAMMAM	16029	150.62	0.94
KRISHNA	8727	27.31	0.31
KURNOOL	17658	352.38	2.00
MAHBUBNAGAR	18432	141.77	0.77
MEDAK	9700	163.56	1.69
NALGONDA	14240	180.88	1.27
NELLORE	13076	303.55	2.32
NIZAMABAD	7956	434.25	5.46
PRAKASAM	17626	217.99	1.24
RANGAREDDY	7493	13.68	0.18
SRIKAKULAM	5837	122.23	2.09
VISHAKHAPATNAM	11161	81.74	0.73
VIZIANAGARAM	6539	117.15	1.79
WARANGAL	12847	185.25	1.44
WEST GODAVARI	7742	49.51	0.64

Maps not to scale

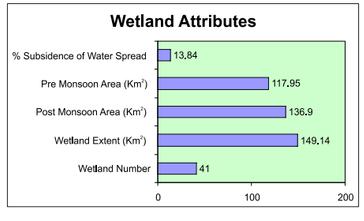
©SACON 2004

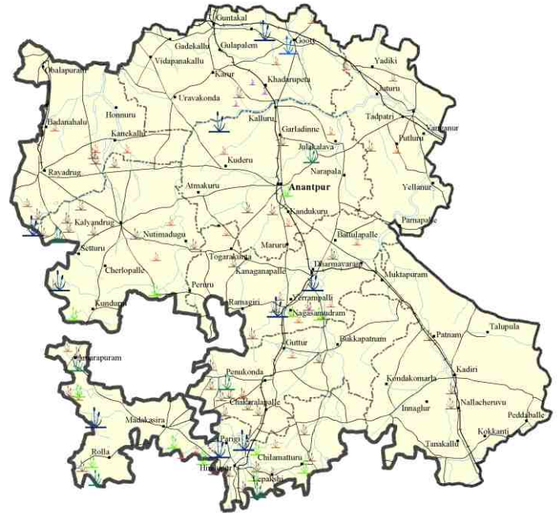
District - wise spatial distribution of wetlands



District Adilabad

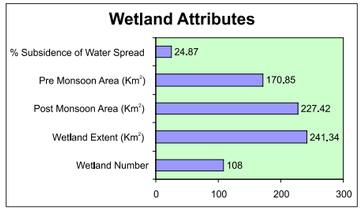






District Anantapur

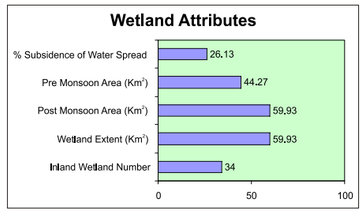






District Chittoor

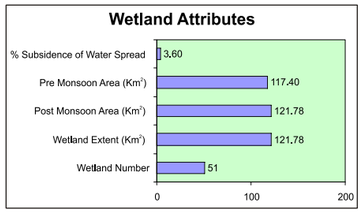






District Cuddapah





Source: Wetland point data; Andhra Pradesh State Remote Sensing Applications Centre, Hyderabad

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

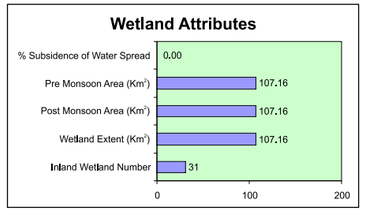
©SACON 2004

District - wise spatial distribution of wetlands



District East Godavari

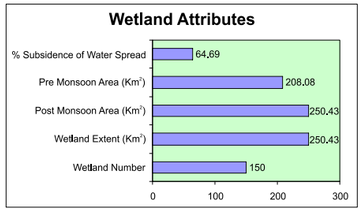






District Karimnagar

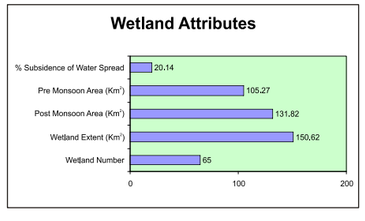






District Khammam

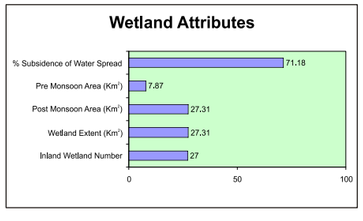






District Krishna





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Andhra Pradesh State Remote Sensing Applications Centre, Hyderabad

Maps not to scale

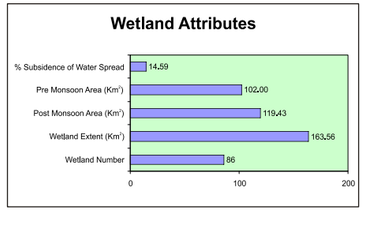
©SACON 2004

District - wise spatial distribution of wetlands



District Medak

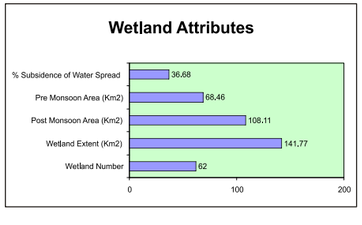






District Mahbubnagar

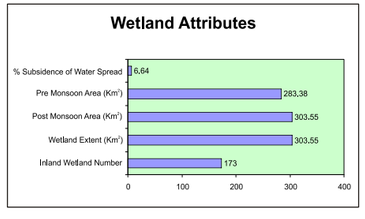






District Nellore

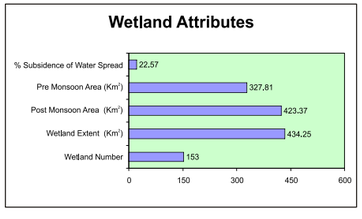






District Nizamabad





Source: Wetland point data; Andhra Pradesh State Remote Sensing Applications Centre, Hyderabad

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

©SACON 2004

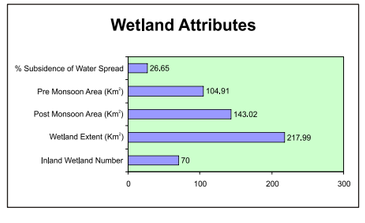
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

District - wise spatial distribution of wetlands



District Prakasam

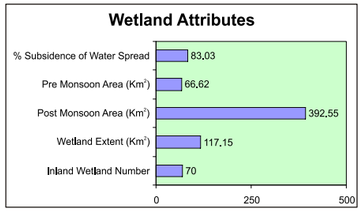






District Vizianagaram

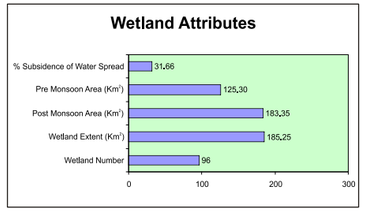






District Warangal

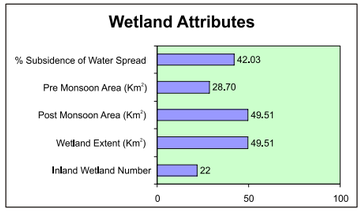






District West Godavari





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Andhra Pradesh State Remote Sensing Applications Centre, Hyderabad

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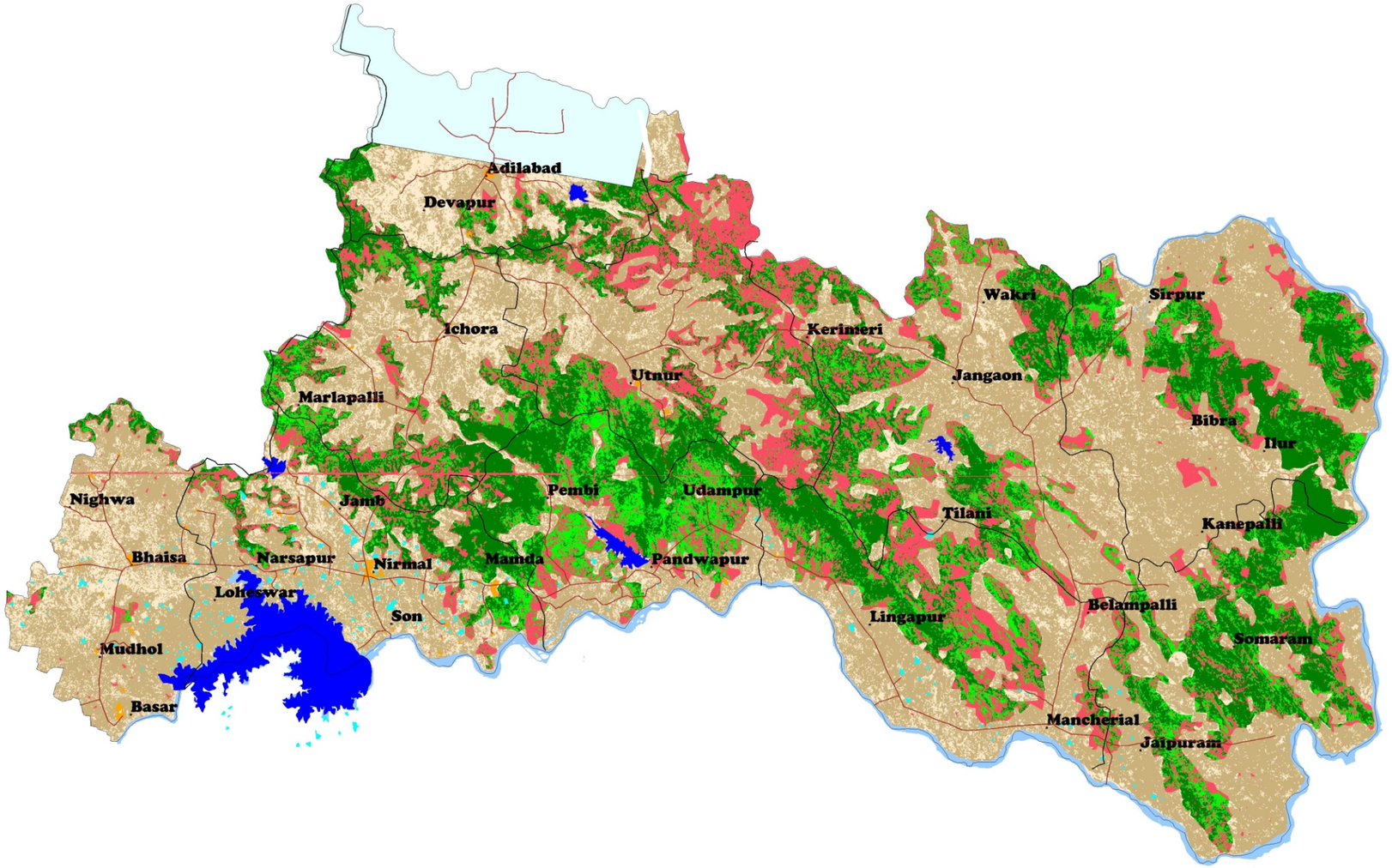
Integrated wetland and land use map



Integrated wetland type and land use

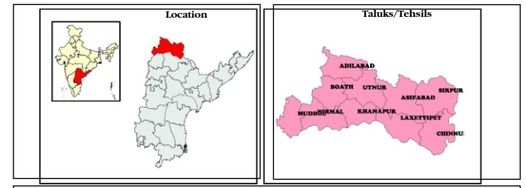
Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Taluks/Tehsil Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Roads
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	District Boundary

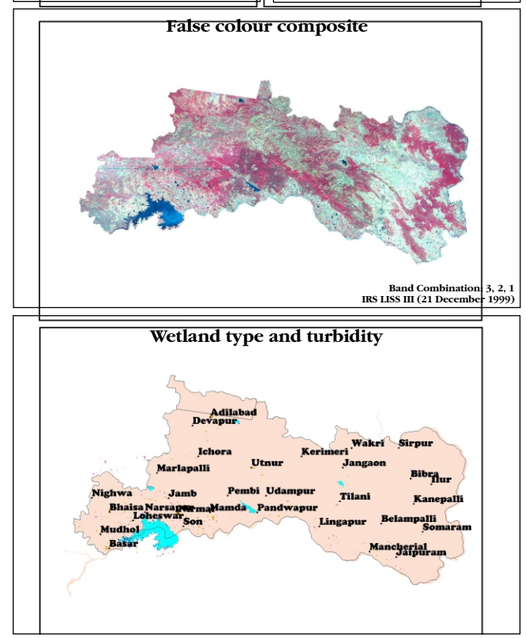
NP * Not Present

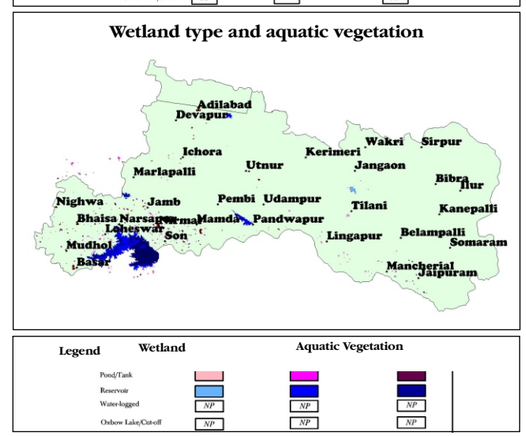
Maps not to scale

©SACON 2004

District Adilabad, Andhra Pradesh

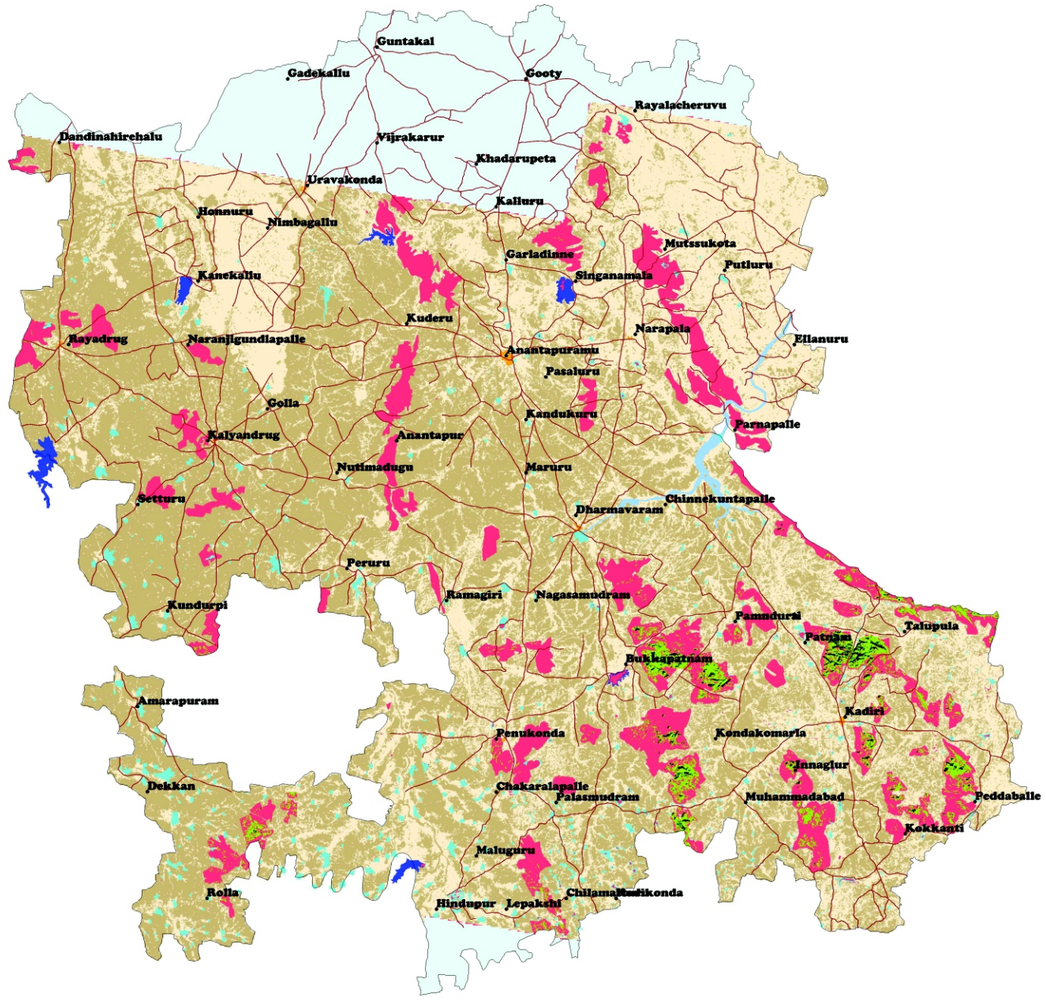






Integrated wetland and land use map

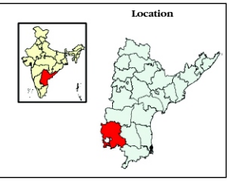
District Ananatpur, Andhra Pradesh



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Taluks/Tehsil Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Roads NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	District Boundary

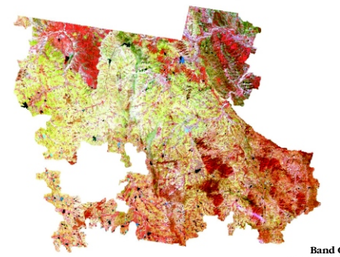
Location



Taluks/Tehsils



False colour composite



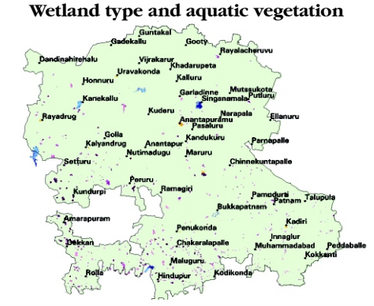
Band Combination: 3, 2, 1
IRS LISS III (21 November 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	*Medium*	*High*
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Wetland type and aquatic vegetation



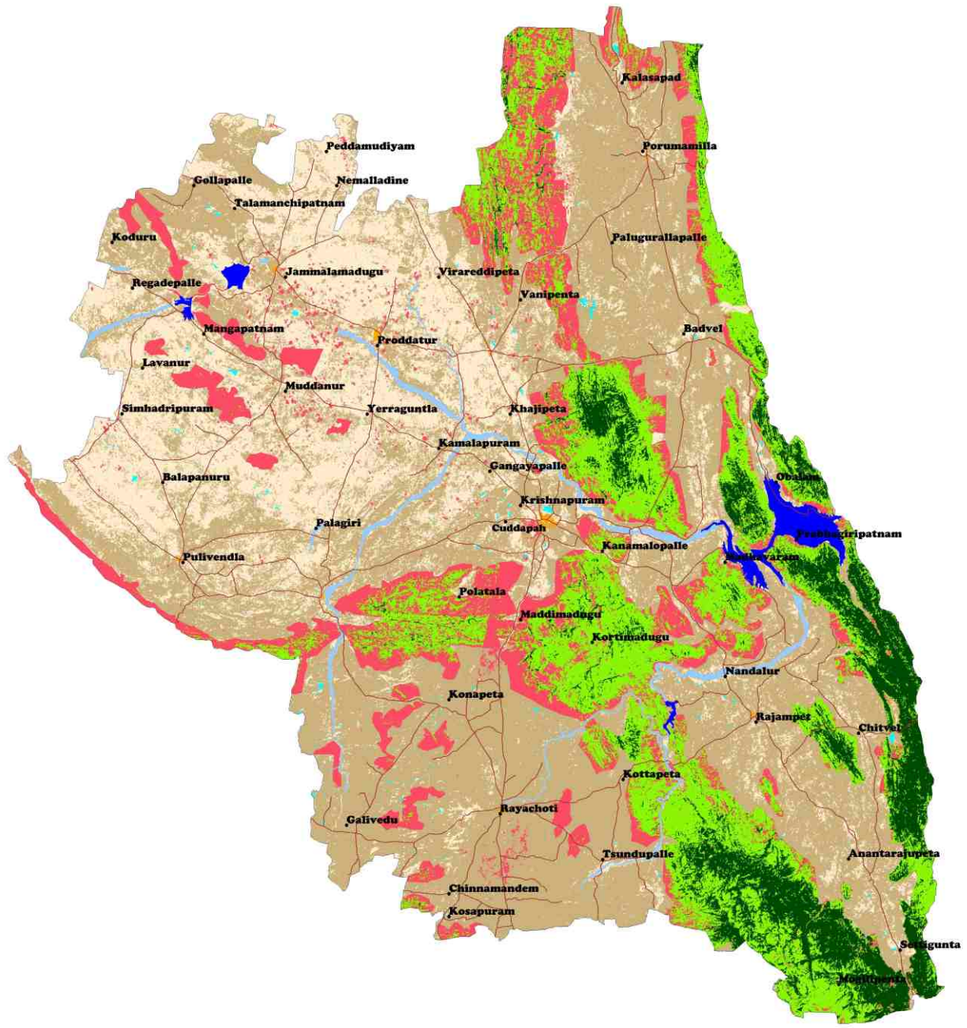
Legend	Wetland	Aquatic Vegetation		
		Low	*Medium*	*High*
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Maps not to scale

©SACON 2004

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Taluks/Tehsil Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Roads
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	District Boundary

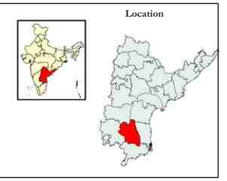
NP * Not Present

Maps not to scale

©SACON 2004

District Cuddapah, Andhra Pradesh

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS LISS III (18 December 1999)

Wetland type and turbidity



Legend Wetland Turbidity

	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation

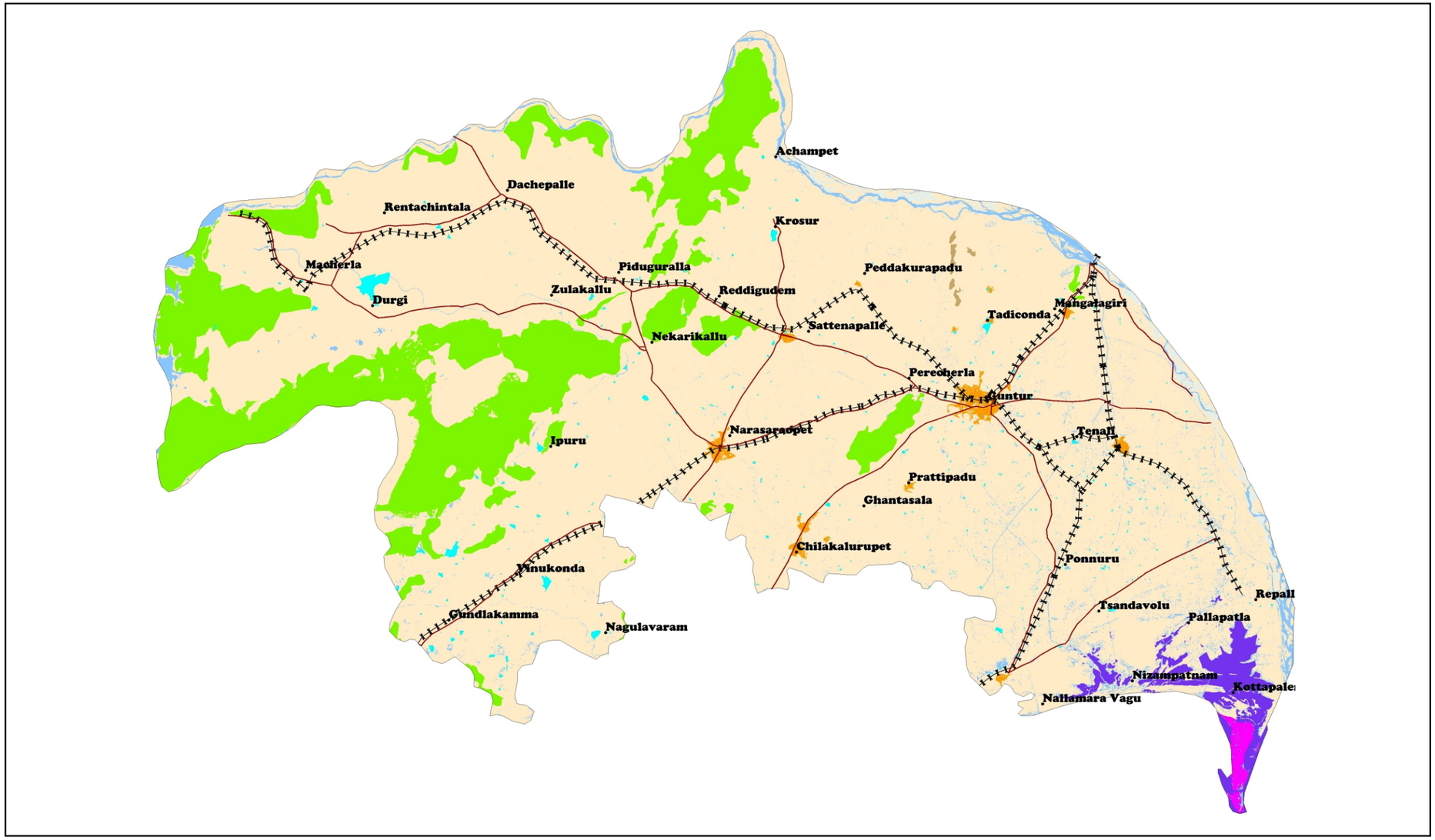


Legend Wetland Aquatic Vegetation

	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



Integrated wetland type and land use

NP Dense Forest	Waste Land	Pond/Tank	Water-logged	Sand	Roads	District Boundary
Open Forest	River	NP Reservoir	NP Coastal-water	NP Others/Salt	Railways	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Mangrove area	Taluks/Tehsil Boundary	

District Guntur, Andhra Pradesh

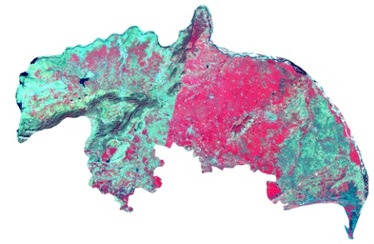
Location



Taluks/Tehsils

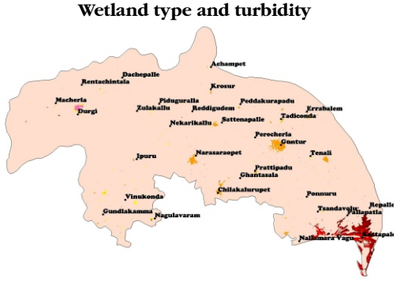


False colour composite



Band Combination: 3, 2, 1
IRS LISS III (December 2000)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir	NP	NP	NP
	Water-logged			
	Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir	NP	NP	NP
	Water-logged			
	Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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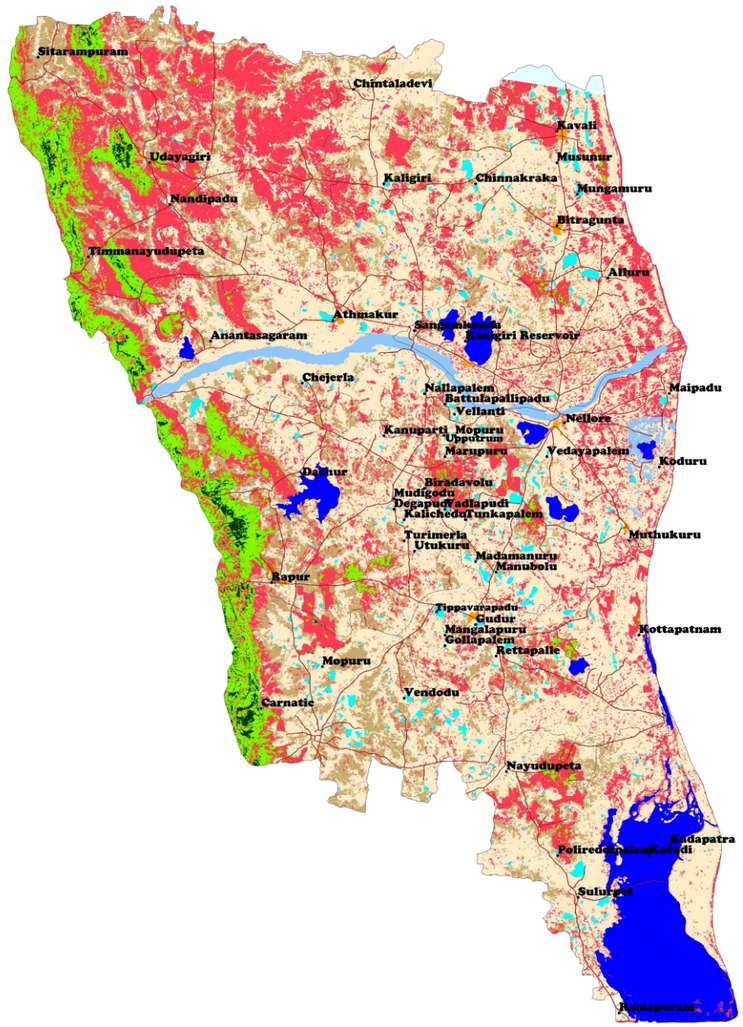
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Taluks/Tehsil Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Roads
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	District Boundary

NP * Not Present

Maps not to scale

©SACON 2004

District Nellore, Andhra Pradesh

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS LISS III Data

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow		NP	NP	NP

Wetland type and aquatic vegetation

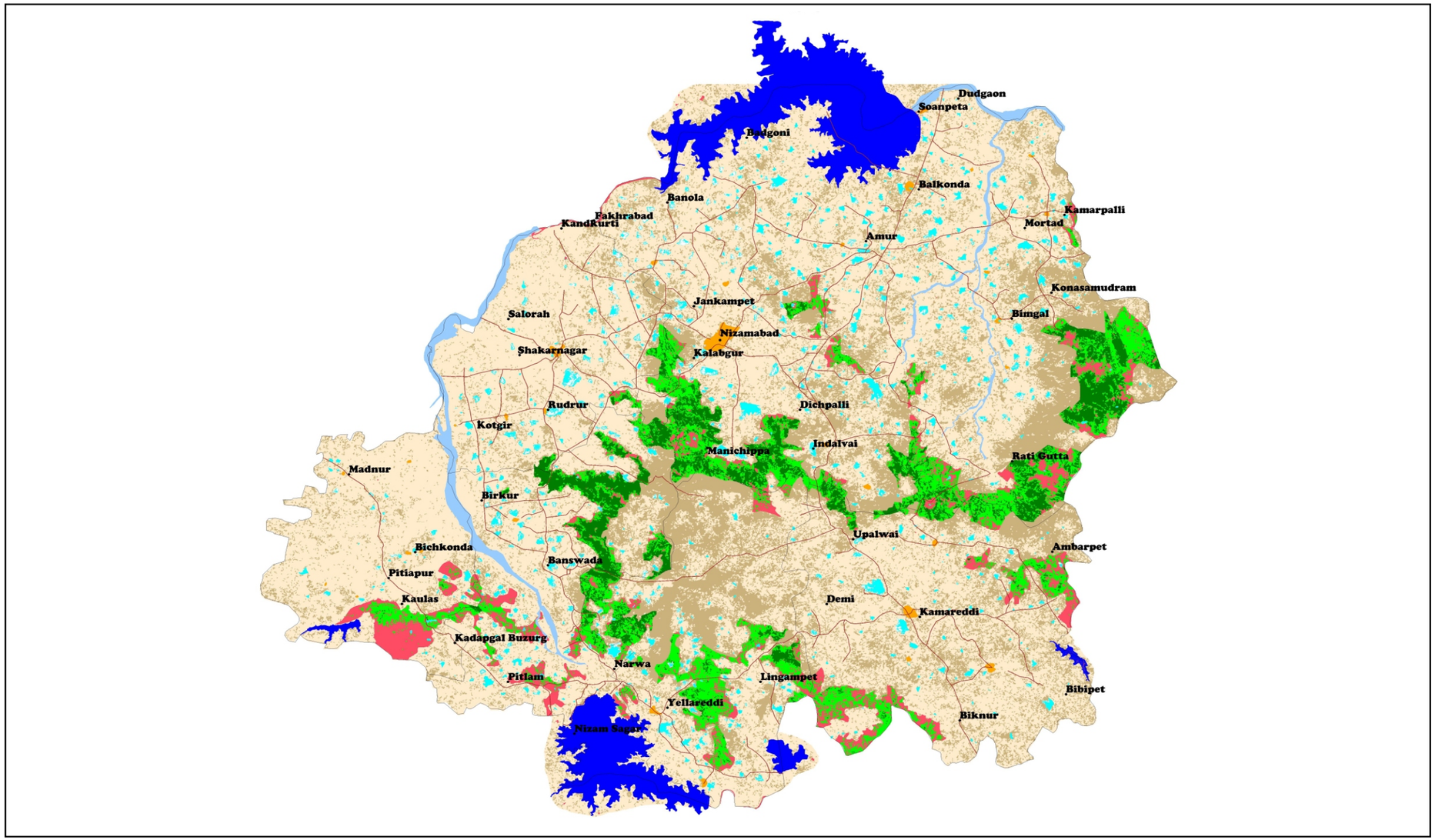


Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow		NP	NP	NP

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

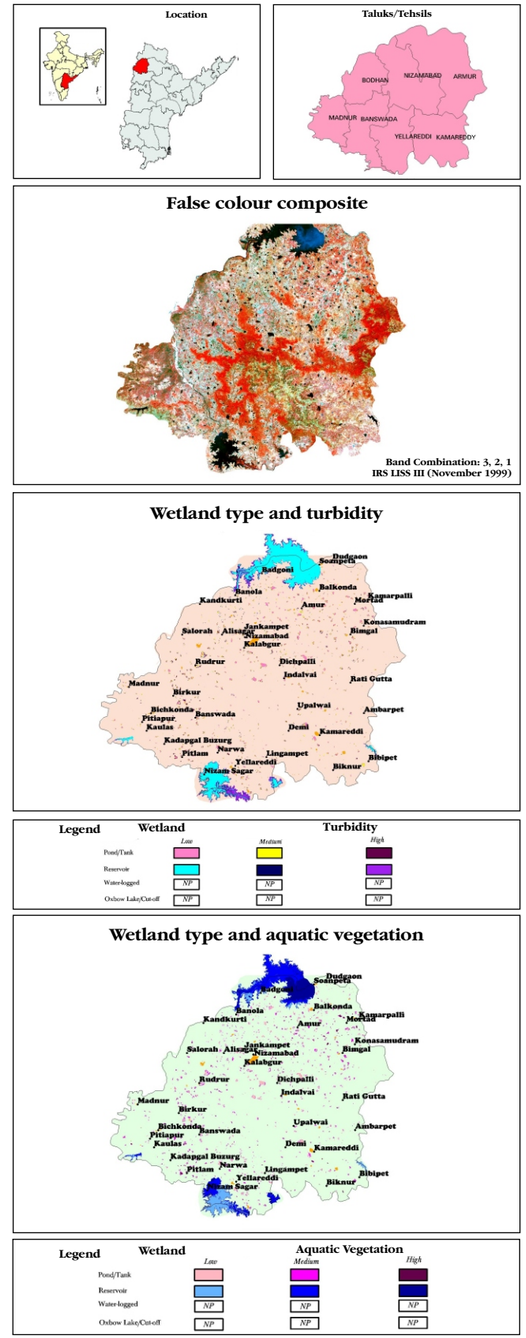
Integrated wetland and land use map

District Nizamabad, Andhra Pradesh



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Taluks/Tehsil Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Roads NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	District Boundary



Regional Remote Sensing Service Centre, Nagpur & Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Maps not to scale

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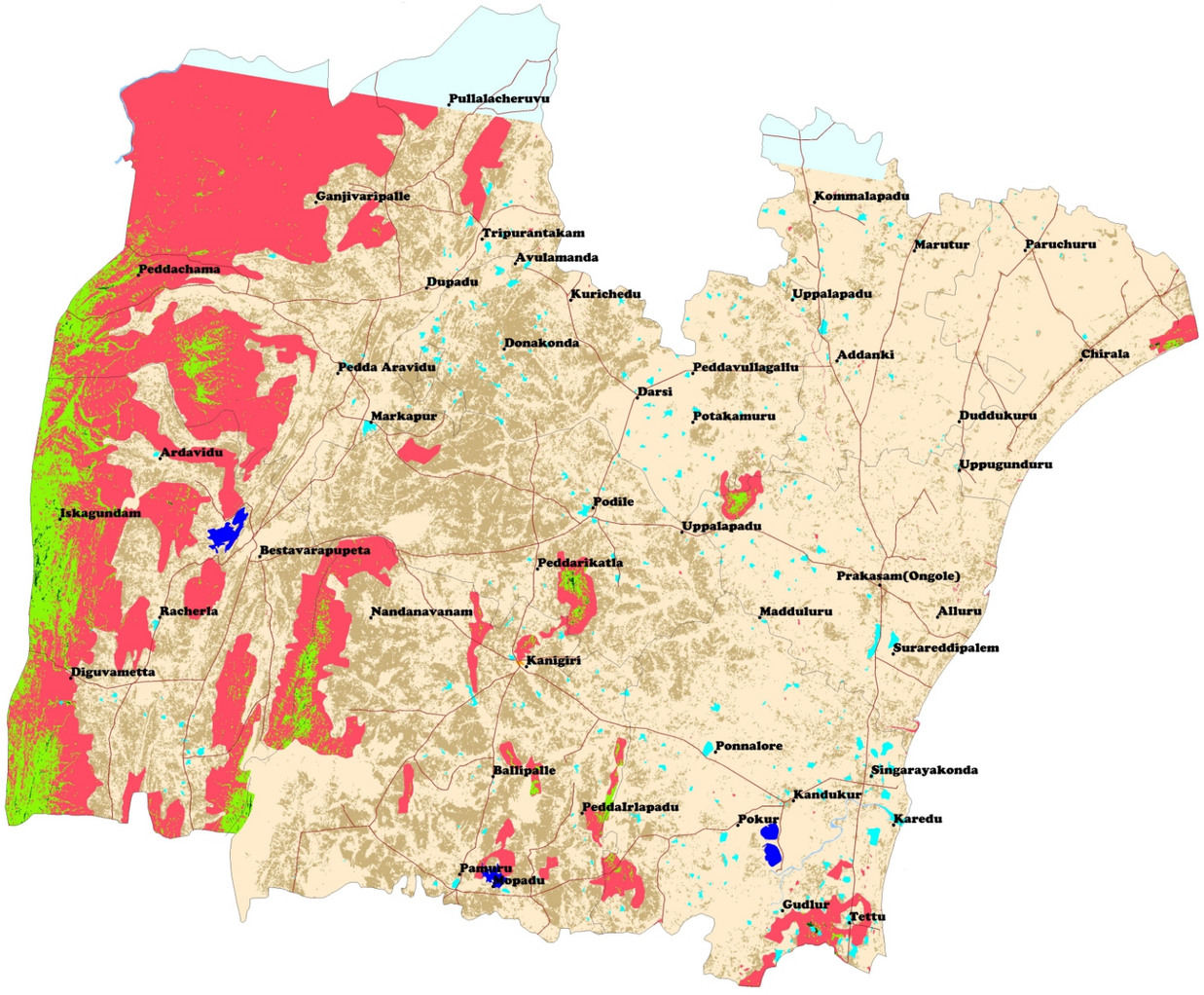
Integrated wetland and land use map

District Prakasam, Andhra Pradesh

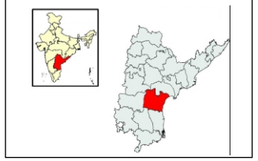


Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Taluks/Tehsil Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Roads
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	District Boundary

NP * Not Present

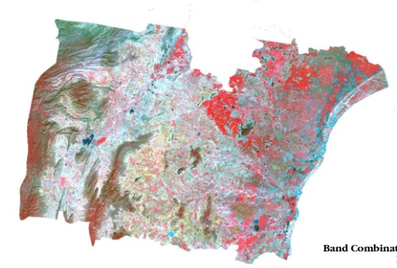
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS LISS III

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



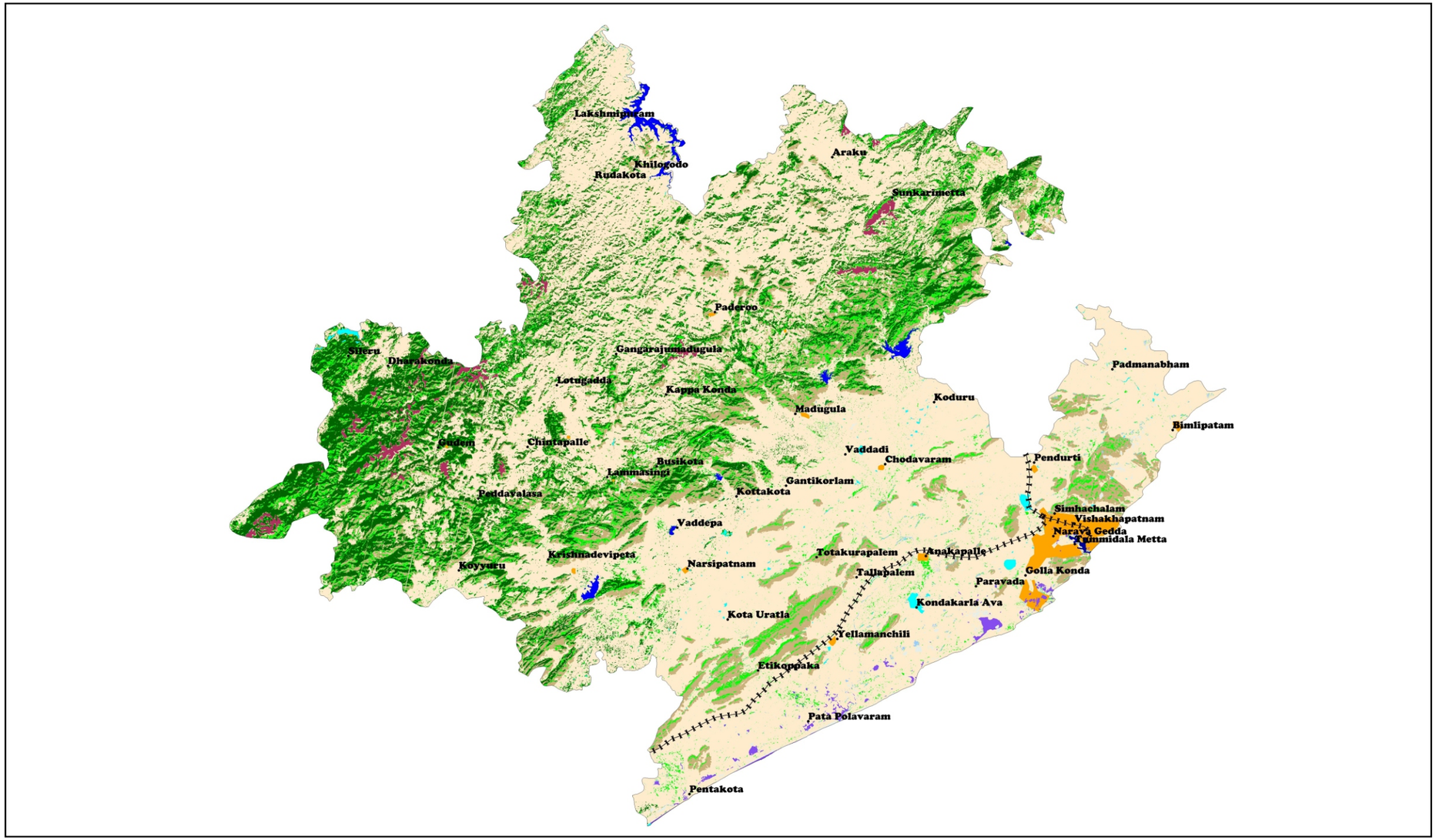
Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

©SACON 2004

Integrated wetland and land use map

District Visakhapatnam, Andhra Pradesh



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	Water-logged	Sand	Boxite Mine Area	District Boundary
Open Forest	River	Reservoir	Coastal-water	Others/Salt	Railways	* Not Present
Arable Land	Township	Oxbow Lake/Cut-off	Marsh/Mud	Harbour	Taluks/Tehsil Boundary	

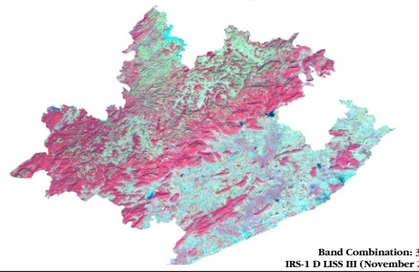
Location



Taluks/Tehsils

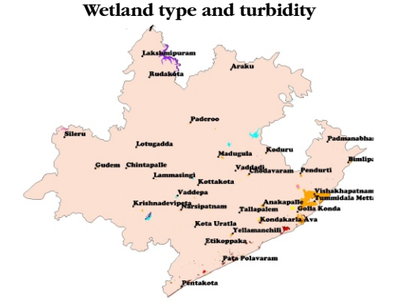


False colour composite



Band Combination: 3, 2, 1
IRS-1 D LISS III (November 2000)

Wetland type and turbidity



Legend	Wetland		Turbidity		
		Low	Medium	High	
Pond/Tank					
Reservoir					
Water-logged					
Oxbow Lake/Cut-off		NP	NP	NP	

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged				
Oxbow Lake/Cut-off		NP	NP	NP

Maps not to scale

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore SACON

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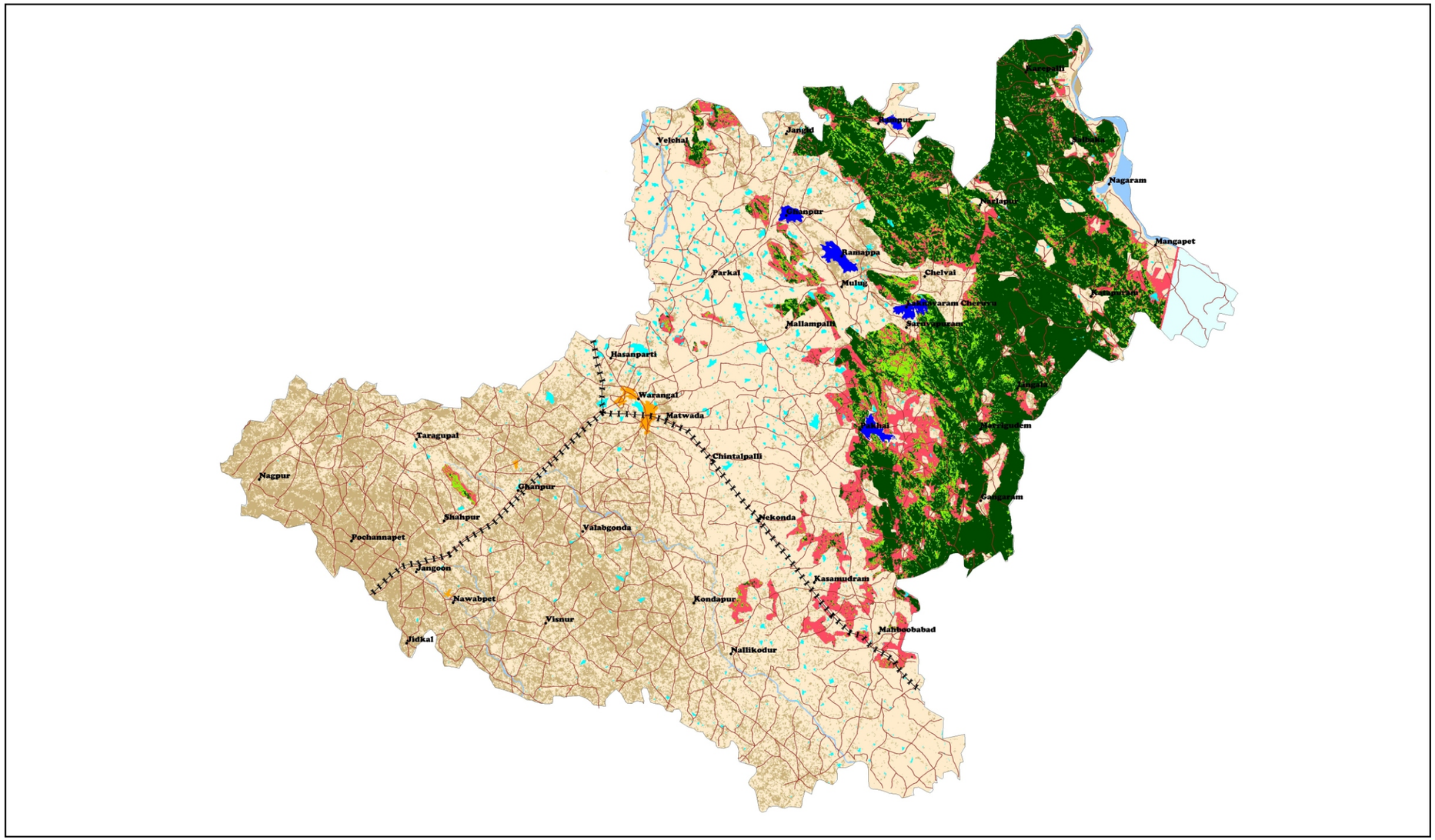
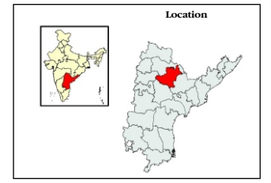
Integrated wetland and land use map

District Warangal, Andhra Pradesh



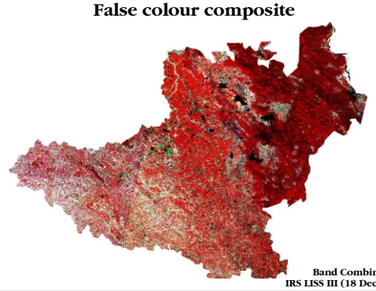
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Roads	District Boundary	
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Railways	NP * Not Present	
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	No Data	Taluks/Tehsil Boundary		





False colour composite



Band Combination: 3, 2, 1
IRS LISS III (18 December 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	*Medium*	*High*
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Wetland type and aquatic vegetation

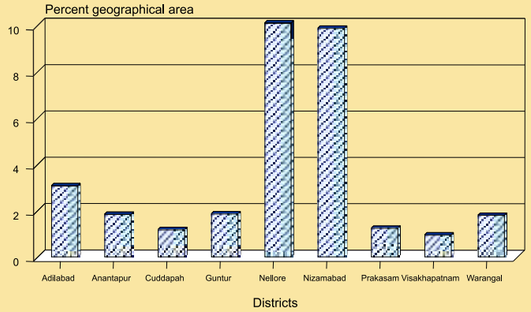


Legend	Wetland	Aquatic Vegetation		
		Low	*Medium*	*High*
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Maps not to scale

©SACON 2004

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

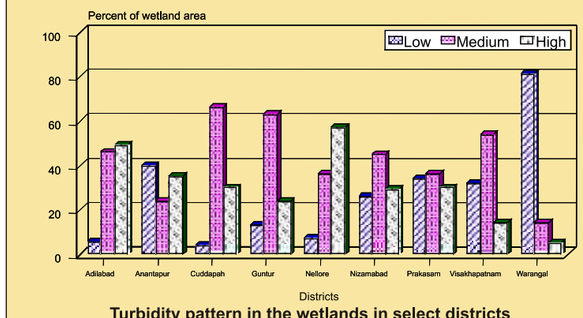


Area under wetland in select districts

Attributes of wetlands and environmental contamination

Wetlands

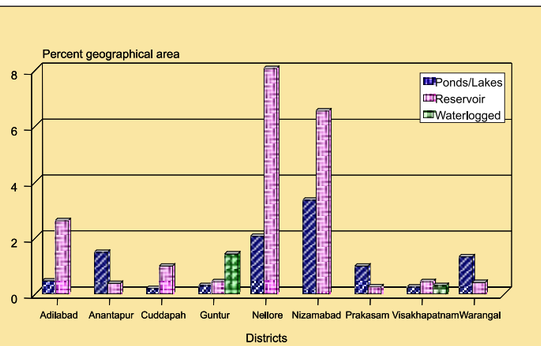
The area under wetlands in the districts varied from 0.90% (Visakhapatnam) to 9.89% (Nellore). Two major categories of wetlands, namely reservoirs and ponds/lakes are identified in these districts. Nellore, Nizamabad and Adilabad districts have a large area under reservoirs. All the other districts have more of ponds and lakes. Wetlands smaller than 56.25 ha are more numerous in all the districts studied.



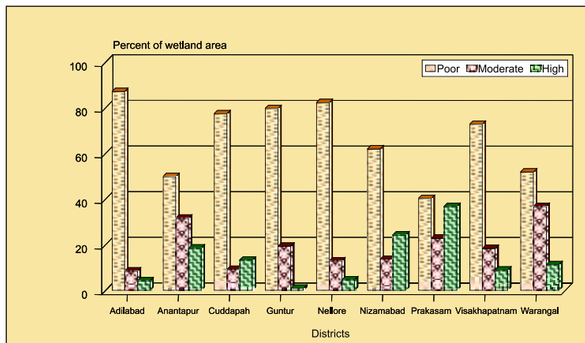
Turbidity pattern in the wetlands in select districts

Turbidity

Wetlands of Warrangal have low turbidity. In Cuddapah, Guntur and Visakhapatnam districts, most wetlands had medium turbidity. Nellore has higher proportion of wetland area under high turbidity, while in Adilabad district, the proportion of wetland area under medium and high turbidity was almost the same. The data on turbidity levels for these districts show 60-90% of high to moderate levels of sediments. The wetlands with forested catchments, on the other hand, show relatively low turbidity as observed in Visakhapatnam district.



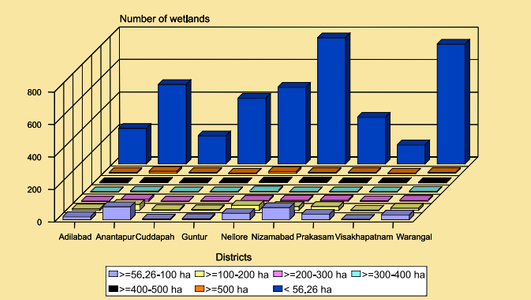
Area under different wetland classes in select districts



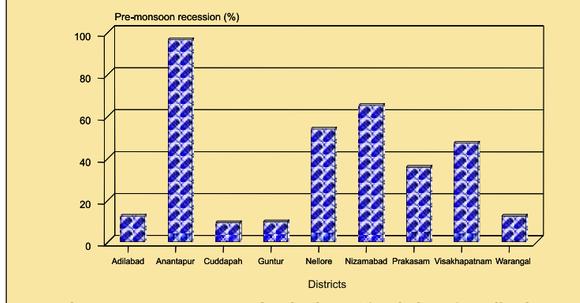
Aquatic vegetation in the wetlands in the select districts

Summer recession of water

The summer recession among the wetlands varied from less than 10% to almost 100%. Guntur and Cuddapah districts have shown minimum recession, whereas the highest summer recession was recorded from Anantapur district.



Size class distribution in select districts



Average summer recession in the wetlands in select districts

Ashish Pitty

Maps not to scale

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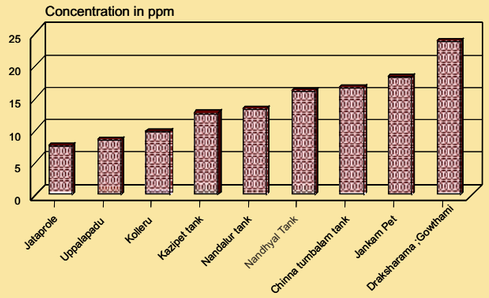
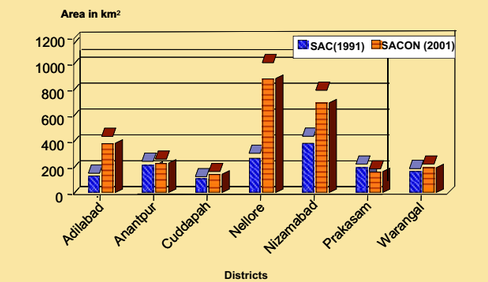


Zinc contamination in select wetlands



Difference in Total Wetland Area (km²) in select districts



B. Sinha

Attributes of wetlands and environmental contamination

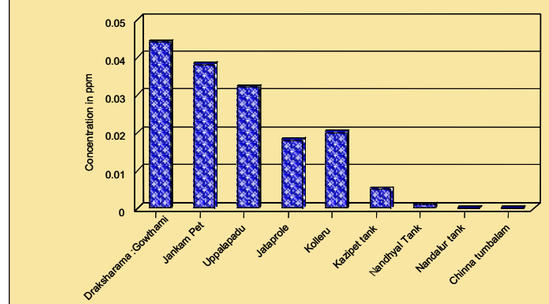
Heavy metals

Among the wetlands, fishes of Draksharama of East Godavari district has the maximum concentrations of zinc followed by Jankampet. The levels of lead, cadmium, copper and chromium are below the permissible limits. On an average, among the species, *Channa striatus* recorded the maximum concentrations of lead, which is twice higher than that in *Cirrhinus mrigala*. Detectable concentrations of other metals were observed but they were well below the toxicity levels. The variation in contamination among the wetlands and species is significant for lead and zinc.

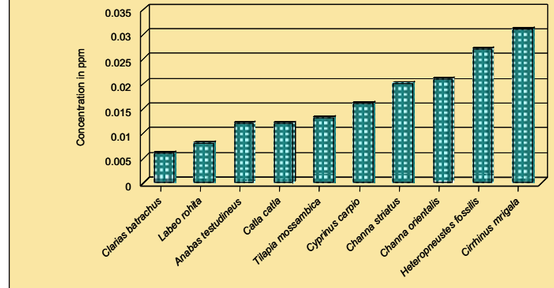
Pesticides

Fishes of Draksharama of East Godavari district has the maximum load of average organochlorine residues followed by Jankampet of Nizamabad district and Uppalapadu of Guntur district. All other wetlands have less than 0.02 ppm of total pesticide concentration, while Nandhyal tank in Kurnool district, Nandalur tank of Cuddapah district and Chinna Tumbalam tank of Kurnool district have the lowest. The annual pesticide consumption is estimated to be 4054 mt. According to a report published by ICAR, 57.1% of the bovine milk and 30% of the vegetables and fruits are contaminated with DDT. However, the present study shows that the fishes are safe for human consumption.

Ashish Pitty



Total organochlorine residues among select wetlands



Total organochlorine residues among various species of fishes



Ameen Ahmed

Maps not to scale

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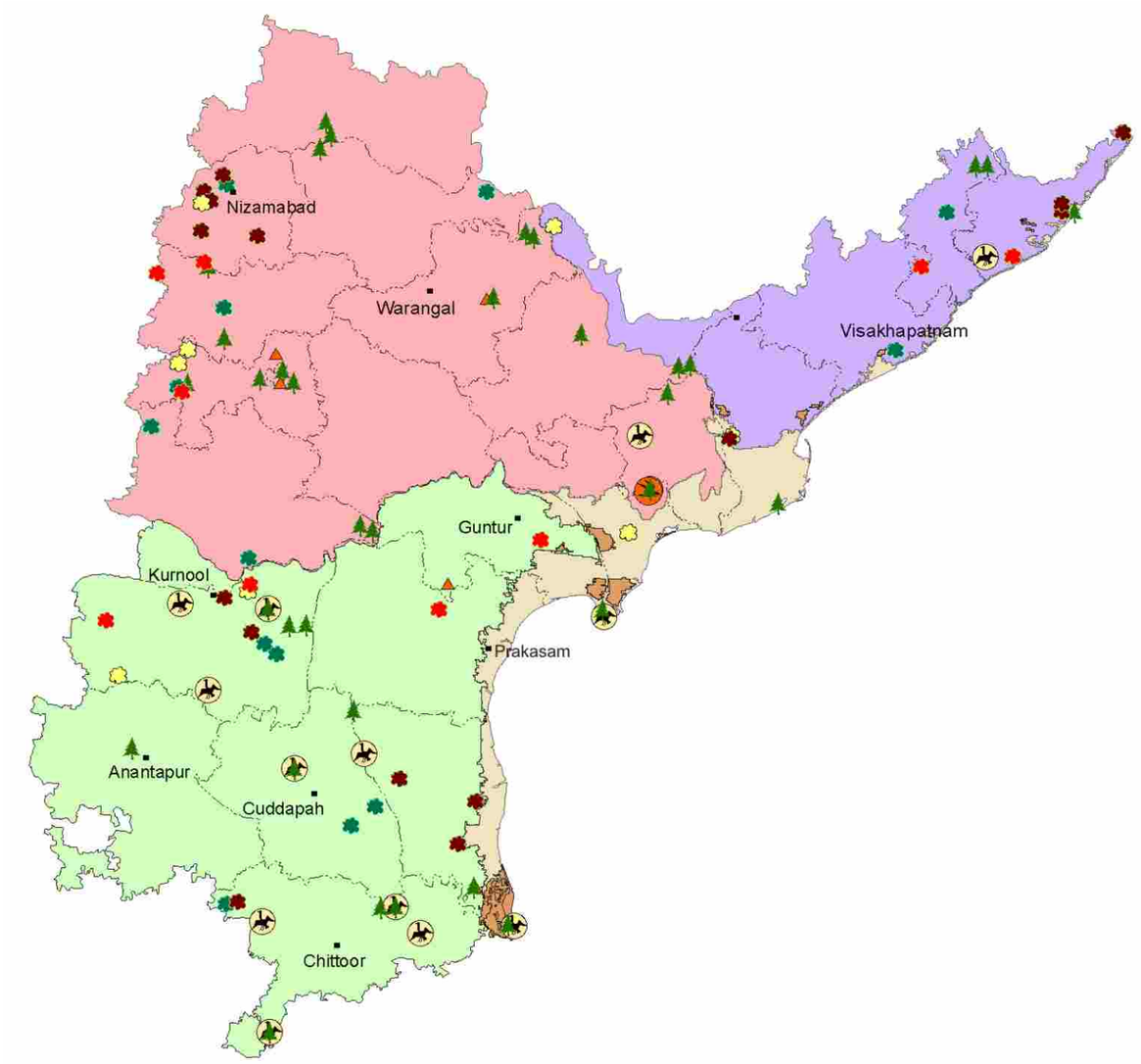
Prioritized inland wetlands of Andhra Pradesh



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*
- *Ramsar Site*

Biogeographic Provinces

- *6C, Deccan Peninsula-Eastern Highlands*
- *6D, Deccan Peninsula-Central Plateau*
- *6E, Deccan Peninsula-Deccan South*
- *8B, Coasts-East Coast*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Andhra Pradesh

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ALISAGAR	NIZAMABAD	184200	795900	JANKAMPET	3	H	6D
BANSWADA	NIZAMABAD	182300	775300	BANSWADA	4	M	6D
BELLAL TANK	NIZAMABAD	184000	775400	BODHAN	4	H	6D
CHIKKADPALLY	NIZAMABAD	182800	802900	RUDRUR	2	M	6C
CHINNA THUMBALAM	KURNOOL	153800	771700	ADONI	1	H	6E
DALI TANK	SRIKAKULAM	183400	832300	TEKKALI	4	L	6C
DOULATABAD CHERUVU	MAHBUBNAGAR	170000	773400	KONDALGAL	3	H	6D
GANGAYAPURAM PEDDA TANK	KURNOOL	154900	780800	KURNOOL	4	M	6E
GODAVARI RIVER	EAST GODAVARI	170000	814800	KAKINADA	2	L	6C
GUDUR TANK	NELLORE	140800	795100	GUDUR TOWN	4	L	6E
IBRAHIMPUR	RANGAREDDY	171700	774500	PARGI	3	M	6D
ISSALPET	NIZAMABAD	182130	781800	ISSALPET TOWN	4	H	6D
JAMUKULADINNE	PRAKASAM	154600	794100	DARSI	1	L	6E
JANKAMPET TANK	NIZAMABAD	184300	780400	JANKAMPET	3	H	6D
JATAPROLE TANK	MAHBUBNAGAR	160600	781800	KOLLAPUR	3	L	6D
KALIGIRI RESERVOIR	NELLORE	143448	792512	NELLORE	4	L	6E
KODAD LAKE	NALGONDA	170100	795700	KODAD TOWN	4	M	6D
KODAKARLA	VISAKHAPATNAM	161912	810300	ANARAPALLI	2	L	8B
KOLLERU LAKE	WEST GODAVARI	173600	830000	ELURU	3	L	6C
KOTPALLI	RANGAREDDY	172700	774500	VIKRABAD	2	M	6D
LAKNAPUR	RANGAREDDY	173300	774900	PAGRI	2	L	6D
MITTEKODURU	RANGAREDDY	171500	774700	PARGI	1	M	6D
NANDALUR TANK	CUDDAPAH	141500	790500	CUDAPPA HQ	3	M	6E
NANDYAL TANK	KURNOOL	153000	782600	NANDYAL TOWN	3	H	6E
NASRULLABAD	NIZAMABAD	183600	775700	NASRULLABAD	4	M	6D
NAVIPET TANK	NIZAMABAD	184700	780200	NAVIPET	4	M	6D
NELLORE TANK	NELLORE	142600	795800	N.A.	4	L	6E
NIZAMSAGAR RESERVOIR	NIZAMABAD	181000	775500	PITLAM	1	M	6D
NOWPADA SWAMPS	SRIKAKULAM	183336	841400	TEKKALI	3	H	6C
PALEM RESERVOIR	MAHBUBNAGAR	153500	782000	KURNOOL NAGAR	4	M	6E
PATHA-KOTHA CHERUVU	ANANTAPUR	151500	772300	GUNTAKAL	2	M	6E
PAVUMANCHALA	KURNOOL	155200	781800	NANDIKOTKUR	2	H	6E
PEDDATIPPA SAMUDRAM	CHITTOOR	134100	781200	MANDANAPALLE	3	H	6E
POCHARAM	MEDAK	180448	773412	MEDAK TOWN	1	L	6D
PUNYAKSHETRAM	EAST GODAVARI	165900	814700	RAJAMUNDRY	4	L	6C
RANGASAMUDRAM	CHITTOOR	134200	781700	MANDANAPALLE	4	M	6E
RUDRUR	NIZAMABAD	183500	775300	RUDRUR	2	H	6D
SANGAMESHWARA BACKWATERS	KURNOOL	155500	781900	NANDIKOTKUR	1	H	6E
SASANAM	SRIKAKULAM	183700	841400	TEKKALI	4	L	6C
SINGOOR DAM	MEDAK	142300	791500	JOGIPET	3	M	6E
SOMASILA	CUDDAPAH	175100	780400	N.A.	3	L	6D
TAMADAPALLI TANK	KURNOOL	152600	783100	NANDYAL	3	H	6E
TELIKUNCHI	SRIKAKULAM	190636	844200	ICHHAPURAM	4	L	6C
TELINEELAPURAM VILLAGE	SRIKAKULAM	181500	835200	TEKKALI	1	L	6C
THATTIPUDI	VIZIANAGARAM	181100	831130	VIZAG	1	L	6C
UPPALAPADU	GUNTUR	161600	802500	GUNTUR	1	L	6E

Note:- In Damercharla, Katakshapur tank, Bhadrakali tank, Nirukula,Hussain sagar, Warangal,Anantaram,Thummalaguda and Draksharama: Gowthami information is not available; N.A.- Not Available/Data Deficient; L-Low,M-Medium,H-High.

Ashish Pitty

Maps not to scale

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Acharya

ARUNACHAL PRADESH

ARUNACHAL PRADESH

Habitat features

Arunachal Pradesh has 806 wetlands of the size 2.25 ha and above, covering an area of about 562.65 km^2(SAC, 1998). Thus, 0.67% of the total geographic area of the state is constituted by wetlands.

Four types of wetlands are described. Although the number of lakes/ponds and waterlogged wetlands did not vary much, the total wetland area varies significantly. The lakes are further classified into four, namely oxbow lakes or cut-off meanders, tectonic/landslide lakes, glacial lakes and artificial reservoirs.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	5	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	3	14	17	N.A.	N.A.
Turtles	N.A.	N.A.	2	2	N.A.	5	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	6	1	N.A.

Prioritized Sites

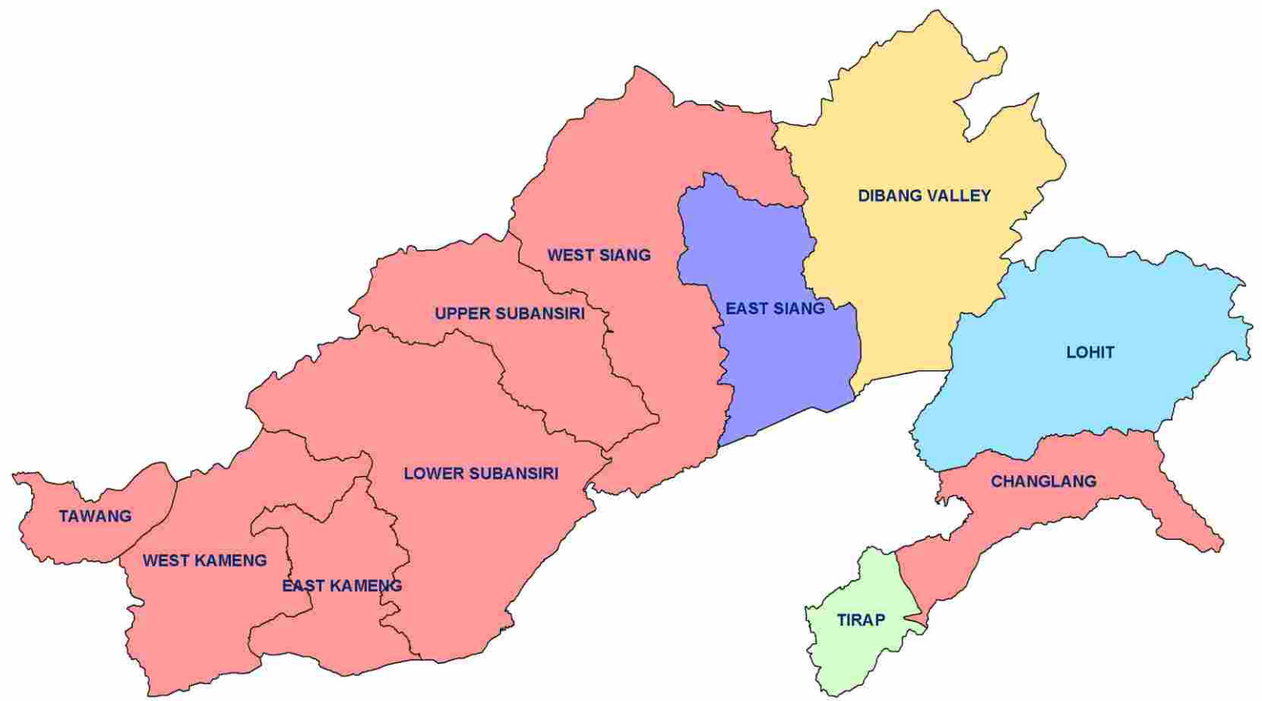
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3
18	8	3	7

The eight top ranking wetlands qualify to be declared as Ramsar sites (page 215).

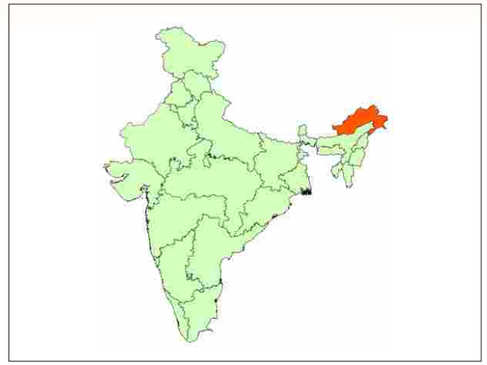


V.S. Vijayan

A profile of wetlands in Arunachal Pradesh



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
CHANGLANG	4662	1.74	0.04
DIBANG VALLEY	13029	123.60	0.95
EAST KAMENG	4134	12.35	0.30
EAST SIANG	3895	164.30	4.22
LOHIT	11402	187.91	1.65
LOWER SUBANSIRI	9548	6.13	0.06
TAWANG	3462	7.27	0.21
TIRAP	2362	25.25	1.07
UPPER SUBANSIRI	7032	1.81	0.03
WEST KAMENG	7422	19.05	0.26
WEST SIANG	8033	13.24	0.16

Maps not to scale

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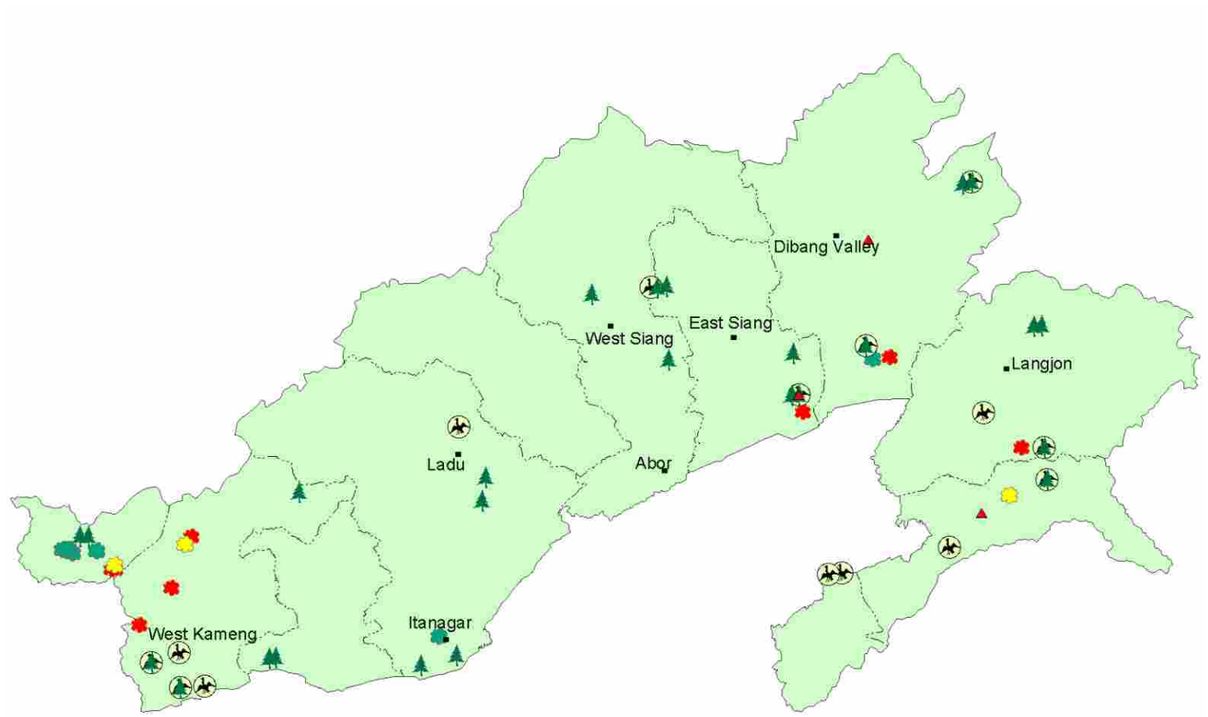
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Prioritized inland wetlands of Arunachal Pradesh



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *2D, Himalaya-East Himalaya*
- *9A, North East-Brahmaputra Valley*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Arunachal Pradesh

PRIORITIZED SITE	LATITUDE	LONGITUDE	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
DHONCHANG TSO	273800	922500	1	M	2D
DUNGPIN TSO	273100	920200	1	M	2D
ENROUTE TO T GOMPHA	273700	914800	3	M	2D
GANGA LAKE	270700	933500	3	M	2D
GESHELA WETLANDS	273600	915700	3	M	2D
GLAO LAKE	274200	963000	1	M	2D
GORJO TSO	273600	922300	2	M	2D
JAPANG BEEL	275700	952700	1	L	2D
LAMCHUER TSO	273100	920100	1	M	2D
MANDELA PHUDUNG WETLANDS	271600	920800	1	M	2D
MEHAO LAKE	280900	955400	1	M	2D
MOTI JHEEL RANI JHEEL RAJA JHEEL	273000	962500	2	M	2D
NEAR Y-JN.	273700	914900	3	M	2D
PT SHO & LAKES S OF NAGULA PASS	273600	915000	3	M	2D
SALLY LAKE	280900	954900	3	M	2D
SANGETSAR/SAGHESWAR LAKE	273700	914700	3	M	2D
SANGTI MARSHES	272500	921800	1	M	2D
SELA LAKE	273200	920200	2	M	2D

Note:- District name and nearest town is not available/Data Deficient; M-Medium, L-Low.

Anwaruddin Chaudhary

Maps not to scale

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Acharya

ASSAM

A profile of wetlands in Assam

Habitat features

Assam has 3513 wetlands of the size 2.25 ha and above, covering 1012.25 km^2 (ARSAC, 1997 & SAC, 1998). Thus, 1.29% of the total geographic area of the state is constituted by wetlands.

Wetland distribution in three districts is given on page 23.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	2	7	25	34	N.A.	N.A.
Turtles	N.A.	N.A.	4	6	N.A.	5	2
Birds	N.A.	N.A.	N.A.	N.A.	12	8	N.A.

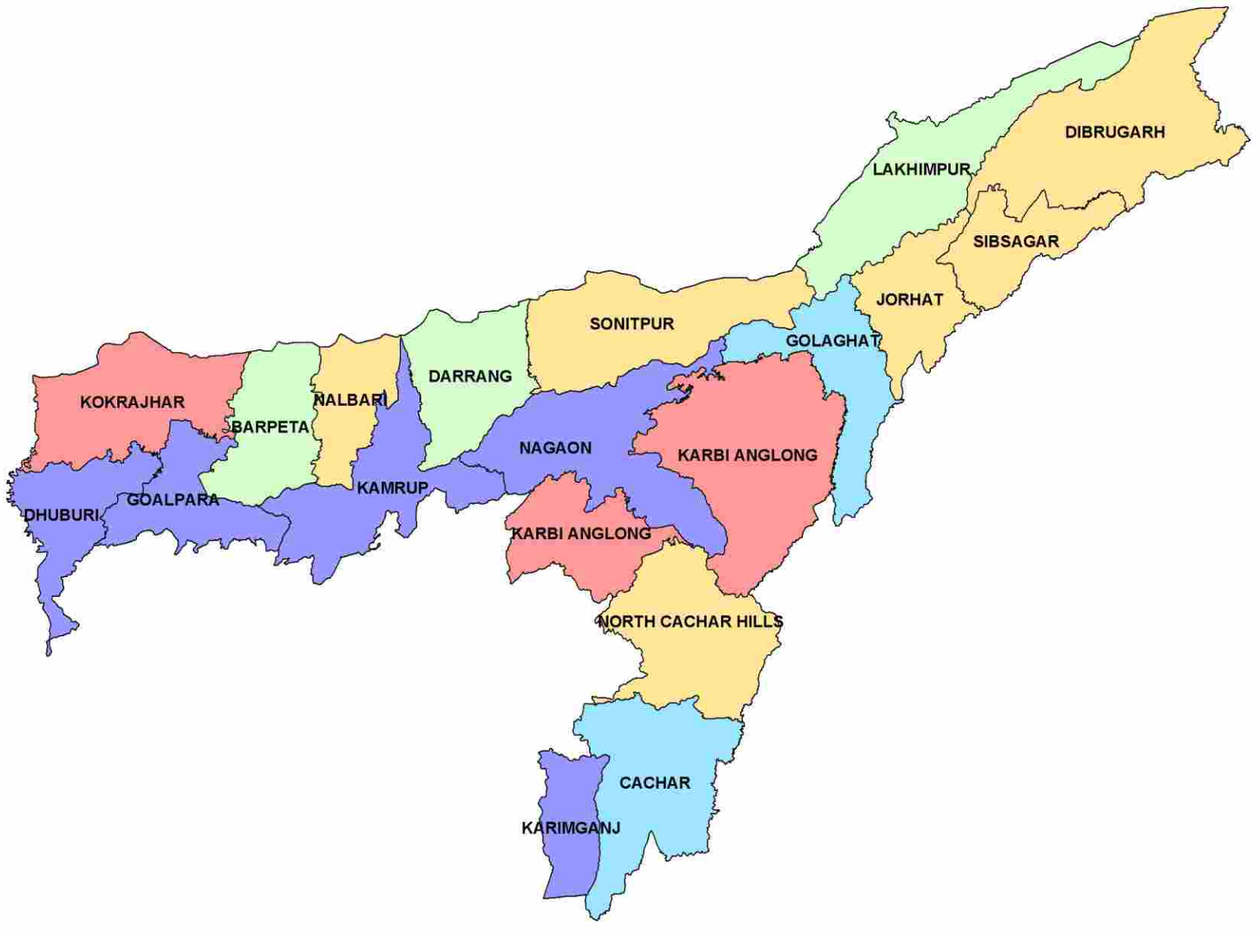
Prioritized Sites

Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
75	25	28	17	5

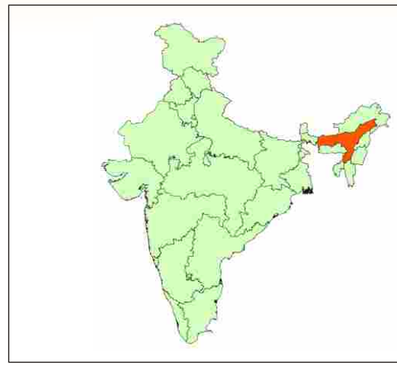
Twenty four wetlands are qualified to be declared as Ramsar sites (page 215).



A-V Library, WII



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BARPETA	3245	33.01	1.02
CACHAR	3786	71.88	1.90
DARRANG	3481	35.15	1.01
DHUBURI	2798	64.59	2.31
DIBRUGARH	3381	27.52	0.81
GOALPARA	1824	38.32	2.10
GOLAGHAT	3502	54.67	1.56
JORHAT	2851	21.08	0.74
KAMRUP	4345	114.07	2.63
KARBI ANGLONG	10434	8.97	0.09
KARIMGANJ	1809	57.19	3.16
KOKRAJHAR	3169	15.78	0.50
LAKHIMPUR	2277	30.33	1.33
NAGAON	3831	112.95	2.95
NALBARI	2257	19.88	0.88
NORTH CACHAR HILLS	4888	25.52	0.52
SIBSAGAR	2668	21.35	0.80
SONITPUR	5324	36.51	0.69

Maps not to scale

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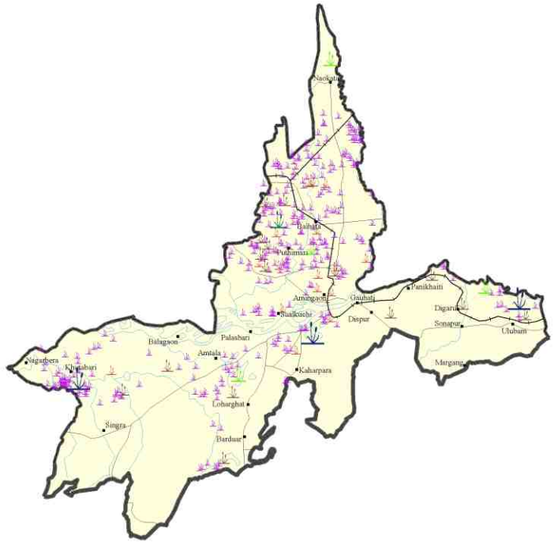
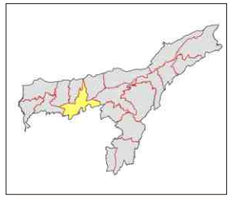
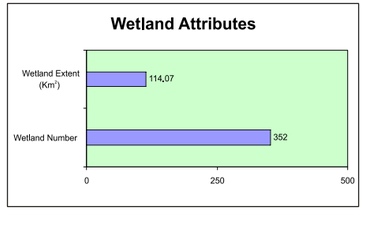
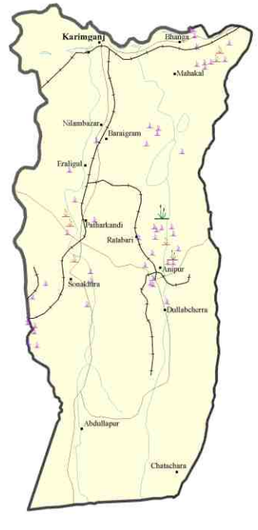
District - wise spatial distribution of wetlands



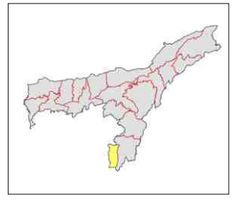
District Kamrup

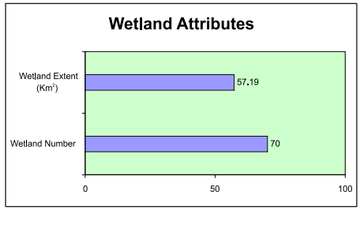


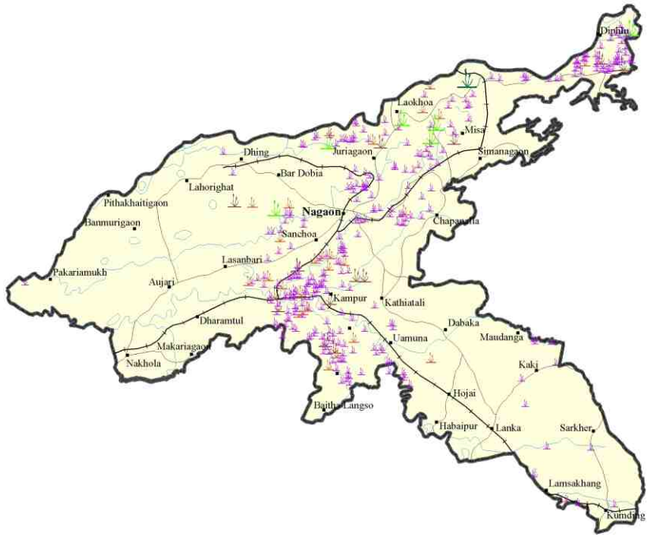




District Karimganj

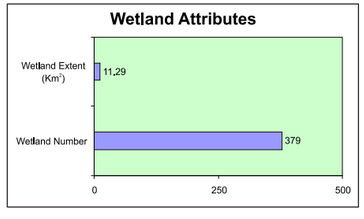






District Nagaon







Anwaruddin Chaudhary

Source: Wetland point data; Assam Remote Sensing Applications Centre, Guahati

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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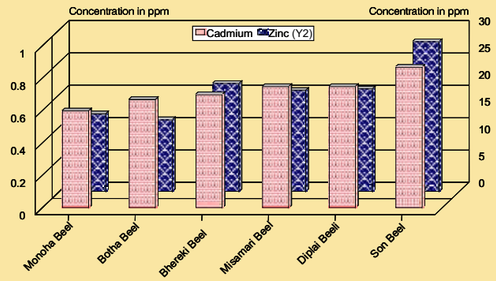
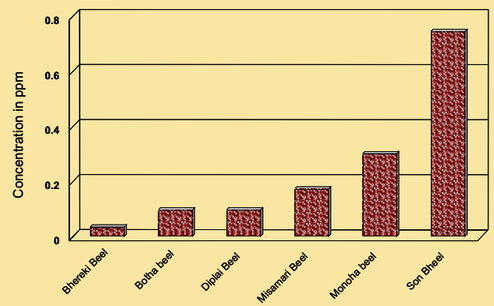


Zinc and Cadmium contamination in select wetlands



Total organochlorine residues among select wetlands



Wil, A-V Library

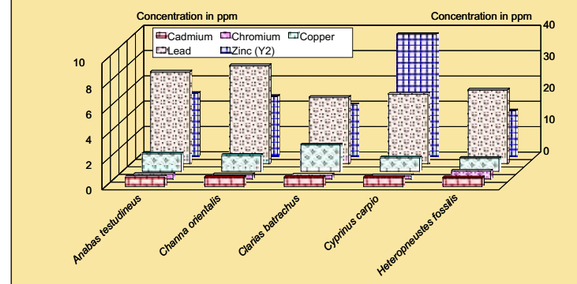
Attributes of wetlands and environmental contamination

Heavy metals

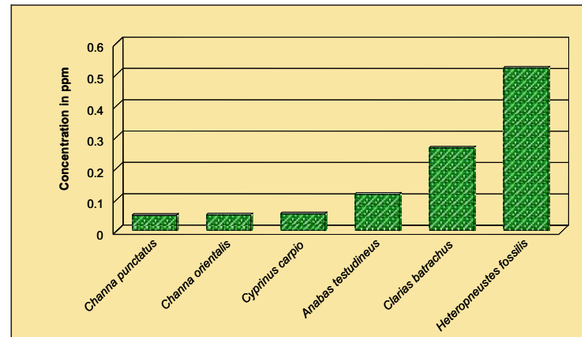
Of all the wetlands, Son beel has the maximum concentrations of zinc and cadmium. Lead is the highest in Misamari beel, while chromium and copper are the highest in Monoha beel and Diplai beel respectively. Variation in the magnitude of contamination is significant. Among each of the five species of fishes, the highest concentration of at least, one of the metals is found. *Channa orientalis, Heteropneustes fossilis, Cyprinus carpio, Clarias batrachus* and *Anabas testudineus* recorded the highest concentrations of lead, chromium, zinc, copper and cadmium copper respectively.

Pesticides

With 80 to 90% of fishes contaminated, Assam stands the most contaminated state in the country. Variation in the magnitude of contamination among the wetlands is significant.On an average, among the wetlands, Son beel of Karimganj has the highest load of total organochlorine residues followed by Monoha beel of Morigaon district and Misamari beel of Jorhat district, whereas the lowest concentrations are recorded in Bhereki beel of Jorhat district. One of the major reasons for the decline in fish catch could be pesticides. It is to be noted that the annual pesticide consumption in Assam is 260 mt. About 45 to 85% of the vegetables and fruits are contaminated with organochlorine residues according to a report from ICAR. *Oreochromis mossambicus* from Son beel exceeds the tolerance levels of HCH recommended for human consumption.



Heavy metal contamination among select species of fishes



Total organochlorine residues among various species of fishes



Anwaruddin Chaudhary

V.S. Vijayan

Maps not to scale

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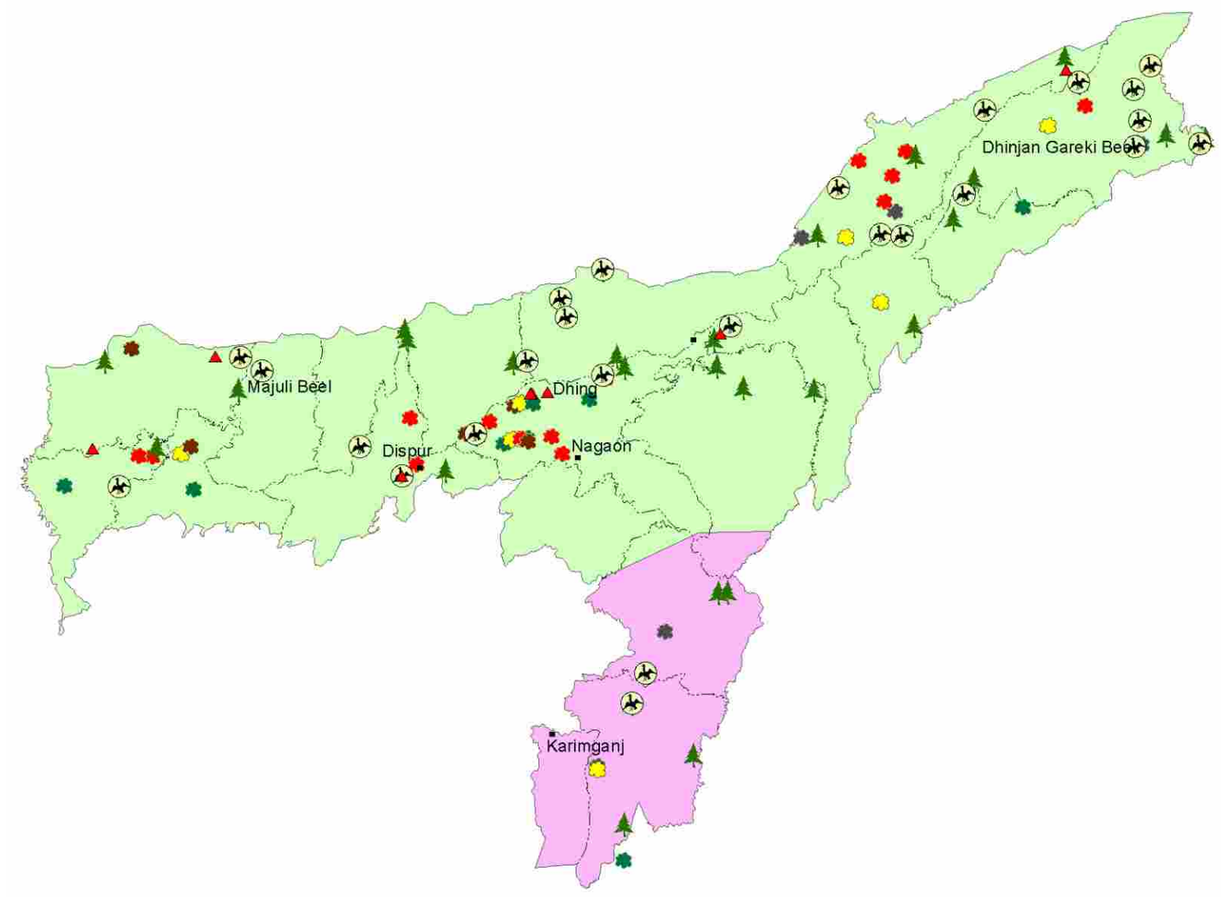
Prioritized inland wetlands of Assam



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *7B, Gangetic Plain-Lower Gangetic Plain*
- *9A, North East-Brahmaputra Valley*
- *9B, North East-North East Hills*
- *District Boundaries*
- *Ramser site*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Assam

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
BARDOLONI	DHEMAJI	270400	940400	DHEMAJI	2	H	9A
BHAKATGAON BEEL	MORIGAON	261500	922000	MORIGAON	3	L	9A
BHEREKI BEEL	KAMALABARI	262300	914400	KAMALABARI	1	M	9A
BHOTA BEEL	KAMRUP	261000	914500	GUWAHATI	1	H	9A
BORALIMORI BEEL	JORHAT	264500	941300	JORHAT	2	H	9A
BORDOIBAM BEELMUKH B S	LAKHIMPUR	272000	942000	LAKHIMPUR	1	M	9A
CHATLA HAOR	CACHAR	241500	924000	SILCHAR	3	H	9B
DANDUWA BEEL	MORIGAON	261500	921700	MORIGAON	1	M	9A
DEOBALI BEEL	NAGAON	261500	922730	NAGAON	1	M	9A
DHEER BEEL	KOKRAJHAR	261651	902314	KOKRAJHAR	1	H	9A
DIGHALI BEEL	JORHAT	271300	941700	JORHAT	1	H	9A
DINJAN GEREKI BEEL	TINSUKIA	273000	951000	CHABUA	2	L	9A
DIPLAI BEEL	KOKRAJHAR	261715	901911	KOKRAJHAR	1	L	9A
DOLONI BEEL	BONGAIGAON	261707	903209	BONGAIGAON	2	M	9A
HARIBHANGA BEEL	NAGOAN	261000	923030	TEZPUR-S	1	M	9A
JAMJING SENGAJAN WETLANDS	JONAI	270800	950000	JONAI	3	H	9A
KHAMTI GUWALI BEEL	TINSUKIA	264500	941300	TINSUKIA	1	L	9A
KURUA BEEL	KAMRUP	261000	914500	GUWAHATI	1	H	9A
KUZI BEEL COMPLEX	NAGAON	262430	922231	NAGAON	3	M	9A
LALI RIVER BEEL	MORIGAON	262415	921640	MORIGAON	4	H	9A
MACH BHANDAR BEEL	KOKRAJHAR	264722	901855	KOKRAJHAR	4	L	9A
MAGURI BEEL	TINSUKIA	273434	952216	TINSUKIA	1	L	9A
MISAMARI BEEL	JORHAT	272625	942500	JORHAT	1	H	9A
MONOHA BEEL	MORIGAON	261400	921230	MORIGAON	3	M	9A
MORIKOLONG BEEL	MORIGAON	261500	921500	MORIGAON	2	H	9A
NANDINI-KARMARI BEEL	MORIGAON	262500	921830	MORIGAON	2	M	9A
PAKARIA-BRAHMAPUTRA RIVER COMPLEX	MORIGAON	261730	920100	MORIGAON	4	H	9A
POTAKALANG BEEL	NAGOAN	263000	924530	SAMOGURI	1	M	9A
SALMARI BEEL	MORIGAON	262030	920830	MORIGAON	1	M	9A
SAMOGURI BEEL	NAGOAN	262430	924000	NAGOAN	3	M	9A
SARESHWAR BEEL	GAURIPUR	261010	895529	GAURIPUR	3	M	9A
SARIYANI BEEL	LAKHIMPUR	272500	941000	LAKHIMPUR	1	M	9A
SATARYAJAN BEEL	LAKHIMPUR	272500	941000	LAKHIMPUR	1	M	9A
SOLMARI BEEL	MORIGAON	261500	921800	MORIGAON	1	M	9A
SON BEEL	HAILAKANDI	244100	923400	HAILAKANDI	2	H	9B
TAMRANGA-KONORA-PAROPOTA COMPLEX	BONGAIGAON	261900	903526	BONGAIGAON	4	H	9A
UDARI BEEL	MORIGAON	261400	922000	MORIGAON	4	L	9A
URPAD BEEL	GOALPARA	260654	903536	GOALPARA	3	M	9A

Note:- In Beedorou, Deepor beel, Dibru-Sowkhoa, Kapla beel, Kaziranga NP, Panidihing Phokoloi, Uprod beel, Auniati beel, Bauwwa, Bheriki (Majuli), Burhacchapori, WLS, Chandubi beel, Chariani beel, Chenimari marshes, Daimari R. F., Dhakinpat wetland, Upper Dihing, Kotabali, Laokhowa WLS, Maher beel, Orang NP, Pabitora WLS, Rata beel, Samarajan, Sonowa, Soulmari, Doom Duma RF, Jengdia beel, Angang beel, Gaurisagar tank, Joysagar tank, Lukka haor, Nameri NP, Sanai-Rupai WLS, Sapkali, Sibsagar tank and Umrangsu reservoir information is not available; L-Low, M-Medium,H-High.

Anwaruddin Chaudhary

Maps not to scale

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B.C. Chaudhary

Habitat features

Bihar and Jharkhand have 759 wetlands of the size 56.25 ha and above, covering an area of 1680.56 km^2 (BRSAC & SAC, 1998). The wetlands constitute 1.03% of the total geographic area of the state.

Maps on integrated land use and wetlands for five districts are prepared. The study shows that in the five districts, there are 3,666 wetlands of two ha. and above covering 996.01 km^2. These are shown in pages 27 to 31.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	5	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	5	14	19	N.A.	N.A.
Turtles	N.A.	1	2	6	N.A.	3	2
Birds	N.A.	N.A.	N.A.	N.A.	3	3	N.A.

Prioritized Sites

Number of Prioritized Wetlands	Rank 1	Rank 2	Data Deficient
42	3	3	36

Three wetlands are qualified to be declared as Ramsar sites (Page 215).



Parasarya

A profile of wetlands in Bihar and Jharkhand



Maps not to scale

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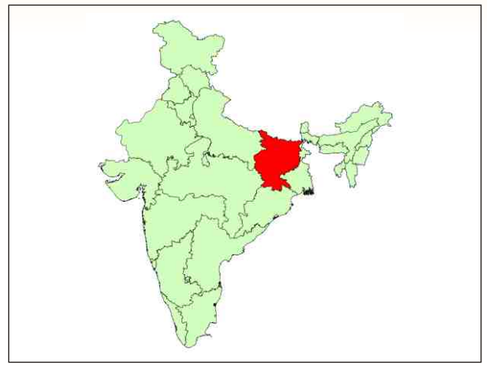
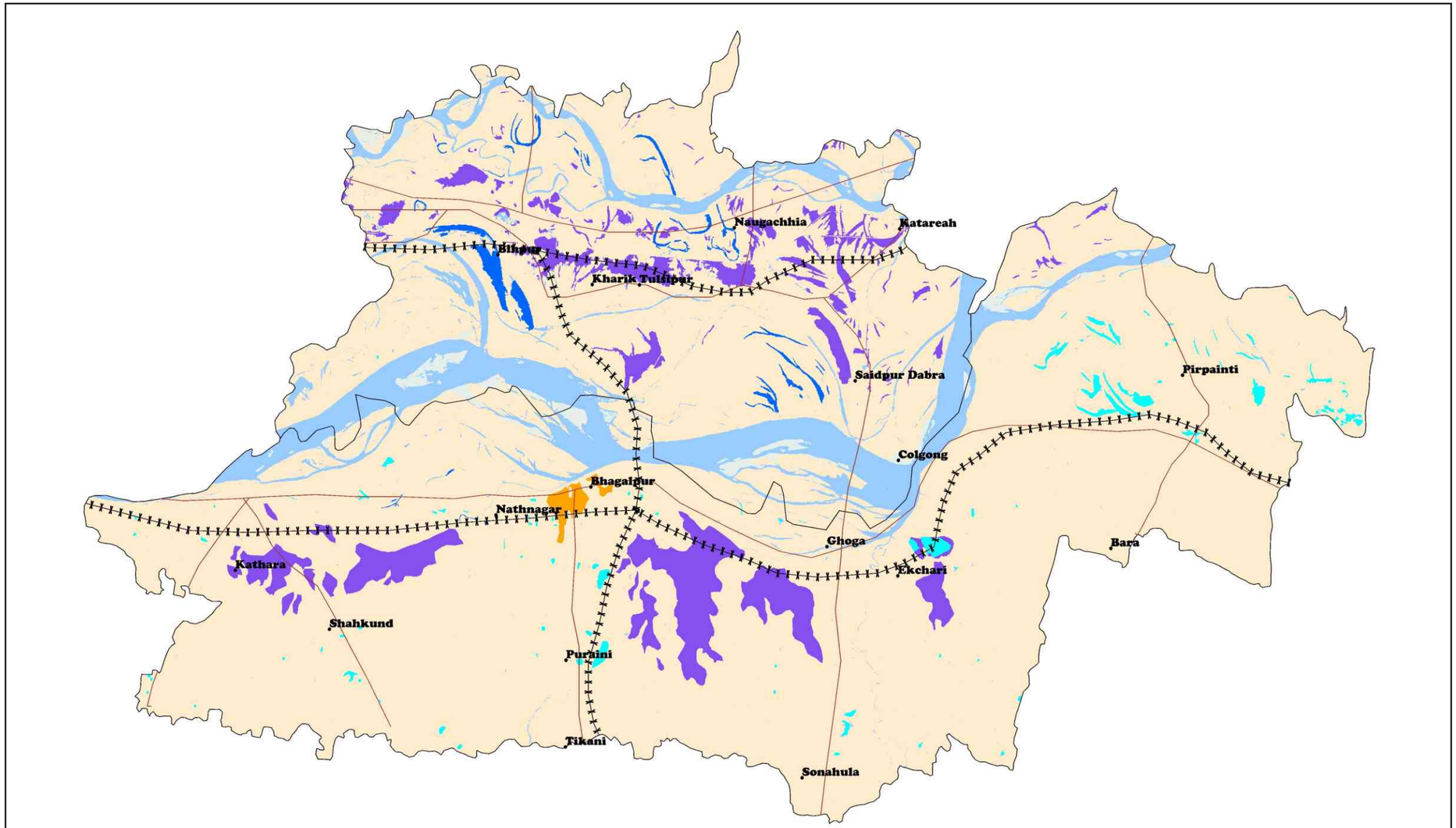
Aerial extent of wetland cover



DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AURANGABAD	3305	N.A.	0.00
BEGUSARAI	1918	42.48	2.21
BHAGALPUR	2569	103.10	4.01
BHOJPUR	2474	6.25	0.25
CHHAPRA	2641	169.25	6.41
DARBHANGA	2279	4.98	0.22
DEVGHAR	2479	N.A.	0.00
DHANBAD	2052	20.62	1.00
DUMKA	6212	N.A	0.00
GAYA	4976	N.A.	0.00
GIRIDIH	4975	126.25	2.54
GODDA	2110	1.87	0.09
GOPALGANJ	2033	43.05	2.12
GUMLA	9077	6.24	0.07
HAZARIBAG	6147	56.87	0.93
KATIHAR	3057	62.39	2.04
KHAGARIA	1486	45.60	3.07
LOHARDAGA	1491	N.A.	0.00
MADHEPURA	1788	N.A.	0.00
MADHUBANI	3501	21.85	0.62
MUNGER	1419	11.26	0.79
MUZAFFARPUR	3172	117.22	3.70
NALANDA	2355	N.A.	0.00
NAWADA	2494	1.25	0.05
PALAMU	8705	23.07	0.27
PASHCHIM CHAMPARAN	5228	65.59	1.25
PATNA	3202	16.88	0.53
PURBA CHAMPARAN	3968	158.79	4.00
PURNIA	7943	46.76	0.59
RANCHI	7698	26.86	0.35
ROHTAS	3851	N.A.	0.00
SAHARSA	1702	33.73	1.98
SAHIBGANJ	1599	11.23	0.70
SAMASTIPUR	2904	171.20	5.90
SINGHBHUM	13440	6.25	0.05
SITAMARHI	2200	85.48	3.89
SIWAN	2219	89.92	4.05

Integrated wetland and land use map



Integrated wetland type and land use

NP Dense Forest	Waste Land	Pond/Tank	Water-logged	Sand	Railways
NP Open Forest	River	NP Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary

NP * Not Present

District Bhagalpur, Bihar

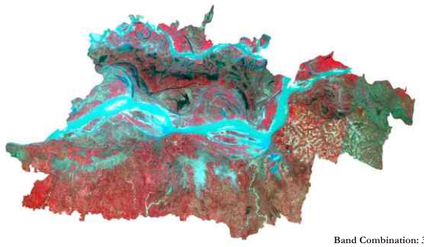
Location



Taluks/Tehsils

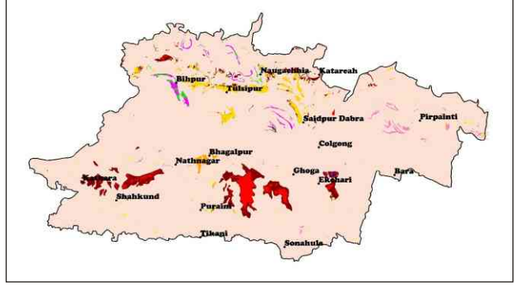


False colour composite



Band Combination: 3, 2, 1
IRS ID LISS III (December 2000)

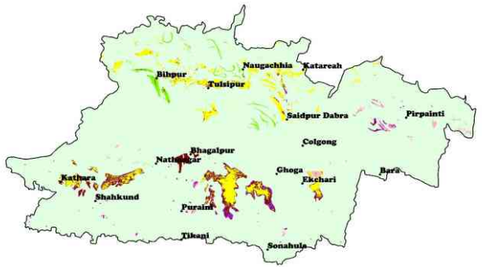
Wetland type and turbidity



Legend — Wetland / Turbidity

Wetland	Low	Medium	High
Pond/Tank			
Reservoir	NP	NP	NP
Water-logged			
Oxbow Lake/Cut-off			

Wetland type and aquatic vegetation



Legend — Wetland / Aquatic Vegetation

Wetland	Low	Medium	High
Pond/Tank			
Reservoir	NP	NP	NP
Water logged			
Oxbow Lake/Cut-off			

Maps not to scale

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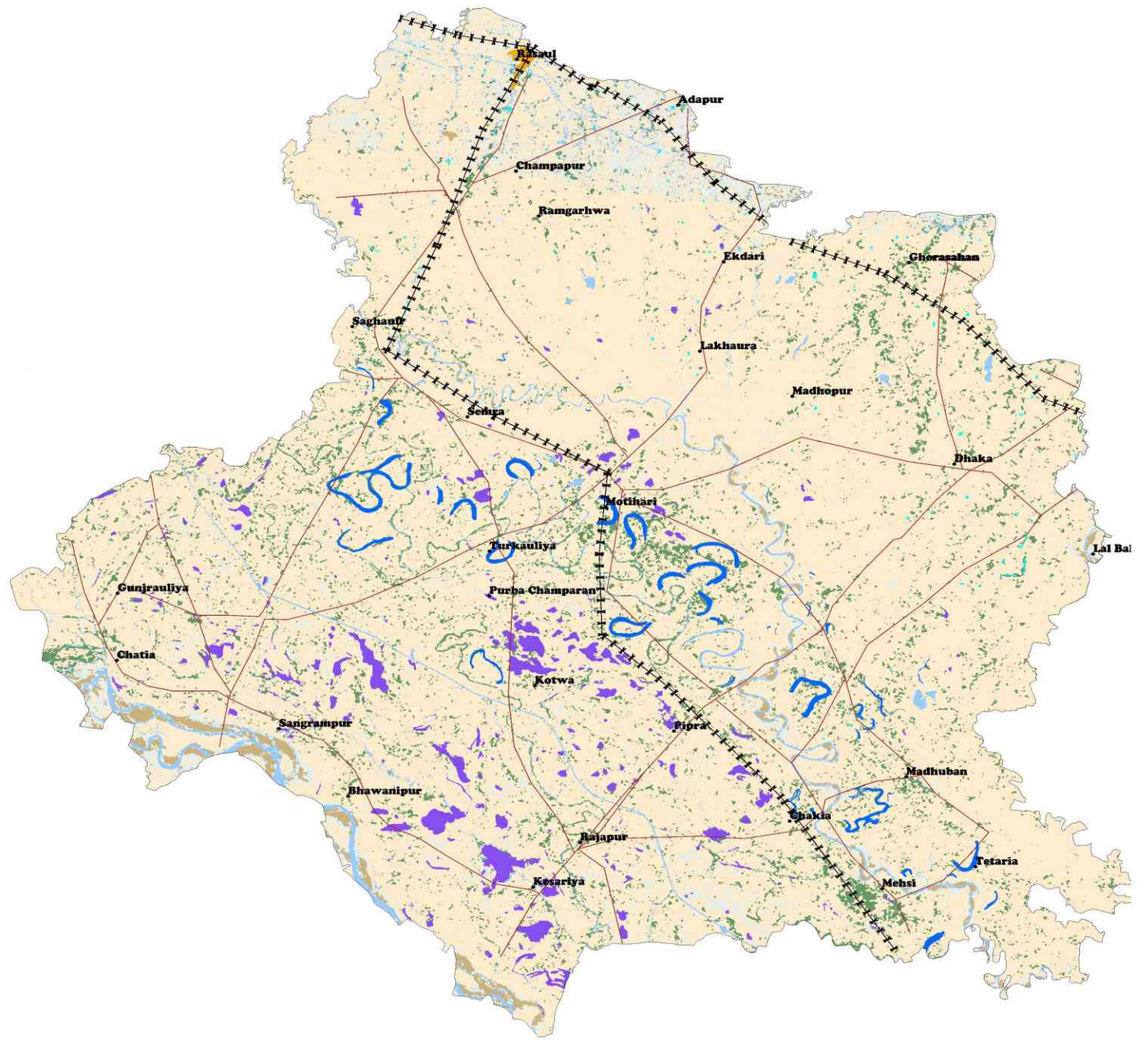
Regional Remote Sensing Service Centre, Kharagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



Integrated wetland type and land use

NP Dense Forest	Waste Land	Pond/Tank	Water-logged	Sand	Railways	NP	* Not Present
NP Open Forest	River	NP Reservoir	NP Coastal-water	Orchard	Tehsil Boundary		
Arable Land	Township	Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	District Boundary		

Maps not to scale

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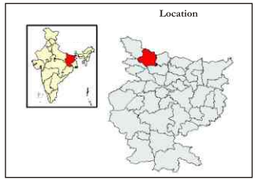
District East Champaran, Bihar

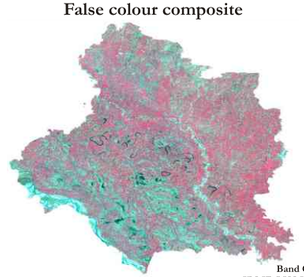
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS ID LISS III (December 2000)

Wetland type and turbidity



Legend — Wetland: Pond/Tank, Reservoir, Water-logged, Oxbow Lake/Cut-off; Turbidity: Low, Medium, High (NP)

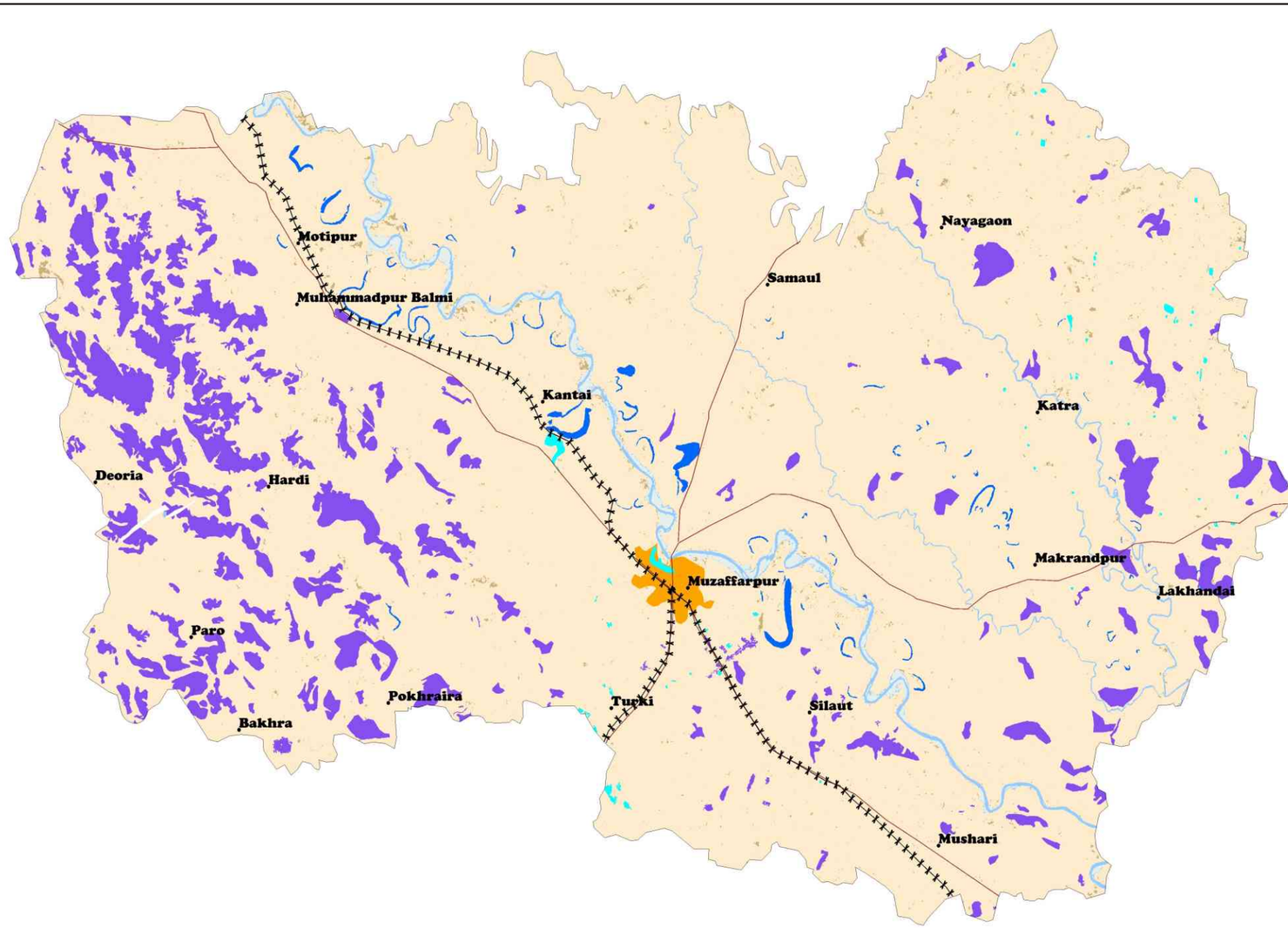
Wetland type and aquatic vegetation



Legend — Wetland: Pond/Tank, Reservoir, Water-logged, Oxbow Lake/Cut-off; Aquatic Vegetation: Low, Medium, High (NP)

Regional Remote Sensing Service Centre, Kharagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map

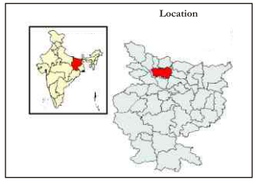


Integrated wetland type and land use

NP	Dense Forest		Waste Land		Pond/Tank		Water-logged		Sand		District Boundary
NP	Open Forest		River	NP	Reservoir	NP	Coastal-water		Roads	NP	* Not Present
	Arable Land		Township		Oxbow Lake/Cut-off	NP	Marsh/Mud		Railways		

District Muzaffarpur, Bihar

Location



Taluks/Tehsils

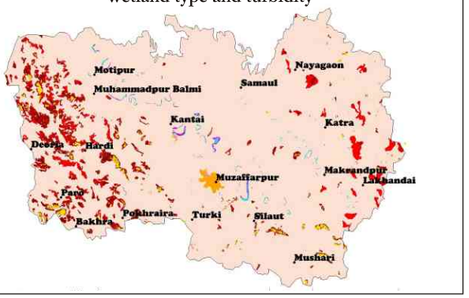


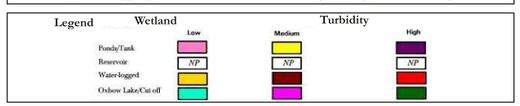
False colour composite



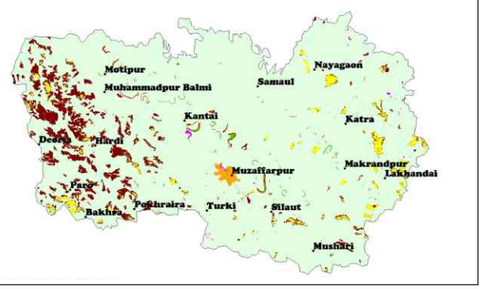
Band Combination: 3, 2, 1
IRS ID LISS III November, 2000)

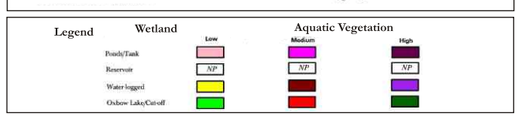
Wetland type and turbidity





Wetland type and aquatic vegetation





Maps not to scale

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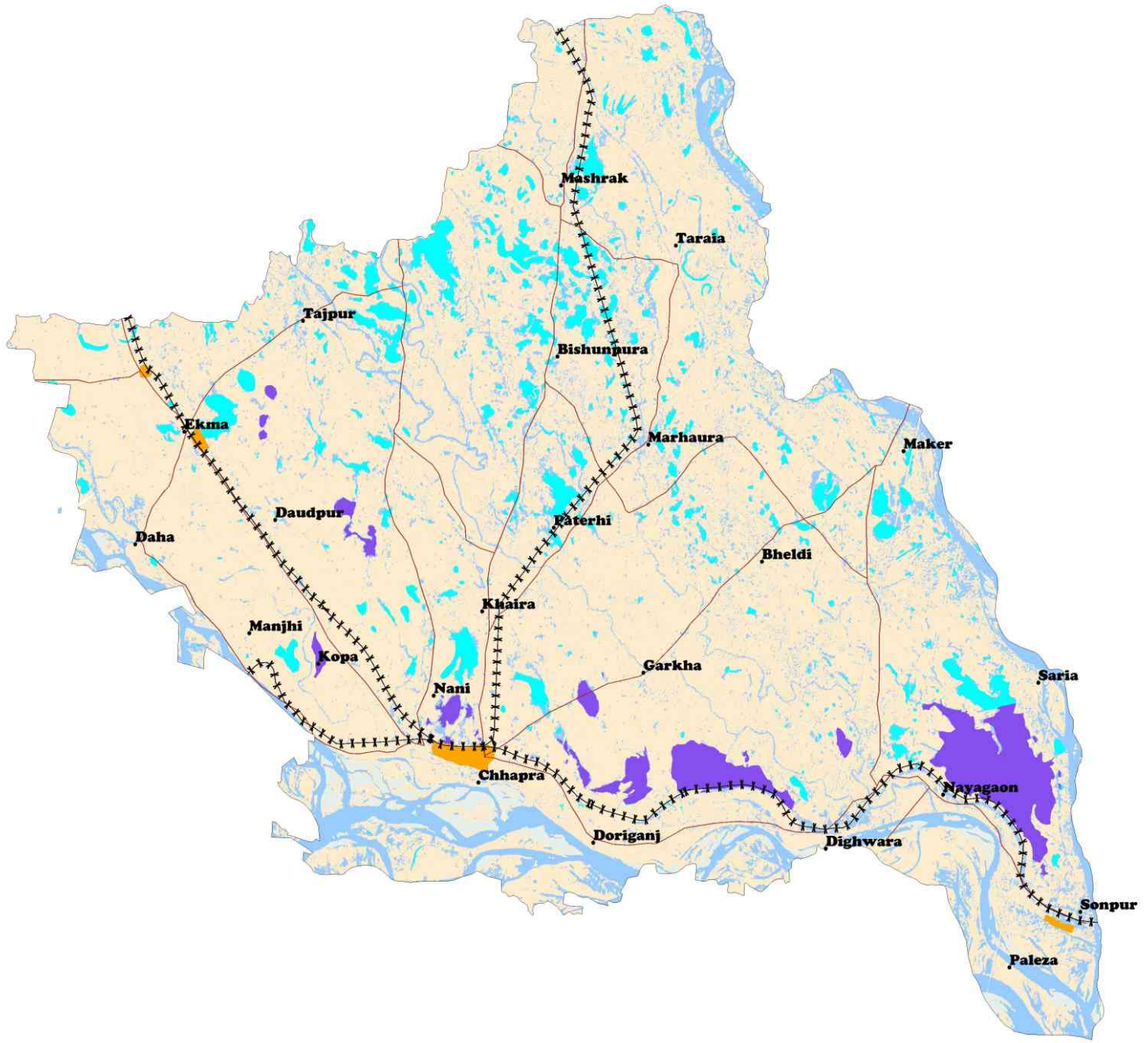
Integrated wetland and land use map

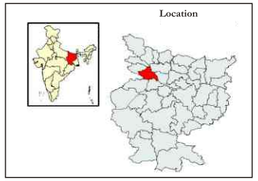


Integrated wetland type and land use

NP	Dense Forest		Waste Land		Pond/Tank		Water-logged		Sand		District Boundary
NP	Open Forest		River	NP	Reservoir	NP	Coastal-water		Roads	NP	* Not Present
	Arable Land		Township	NP	Oxbow Lake/Cut-off	NP	Marsh/Mud		Railways		

District Saran (Chhapra), Bihar

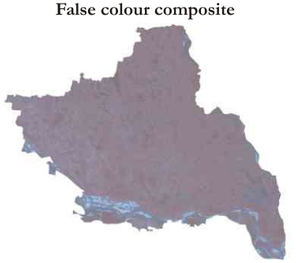
Location



Taluks/Tehsils

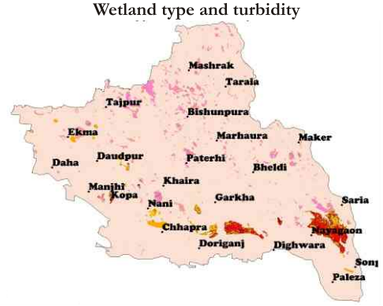


False colour composite



Band Combination: 3, 2, 1
IRS ID LISS III November, 2000)

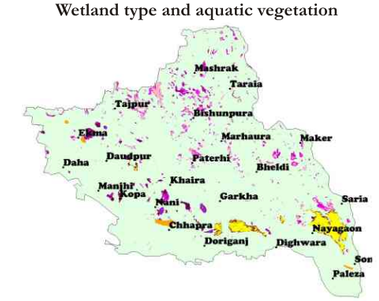
Wetland type and turbidity



Legend — Wetland / Turbidity

Wetland	Low	Medium	High
Ponds/Tank			
Reservoir	NP	NP	NP
Water-logged			
Oxbow Lake/Cut-off		NP	NP

Wetland type and aquatic vegetation



Legend — Wetland / Aquatic Vegetation

Wetland	Low	Medium	High
Ponds/Tank			
Reservoir	NP	NP	NP
Water-logged			
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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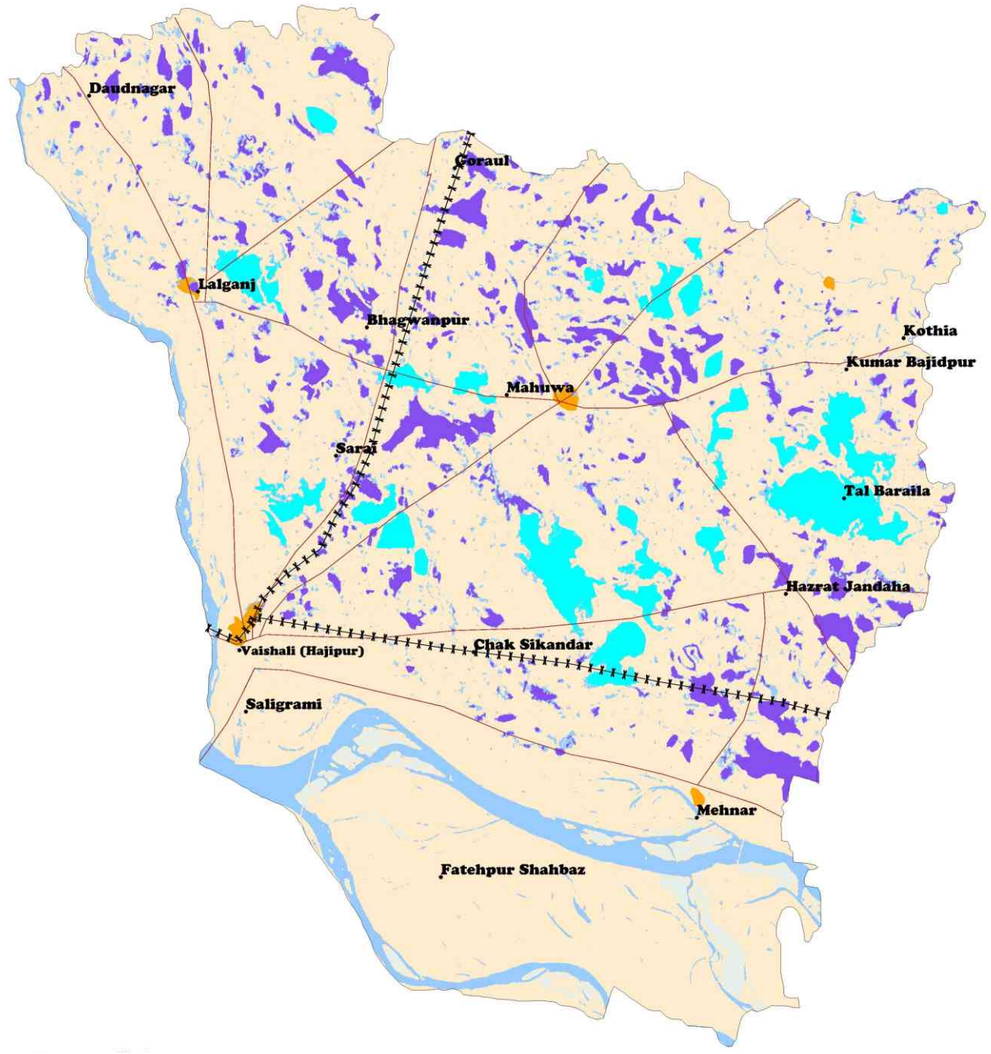
Integrated wetland and land use map

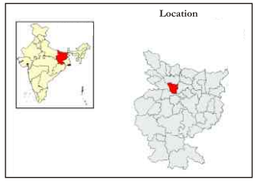


Integrated wetland type and land use

NP	Dense Forest	NP	Waste Land		Pond/Tank	NP	Oxbow Lake/Cut-off		Sand		Railways
NP	Open Forest		Township	NP	Reservoir	NP	Coastal-water	NP	Others		District Boundary
	Arable Land		River		Water-logged	NP	Marsh/Mud		Roads	NP	* Not Present

District Vaishali (Hajipur), Bihar

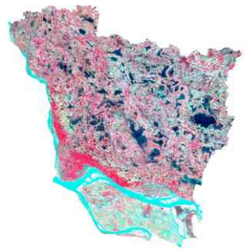
Location



Taluks/Tehsils



False colour composite



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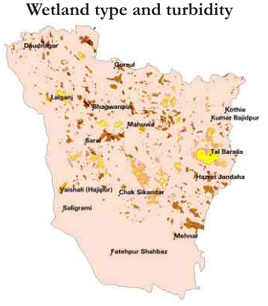
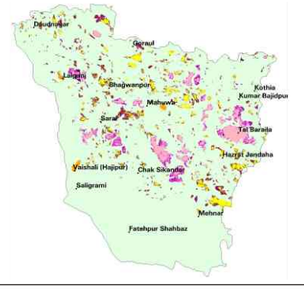
IRS ID-LISS III Data (November, 2000)

Wetland type and turbidity



Legend — Wetland: Pond/Tank, Reservoir, Water-logged, Oxbow — Turbidity: Low, Medium, High (NP)

Wetland type and aquatic vegetation



Legend — Wetland: Pond/Tank, Reservoir, Water-logged, Oxbow — Aquatic Vegetation: Low, Medium, High (NP)

Maps not to scale

Regional Remote Sensing Service Centre, Kharagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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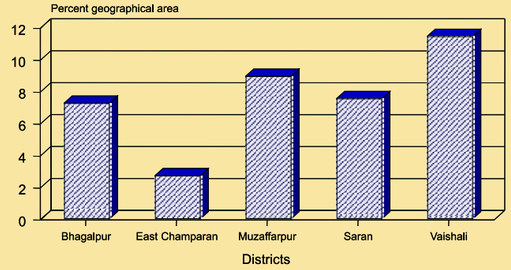
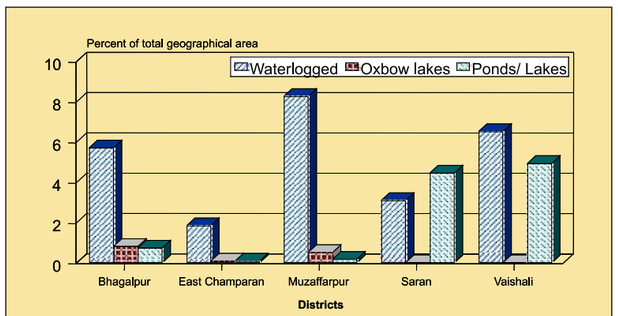
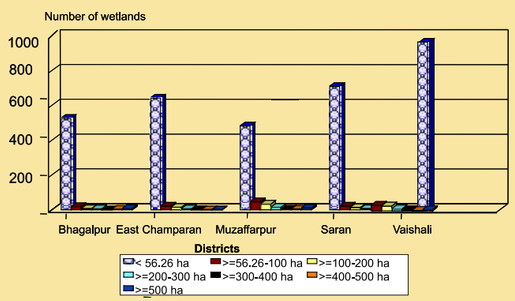


Area under wetland in select districts



Area under different wetland classes in select districts



Size class distribution of wetlands in select districts

Attributes of wetlands and environmental contamination

Wetlands

The areas under wetlands in the five districts vary from 2.71% (East Champaran) to 11.43% (Vaishali). The major type of wetland in all the districts, except for Saran, is waterlogged. In Saran, ponds and lakes are dominant while in Vaishali also they occupy a substantial area. It is notable that in all the five districts, there is a preponderance of smaller wetlands of the size less than 56.25 ha.

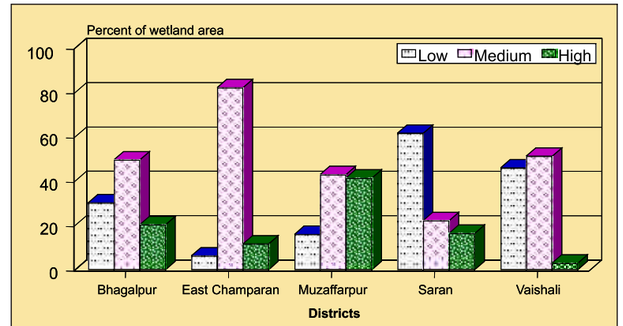
Turbidity

Wetlands in all the districts, except for those in Saran have medium turbidity. They are of low turbidity in Saran while those in Muzaffarpur have almost equal proportion of medium and high turbidity. The medium and high values of turbidity indicate higher level of sedimentation.

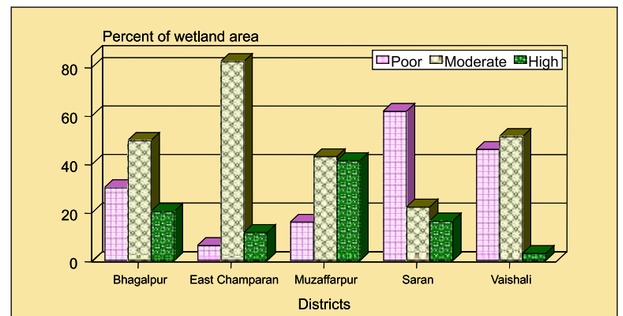
Summer recession of water

The summer recession was the highest in Bhagalpur, while it was the lowest in Muzaffarpur, at 16.86%.

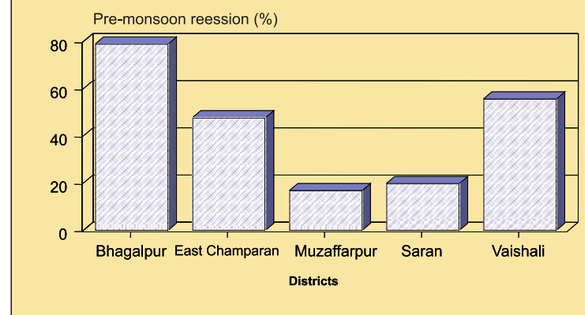
Achanya



Turbidity pattern in select districts



Aquatic vegetation in wetlands in select districts



Average summer recession in select districts

Maps not to scale

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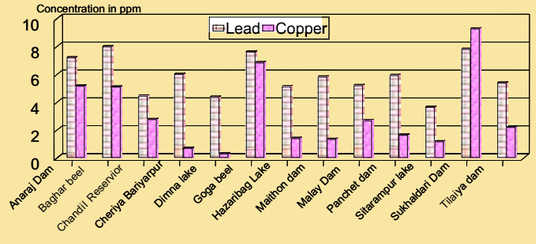
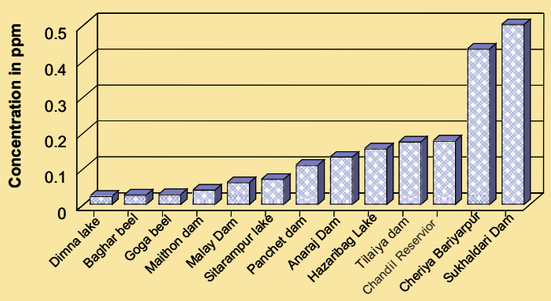
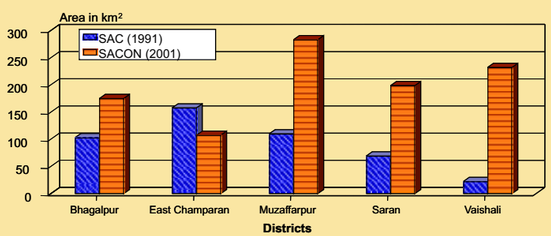


Lead and copper concentration in select wetlands



Organochlorine residues in various wetlands



Difference in total wetland area (km²) in select districts

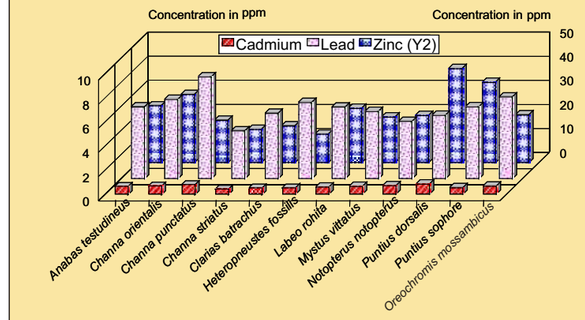
Attributes of wetlands and environmental contamination

Heavy metals

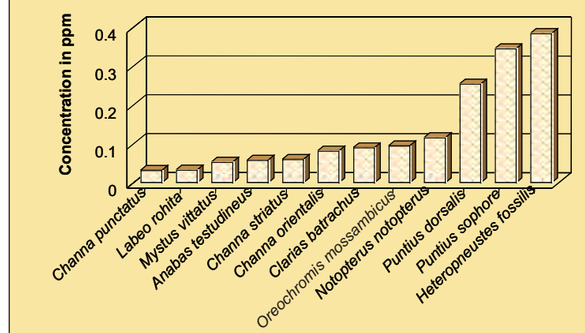
On an average, among the wetlands, Sukhaldari dam and Baghar beel recorded maximum concentrations of copper and lead respectively. Levels of metals in all other wetlands were not harmful. Among the fish species, *Puntius dorsalis* recorded the maximum concentrations of zinc and cadmium while *Channa punctatus* recorded maximum concentrations of lead. Although detectable levels of other metals have been recorded, they are below permissible levels.

Pesticides

Fishes from Sukhaldari dam of Garhwa district and Cheriya Bariyarpur of Begusarai district have the maximum load of total average concentration of organochlorine pesticides followed by Chandil reservoir and Tilaiya dam. The least concentrations recorded in Bhaghar beel of Katihar district and Dimna lake of Singbhum district. Of the 12 species analyzed, *Heteropneustes fossilis* and *Puntius sophore* are recorded the maximum load of total organochlorine residues followed by *Puntius dorsalis*. Both *Labeo rohita and Channa punctatus* recorded the lowest. Among different organochlorine residues, HCH, *p,p*'-DDT and endosulfan are higher in concentrations and variation in concentrations recorded among the species was statistically significant. It is also reported that the pesticide consumption in Bihar is about 1322 mt/year. According to a report from ICAR 19.2% of the bovine's milk tested in Bihar was contaminated with DDT.



Heavy metal contamination in select species of fishes



Total organochlorine residues among various species of fishes



B. Sinha

Achaya

Maps not to scale

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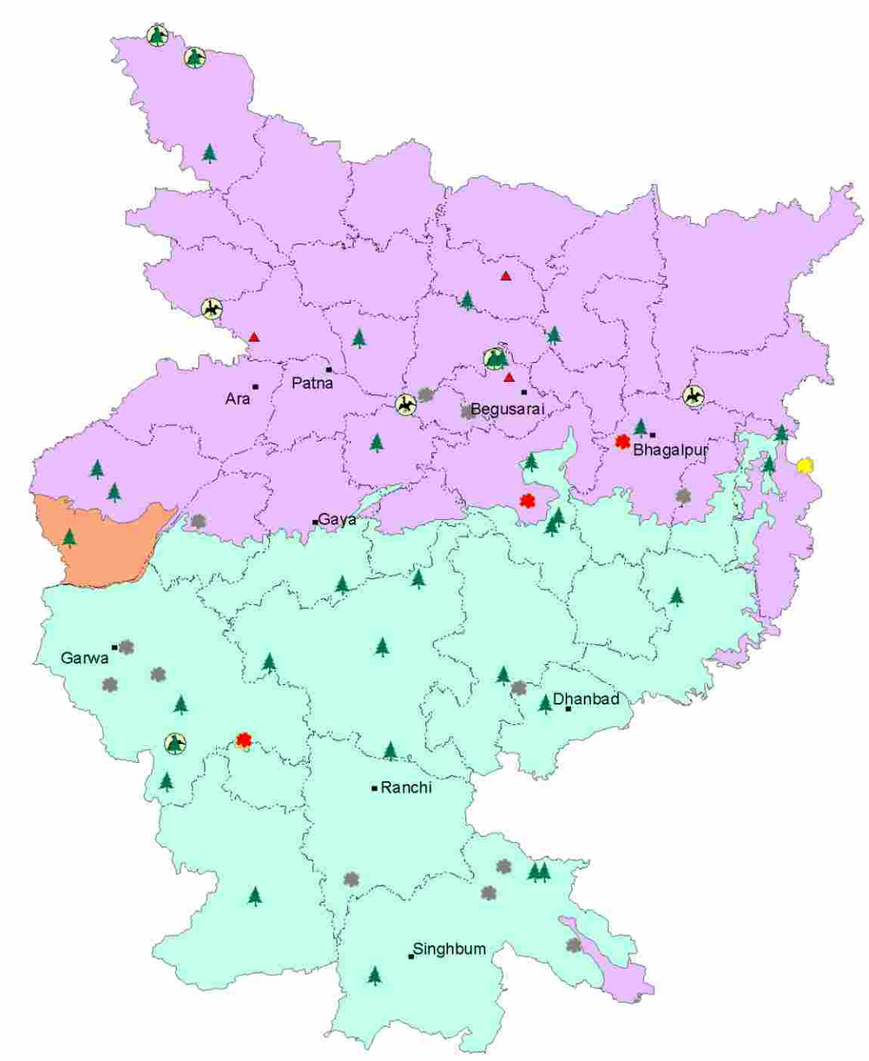
Prioritized inland wetlands of Bihar and Jharkhand



Prioritized Wetland
- *Rank 1*
- *Rank 2*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces
- *6A, Deccan Peninsula-Central Highlands*
- *6B, Deccan Peninsula-Chotta Nagpur*
- *7A, Gangetic Plain-Upper Gangetic Plain*
- *7B, Gangetic Plain-Lower Gangetic Plain*
- *District Boundaries*

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Bihar and Jharkhand

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ANRAJ DAM	GARHWA	235900	834700	RANKA TOWN	N.A.	M	6B
BAGHAR BEEL	KATIHAR	234000	843300	KATHIAR	2	M	6B
BARAUNI	BEGUSARAI	252400	855500	BEGUSARAI	N.A.	H	7B
BATANE DAM	PALAMAU	245100	841900	DHURKI	N.A.	H	7B
CHAND SHAHAR LAKE	SAHIBGANJ	250330	875330	CHAND SAGAR	2	L	7B
CHANDIL RESERVOIR	WEST SINGBHUM	225800	860300	N.A.	N.A.	M	6B
CHERIYA BARIYARPUR	BEGUSARAI	253000	854000	BEGUSARAI	N.A.	H	7B
DIMNA DAM	WEST SINGBHUM	224930	855730	N.A.	N.A.	M	6B
GOGA BEEL	KATIHAR	234030	843330	KATHIAR	1	M	6B
HATIYA DAM	RANCHI	225500	851000	RANCHI	N.A.	L	6B
JAGATPUR LAKE	BHAGALPUR	251500	802000	BHAGALPUR	1	L	7B
KANKE DAM	RANCHI	235500	861000	RANCHI	N.A.	L	6B
KHARAGPUR JHEEL	MUNGER	245500	861500	HAWELI KHARAGPUR	1	H	7B
MALAY DAM	PALAMAU	240200	840400	DALTONGANJ	N.A.	L	6B
RUKKA DAM	RANCHI	245500	871000	RANCHI	N.A.	L	7B
SITARAMPUR DAM	EAST SINGBHUM	223200	862630	N.A.	N.A.	L	6B
SUKHALDARI DAM	GARHWA	241100	835300	GARHWA TOWN	N.A.	L	6B
UDHUWA NALA	SAHIBGANJ	250300	875300	RAJMAHAL	2	H	7B

S. A. Hussain

Note:- In Fatua Chandan, Hanumana, Indrapuri, Mora tal, Moti jheel, Mawda dam, Birpur-Sipaul-Kosi barrage, Kosi east & west, Kajra Ararja, Maithon dam, Tilaiya dam, Disha-Patha, Rajauli, Darong tal, Surya Pokhar, Mehdar, Khemaith, Kesaria, Brahmaputra, Hardia, Bhimbandh, Kursela and Amarpur information is not available; N.A.-Not Available/Data deficient; L-Low,M-Medium, H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Acharya

GUJARAT

Habitat features

The total number of wetlands above 56.25 ha is estimated at 393 covering an area of 2,092.02 km^2 (CEPT & SAC 1998). The wetlands constitute 0.86% of the total geographic area of the state.

In five districts of Gujarat, SACON has estimated 663 wetlands having two ha and above, covering 743.76 km^2. These are shown in pages 36 to 40. Smaller wetlands are numerous compared to large ones. Most of the lakes/ ponds have medium to high turbidity while in reservoirs it is low to medium. Sabarkantha district showed a drastic decline of wetland area for the past ten years, whereas Jamnagar showed many-fold increase. The lakes/ ponds have medium to highly dense vegetation while, reservoirs have low to medium vegetation.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	11	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	N.A.	11	11	N.A.	N.A.
Turtles	N.A.	N.A.	N.A.	1	N.A.	3	1
Birds	N.A.	N.A.	N.A.	N.A.	8	7	N.A.

Prioritized Sites

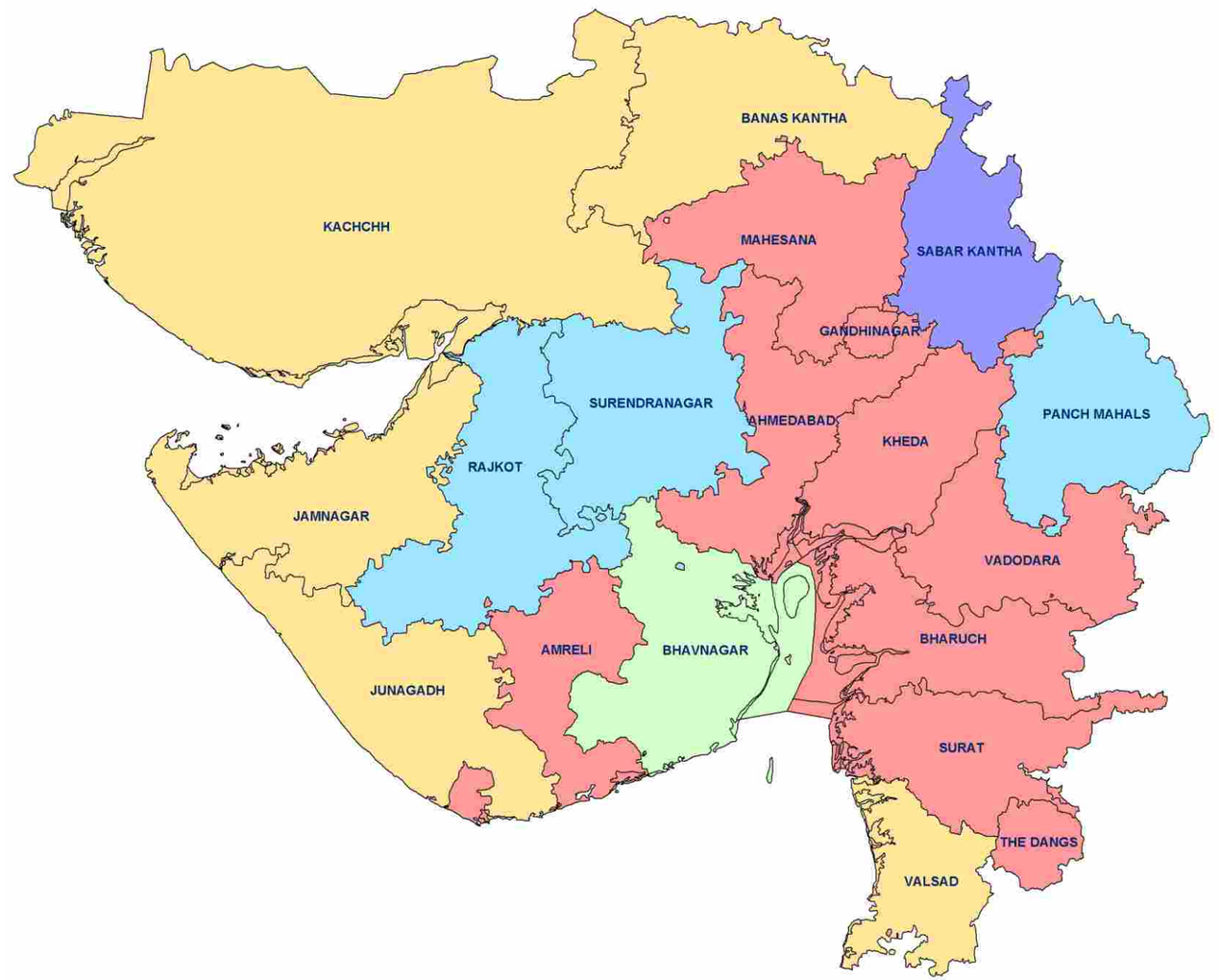
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
45	16	10	12	7

Twenty one wetlands are qualified to be declared as Ramsar sites (page 215).

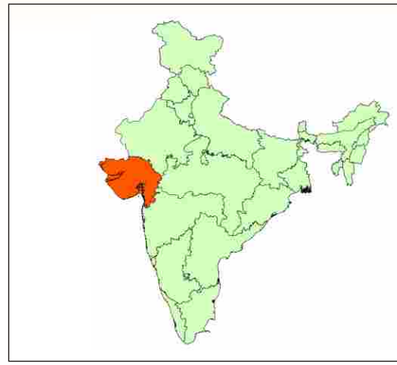


B.C. Chaudhary

A profile of wetlands in Gujarat



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AHMEDABAD	8068.8	6.30	0.08
AMRELI	7397.3	35.00	0.47
BANAS KANTHA	10757	88.92	0.83
BHARUCH	9282.5	34.75	0.37
BHAVNAGAR	9980.9	107.11	1.07
GANDHINAGAR	2163.4	1.38	0.06
JAMNAGAR	14125	93.05	0.66
JUNAGADH	11143.8	105.49	0.95
KACHCHH	45652	368.42	0.81
KHEDA	7159.6	23.17	0.32
MAHESANA	10113.2	16.20	0.16
PANCH MAHALS	8866	140.7	1.59
RAJKOT	11203	185.81	1.66
SABAR KANTHA	7390	171.12	2.32
SURAT	7657	26.68	0.35
SURENDRANAGAR	10489	208.62	1.99
THE DANGS	1764	N.A.	0.00
VADODARA	7549.5	37.37	0.49
VALSAD	5244	41.87	0.80

Maps not to scale

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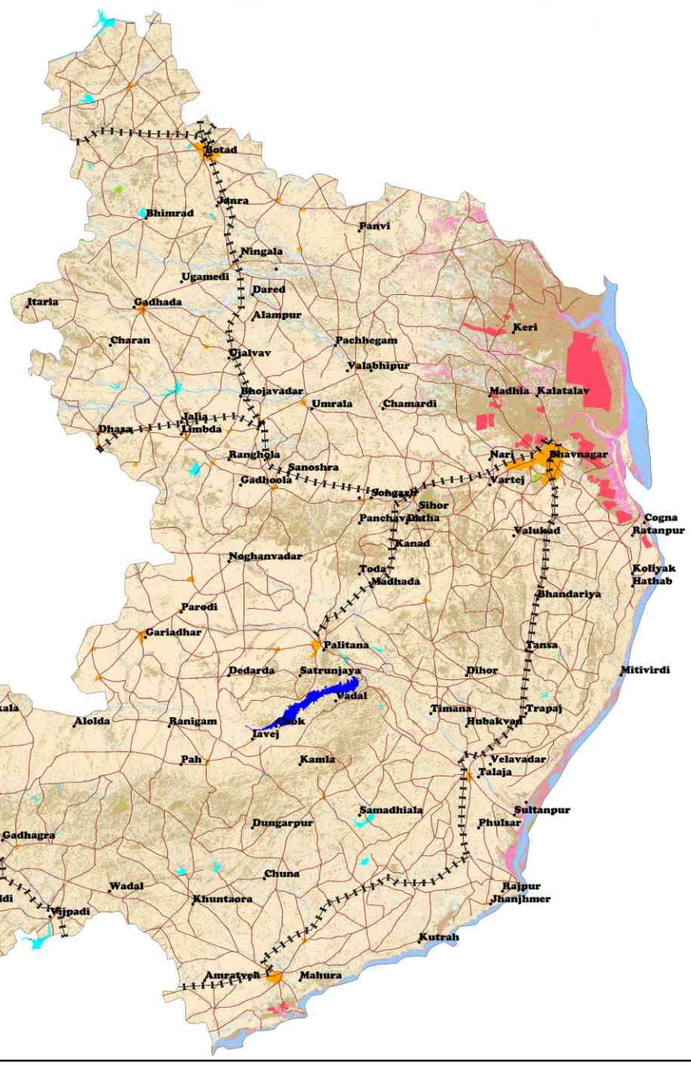
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	Sand	Railways	NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	Others	Taluks/Tehsil Boundary	
Arable Land	Township	NP Water-logged	Marsh/Mud	Roads	District Boundary	

Maps not to scale

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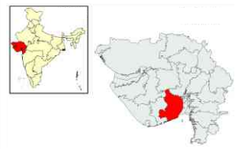
District Bhavnagar, Gujarat

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS I C LISS III (20 December 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow/Cut-off	NP	NP	NP

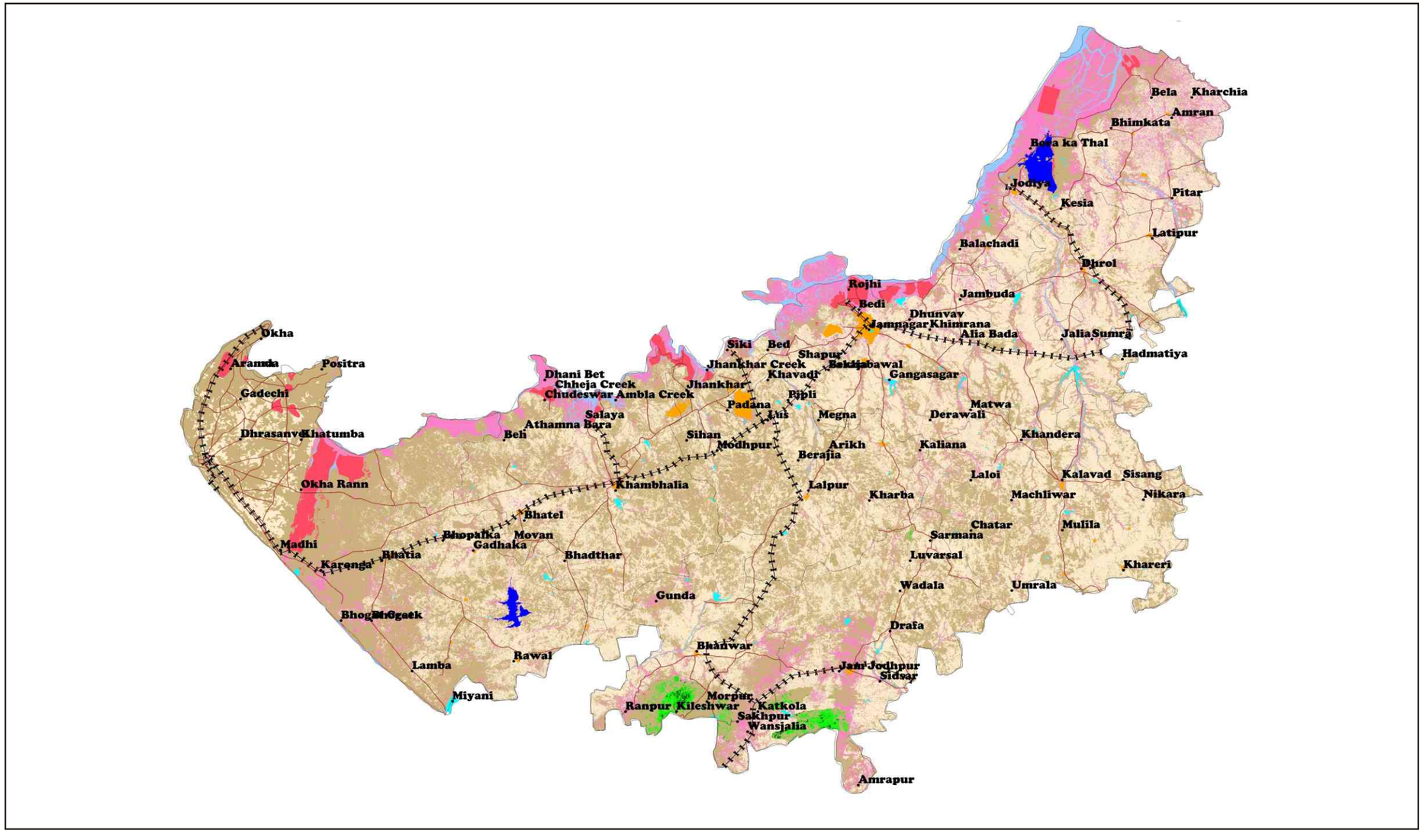
Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow/Cut-off	NP	NP	NP

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



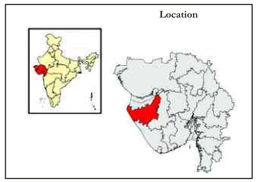
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	Others	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	Marsh/Mud	Roads	Taluks/Tehsil Boundary

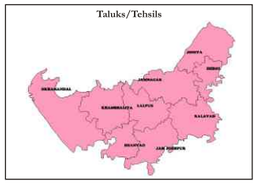
NP * Not Present

District Jamnagar, Gujarat

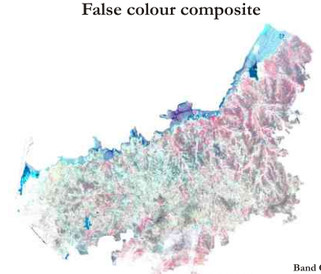
Location



Taluks/Tehsils

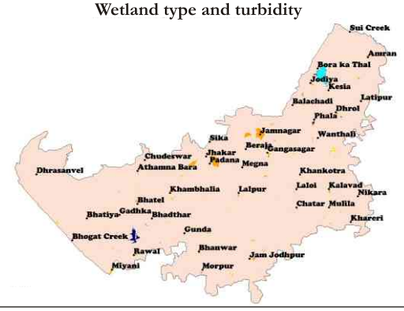


False colour composite



Band Combination: 3, 2, 1
IRS IC\ID LISS III (28 November - 1 December 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Maps not to scale

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore SACON

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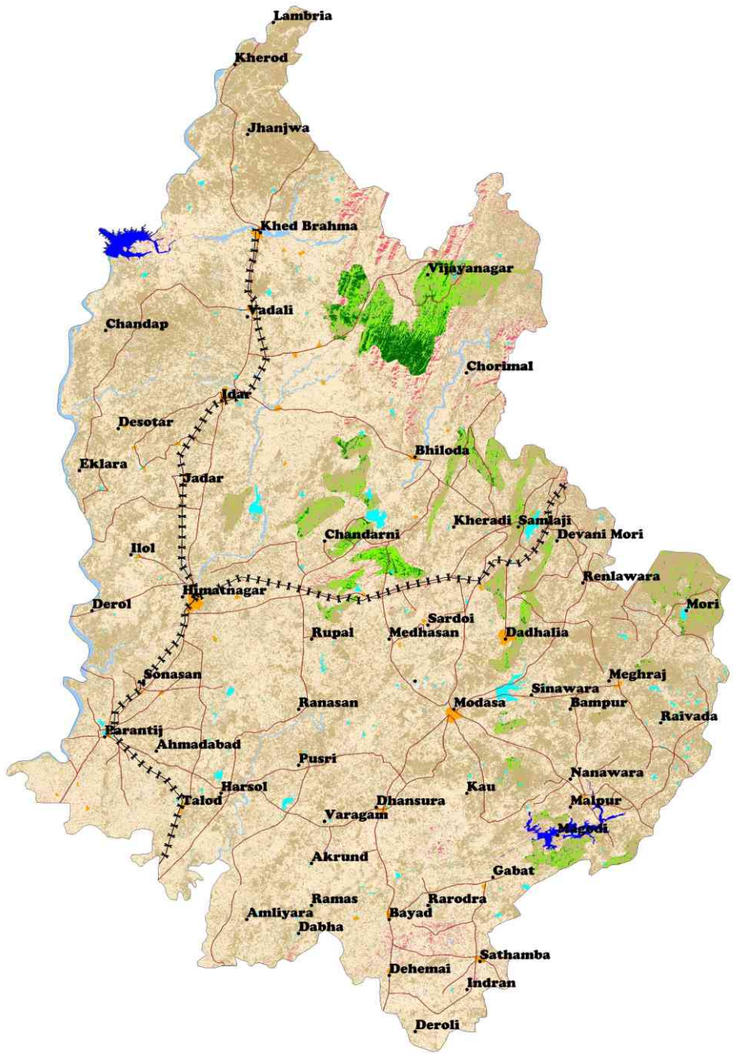
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	Sand	Railways	NP * Not Present	
Open Forest	River	Reservoir	NP Coastal-water	Others	District Boundary		
Arable Land	Township	NP Water-logged	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary		

Maps not to scale

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District Sabarkantha, Gujarat

Location



Taluks/Tehsils



False Colour Composite



Band Combination: 3, 2, 1
D LISS III (17 December 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

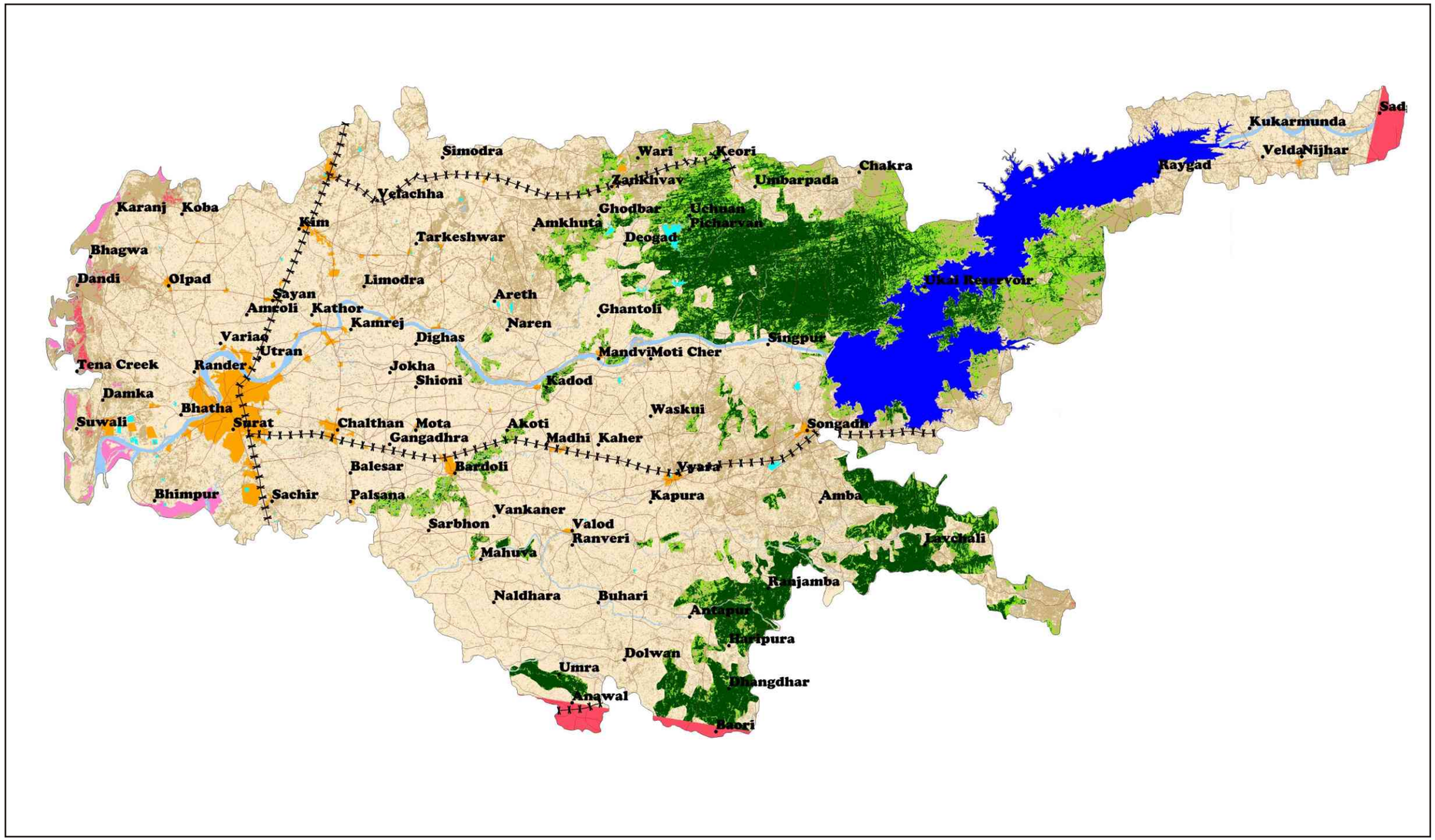
Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow/Cut-off	NP	NP	NP

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



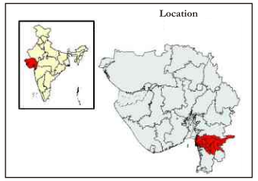
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	Marsh/Mud	Roads	Taluks/Tehsil Boundary

NP * Not Present

District Surat, Gujarat

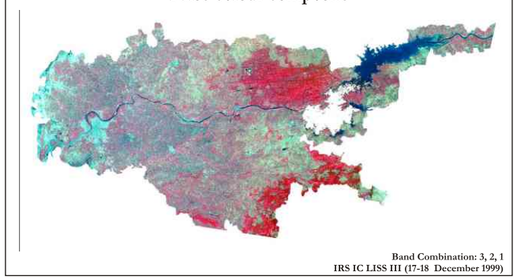
Location



Taluks/Tehsils



False colour composite



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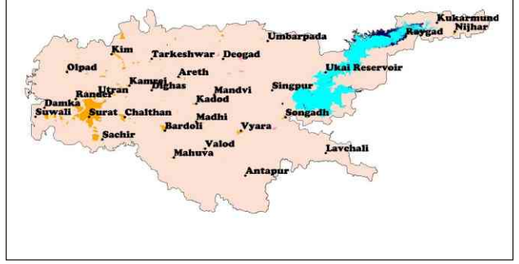
IRS IC LISS III (17-18 December 1999)

Wetland type and turbidity



Legend

Wetland	Turbidity		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend

Wetland	Aquatic Vegetation		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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Integrated wetland and land use map



Integrated wetland type and land use

- Dense Forest
- Open Forest
- Arable Land
- Waste Land
- River
- Township
- Pond/Tank
- Reservoir
- NP Water-logged
- NP Oxbow Lake/Cut-off
- NP Coastal-water
- Marsh/Mud
- Sand
- Others/Salt
- Roads
- Railways
- NP * Not Present
- District Boundary
- Taluks/Tehsil Boundary

Maps not to scale

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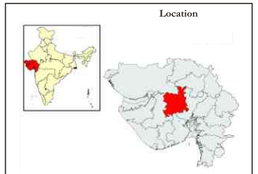
District Surendranagar, Gujarat

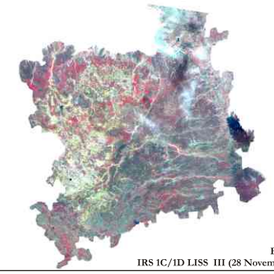
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1C/1D LISS III (28 November - 20 December 1999)

Wetland type and turbidity



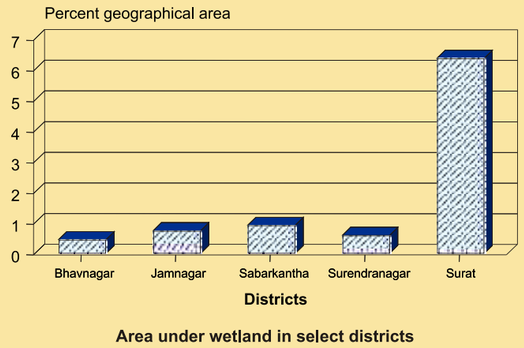
Legend	Wetland	Turbidity		
		Low	*Medium*	*High*
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Wetland type and aquatic vegetation

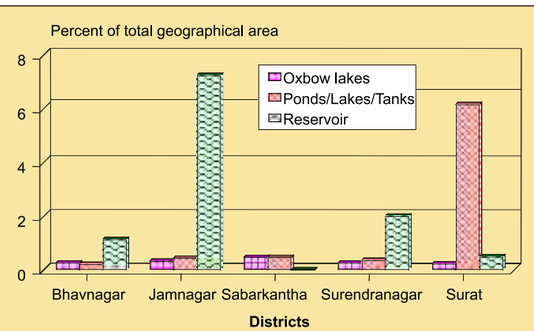


Legend	Wetland	Aquatic Vegetation		
		Low	*Medium*	*High*
	Pond/Tank			
	Reservoir			
	Water-logged	NP	NP	NP
	Oxbow/Cut-off	NP	NP	NP

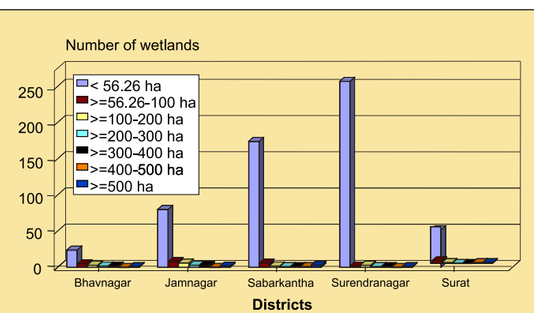
Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Area under wetland in select districts



Area under different wetland classes in select districts



Size class distribution in select districts

Attributes of wetlands and environmental contamination

Wetlands

Surat, among the five districts, has a large area under wetland. Three main categories of wetlands, namely reservoirs, ponds/lakes/tanks and oxbow lakes are found. Reservoirs cover largest area in the Jamnagar followed by Surendranagar and Bhavnagar. Surat has a large area under ponds/lakes/tanks. It is also to be noted that in all the districts, smaller wetlands (below 56.25 ha) are more abundant than larger wetlands.

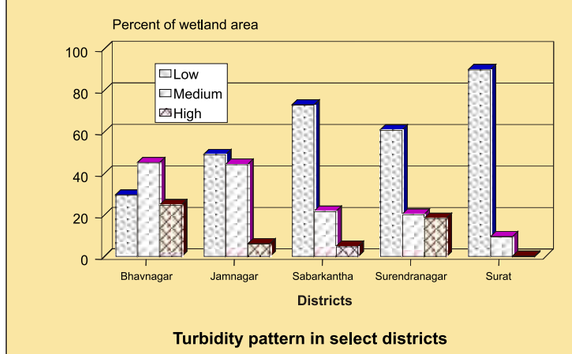
Turbidity

Significant proportions of wetland area in Sabarkantha, Surendranagar and Surat districts have low turbidity. While more wetlands of Bhavnagar have medium turbidity, those in Jamnagar have both low and medium turbidity. These data do not indicate alarming levels of sedimentation in the wetlands. This perhaps, has more to do with forested catchments in Surat and Sabarkantha districts compared to Bhavnagar, Jamnagar and Surendranagar

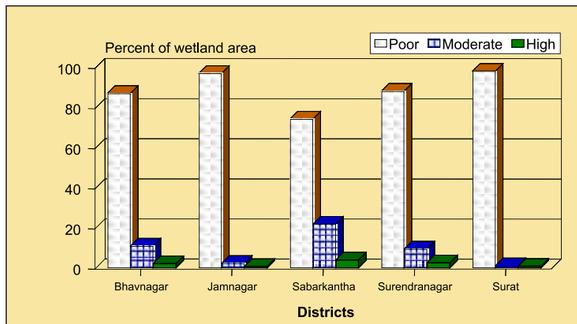
Summer recession of water

The summer recession among the wetlands of the districts, varied from 30% in Surat to more than 80% in Jamnagar. The wetlands in Sabarkantha and Surendranagar recorded recession of about 50% and 60% respectively.

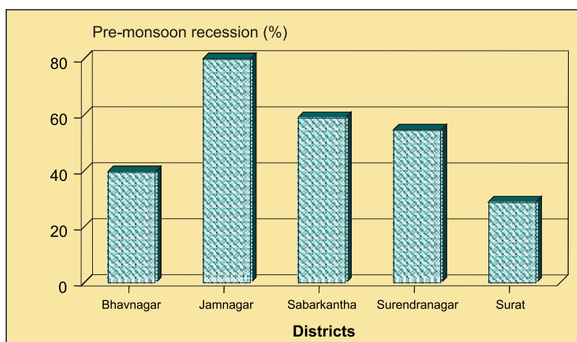
V.S. Vijayan



Turbidity pattern in select districts



Aquatic vegetation in wetlands in select districts



Average summer recession in select districts

Maps not to scale

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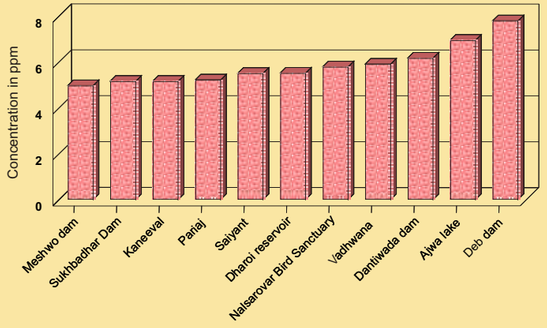
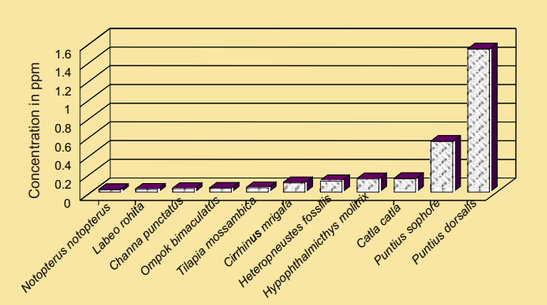


Lead contamination among the select wetlands



Total organochlorine residues among various species of fishes



B.C. Chaudhary

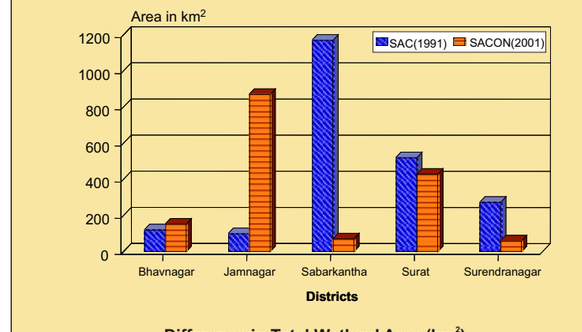
Attributes of wetlands and environmental contamination

Heavy metals

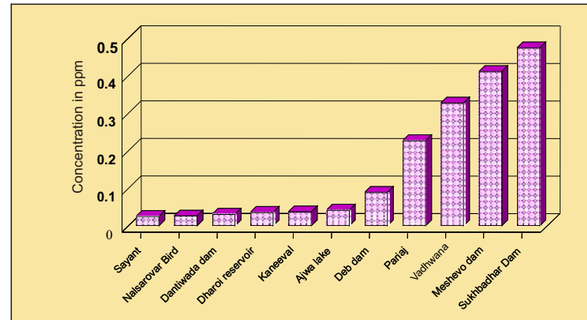
Of the five metals studied, except lead, all others, namely copper, zinc, cadmium and chromium are within the permissible limits in all wetlands. Lead is the highest in Deb dam and minimum in Meshwo dam. Wetlands such as Vadhwana Dharoi reservoir and Nalsarovar Bird Sanctuary showed comparatively high concentrations of all the metals analyzed and there is significant difference in the accumulation among these wetlands. *Channa punctatus, Heteropneustes fossilis, Notopterus notopterus, Ompok bimaculatus, Puntius sophore* and *Oreochromis mossambicus* are the fishes to be avoided for human consumption since the lead levels exceed the permissible levels recommended by WHO.

Pesticides

Gujarat is the second most contaminated state in India, next to Assam, with reference to pesticides. Quantification of organochlorine residues revealed that among the wetlands, Sukhbhadar dam of Bhavnagar district recorded the highest load of organochlorine residues followed by Meshwo dam of Sabarkanth district, Vadhwana in Baroda and Pariej in Anand district. These levels are high enough to cause threat to fish and wildlife, and also human beings. The least concentration was recorded in Sayant of Kheda district. Of the 11 species analyzed for organochlorine residues, *Puntius dorsalis* and *Puntius sophore* recorded the highest total average organochlorine residues while *Labeo rohita and Notopterus notopterus,* the least.



Difference in Total Wetland Area (km^2)



Total organochlorine residues among select wetlands



B. Sinha

Acharya

Maps not to scale

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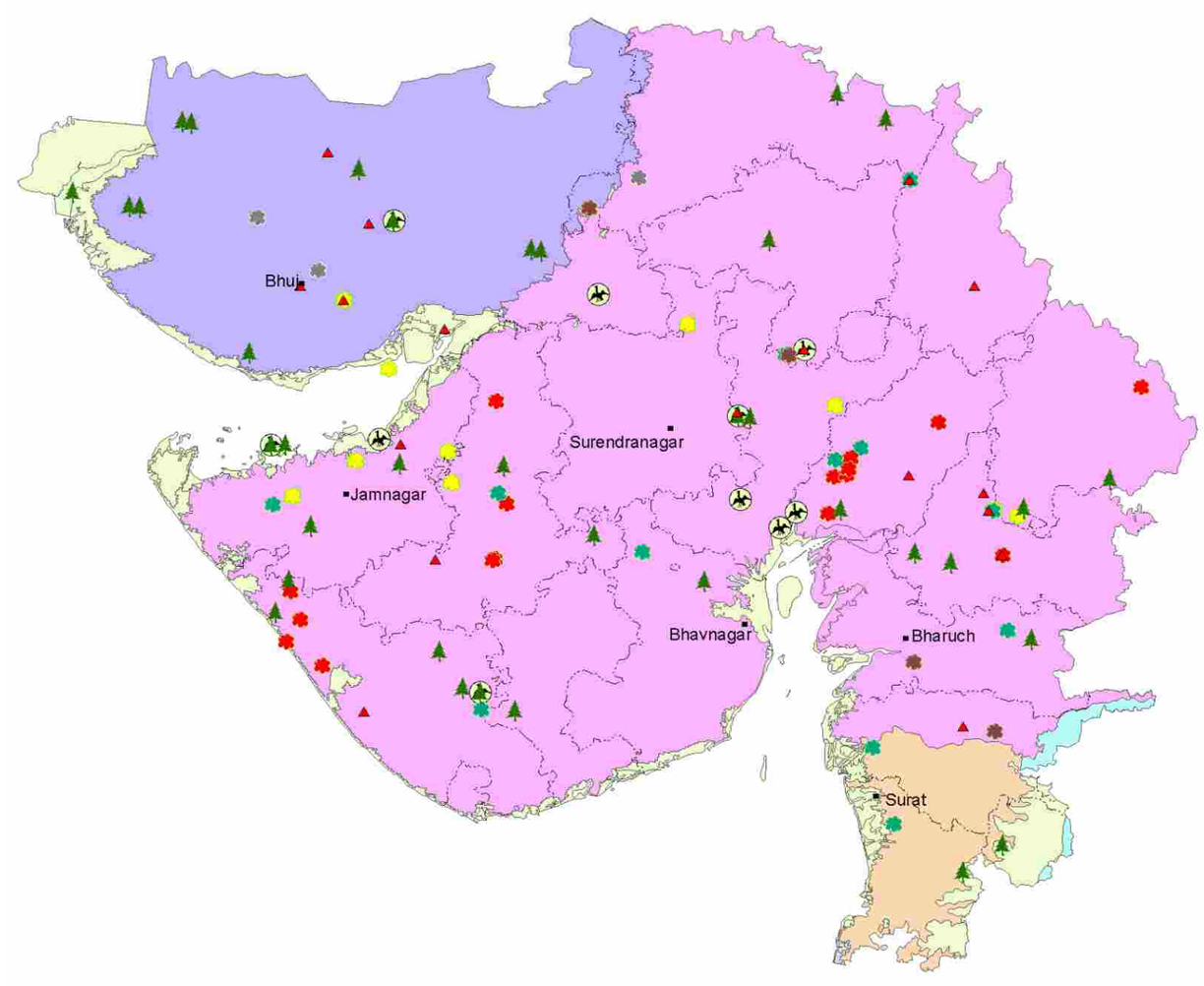
Prioritized inland wetlands of Gujarat



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *3A, Desert-Thar*
- *3B, Desert-Katchchh*
- *4B, Semi-Arid-Gujarat Rajputana*
- *5A, Western Ghats-Malabar Plains*
- *6A, Deccan Peninsula-Central Highlands*
- *6D, Deccan Peninsula-Central Plateau*
- *8A, Coasts-West Coast*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Gujarat

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
AJI-1	RAJKOT	221600	705100	RAJKOT	1	H	4B
AJWA	VADODARA	222430	732530	VADODARA	2	H	4B
AMIPUR TANK	PORBANDAR	212400	695700	PORBANDAR	1	L	4B
BARDA SAGAR	PORBANDAR	214500	694500	PORBANDAR	1	L	4B
BHANDERAJ	ANAND	223600	723400	TARAPUR	3	L	4B
BHIMDAD DAM	BHAVNAGAR	220500	713500	GADHADA	3	H	4B
BRAHMANI DAM	SURENDRANAGAR	225300	701000	HALVAD	2	M	8A
CHHARI-DHANDH	KACHCH	231200	695400	NAKHATRANA	2	H	3B
DALOLI	ANAND	.	723400	TARAPUR	1	M	4B
DEO DAM	PANCHMAHALS	222300	733300	HALOL	2	M	4B
DHAROI DAM BABSAR	MEHSANA	240000	725200	KHEDBRAHMA	3	H	4B
GHEE DAM	JAMNAGAR	221000	693700	KHAMBALIA	3	L	4B
GOSA	PORBANDAR	213000	694500	PORBANDAR	1	M	4B
GOVINDPURA	MEHSANA	230600	721600	KADI	3	H	4B
HERANJ	KHEDA	224000	724200	MATAR	3	L	4B
KAJ	JUNAGADH	224600	704500	KODINAR	1	H	4B
KANEWAL	ANAND	222000	723300	TARAPUR	1	L	4B
KARAJAN DAM	NARMADA	214900	733200	RAJPIPLA	3	H	4B
KUCHADI-JAWAR	PORBANDAR	213700	694900	PORBANDAR	1	M	4B
LAKHI TANK	SURAT	211900	733000	MANDVI	4	H	4B
LAKHOTA	JAMNAGAR	222500	700200	JAMNAGAR	2	H	4B
LUNIVAV	RAJKOT	215930	704830	GONDAL	1	H	4B
MACHHAN NALA	DAHOD	230300	741000	LIMBADI	1	M	4B
MADHUVANTI DAM	JUNAGADH	211500	704800	MENDARDA	3	H	4B
NADAN	MEHSANA	230600	721700	KADI	4	H	4B
NAGHRMA	ANAND	223700	723900	LIMBASI	1	L	4B
NARDA	KHEDA	223200	723800	LIMBASI	1	L	4B
NAVA TALAV	SURENDRANAGAR	231300	714400	PATADI	2	M	4B
NYARI-1	RAJKOT	221900	704800	RAJKOT	3	H	4B
PALAN	VALSAD	205000	730000	VALSAD	3	M	5A
PANOLI	BHARUCH	213800	730300	ANKALESHWAR	4	H	4B
PARIEJ	ANAND	223330	723830	TARAPUR	1	L	4B
SANTHALPUR TANK	PATAN	234500	711000	SANTHALPUR	4	M	4B
SAYANT	KHEDA	224900	730600	DAKOR	1	L	4B
SIHAN DAM	JAMNAGAR	221300	694300	KHAMBALIA	2	L	4B
SUDAMDA DAM	SURENDRANAGAR	223000	703100	SAYLA	2	H	4B
SUKHBHADAR DAM	BHAVNAGAR	222100	703300	PALIYAD	2	M	4B
TAPI BARRAGE	SURAT	211200	725200	SURAT	3	H	5A
TIMBI TANK	VADODARA	222400	732500	VADODARA	3	M	4B
VADHAVANA	VADODARA	221100	732900	VADODARA	1	L	4B
VASAI IRRIGATION	AHMADABAD	225200	723300	AHMADABAD	2	M	4B
VERI DAM	RAJKOT	215900	704800	GONDAL	1	H	4B

B.C. Chaudhary

Note:- In Eastern Great Rann, Korda Sandher, Sherva Dhand information is not available; L-Low,M-Medium,H-High.

Maps not to scale

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Acharya

HARYANA

HARYANA

Habitat features

Haryana has 1827 wetlands of 2.25 ha and above covering an area of 270.4 km^2 (HSRSAC & SAC, 1998). The wetlands constitute 0.62% of the total geographic area of the state.

Wetland distribution in twelve districts is given in pages 45 to 47.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	3	12	15	N.A.	N.A.
Turtles	N.A.	N.A.	N.A.	1	N.A.	1	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	5	8	N.A.

Prioritized Sites

Number of Prioritized Wetlands	Rank 1
4	4

Four prioritized sites are qualified to be declared as Ramsar sites (page 215).

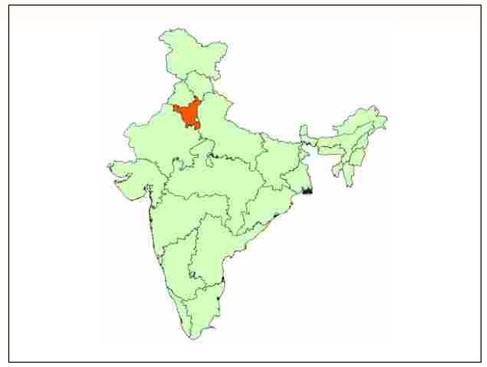


B. Sinha

A profile of wetlands in Haryana



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AMBALA	4240.00	4.29	0.10
BHIWANI	4778.00	4.74	0.10
FARIDABAD	2151.00	25.14	1.17
GURGAON	2766.00	32.84	1.19
HISAR	6521.00	66.29	1.02
JIND	2702.00	10.82	0.40
KARNAL	3788.00	23.59	0.62
KURUKSHETRA	3847.00	6.23	0.16
MAHENDRAGARH	3441.00	0.78	0.02
ROHTAK	3579.00	28.51	0.80
SIRSA	4277.00	40.15	0.94
SONIPAT	2122.00	9.47	0.45

Maps not to scale

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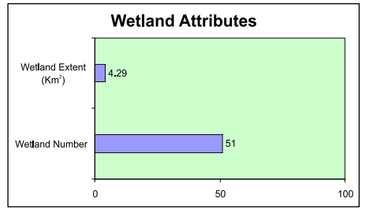
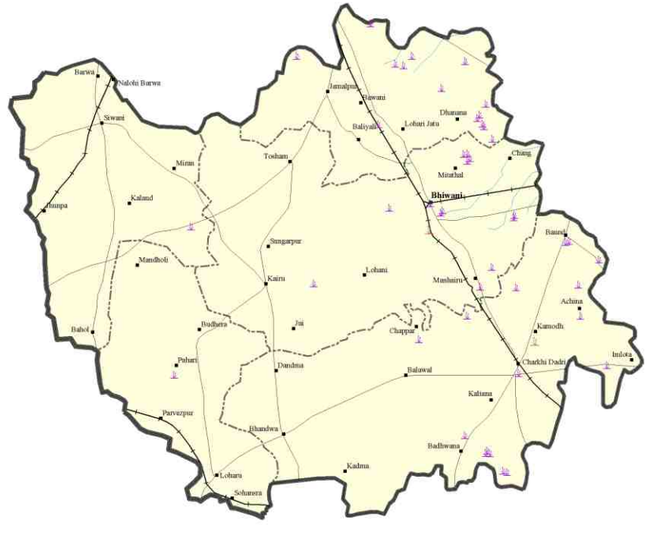
District - wise spatial distribution of wetlands



District Ambala

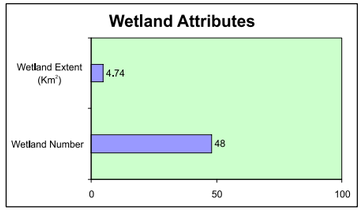


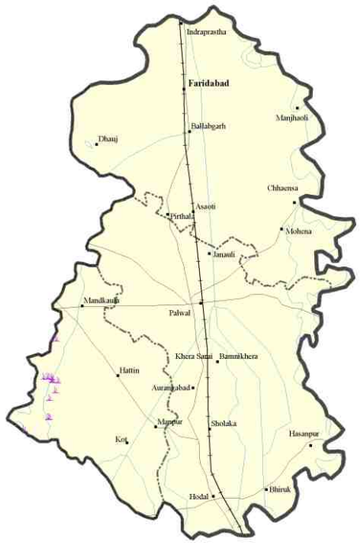




District Bhiwani

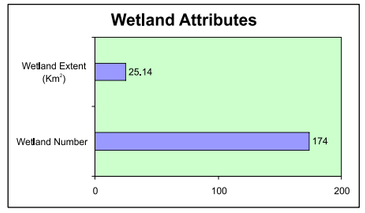


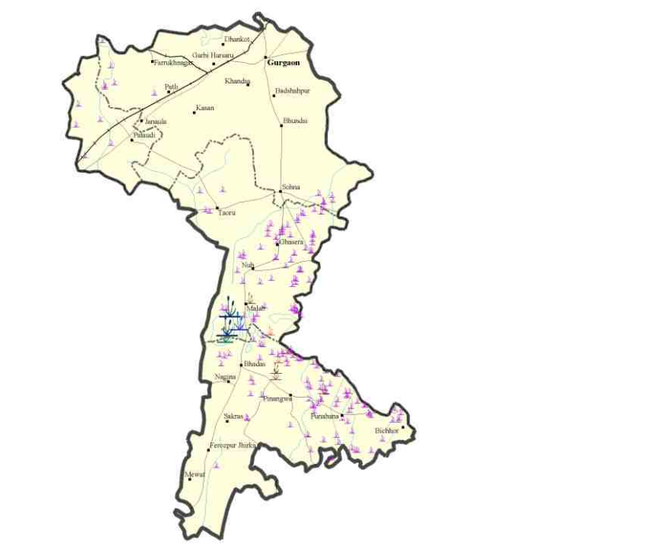




District Faridabad

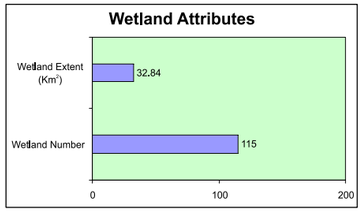






District Gurgaon





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Haryana State Remote Sensing Applications Centre, Hisar

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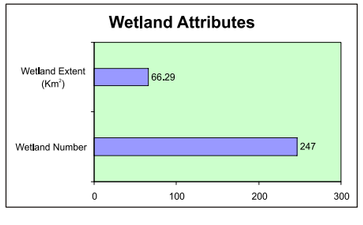
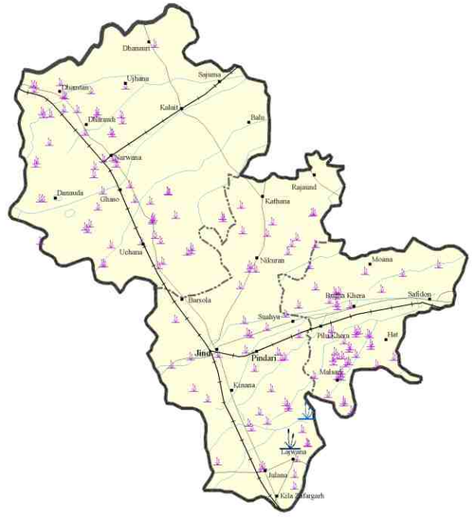
District - wise spatial distribution of wetlands



District Hisar

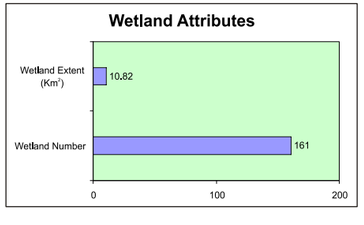


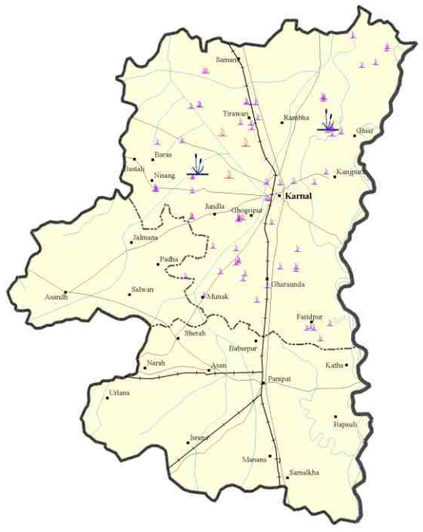




District Jind

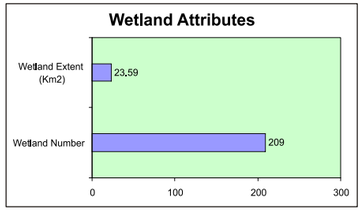


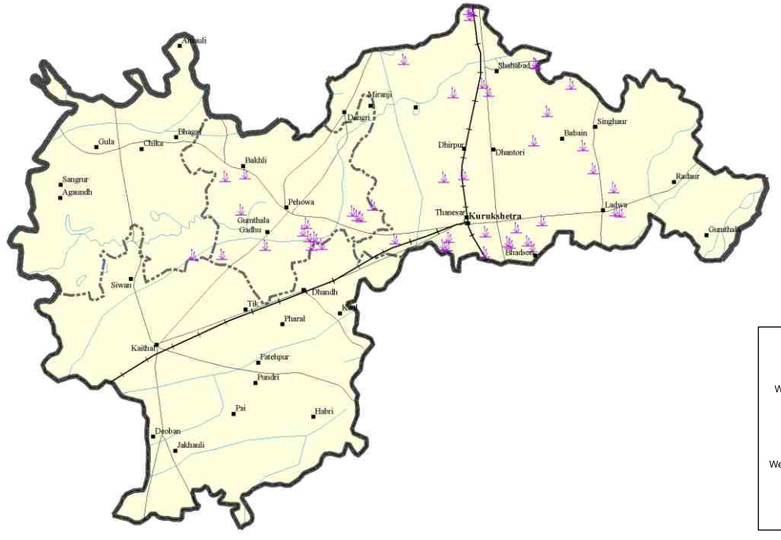




District Karnal

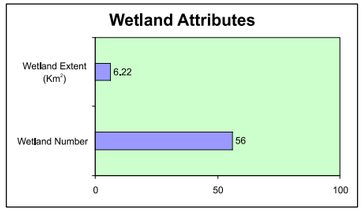






District Kurukshetra





Source: Wetland point data; Haryana State Remote Sensing Applications Centre, Hisar

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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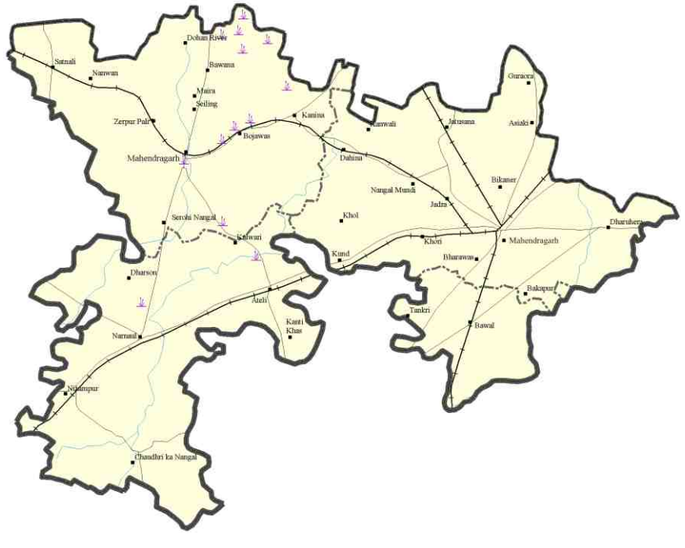
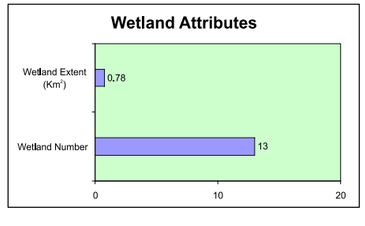
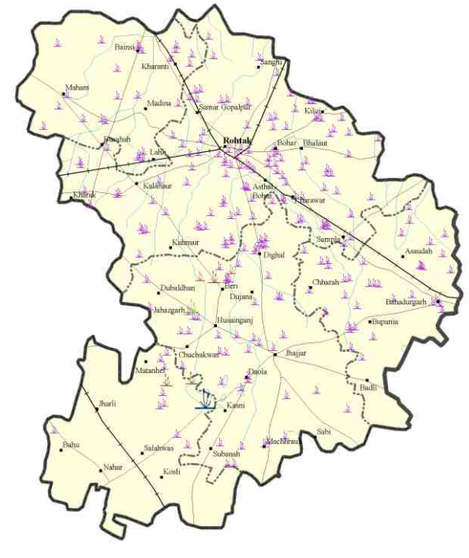
District - wise spatial distribution of wetlands



District Mahendragarh

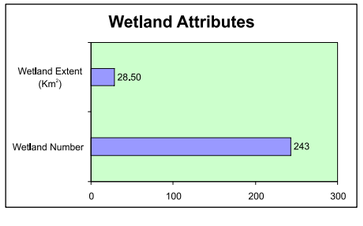


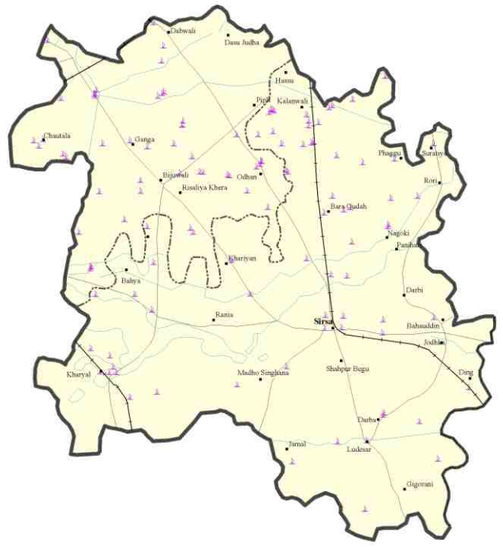




District Rohtak

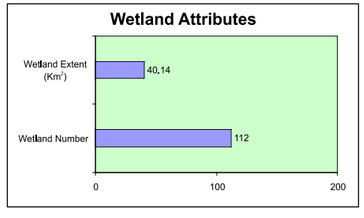


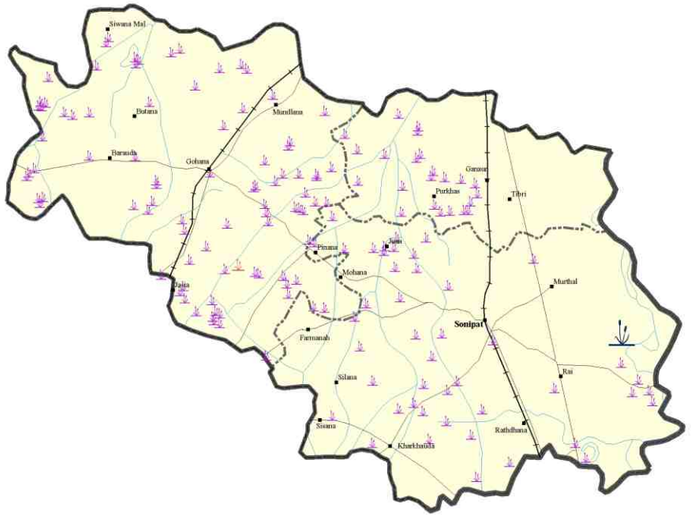




District Sirsa

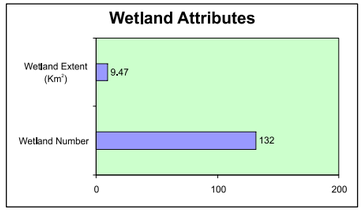






District Sonipat





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Haryana State Remote Sensing Applications Centre, Hisar

Maps not to scale

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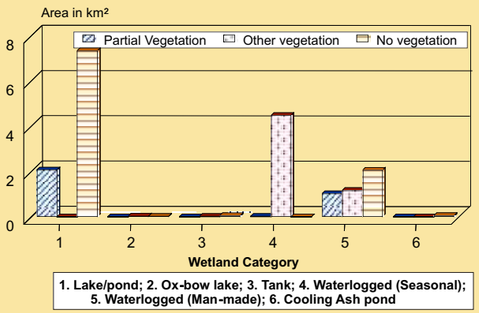
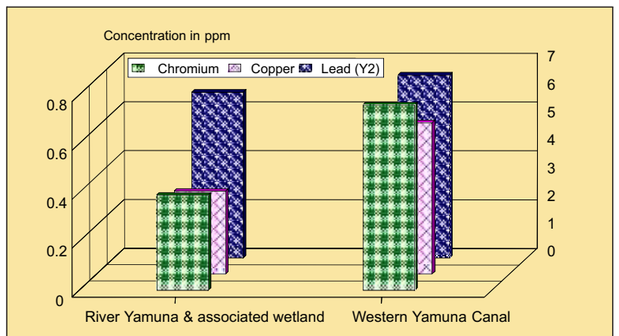


Type-wise aquatic vegetation status of wetlands



Heavy metal contamination in select wetlands



Acharya

Attributes of wetlands and environmental contamination

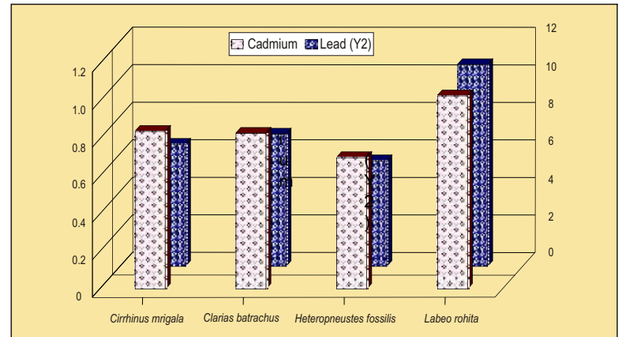
Heavy metals

Wetlands of Western Yamuna canal have the highest concentrations of lead, copper and chromium than those of the River Yamuna. Other metals appear to be within the permissible limits. Significant variation in contamination among the fish species could be attributed to their feeding habits. *Cirrhinus mrigala* and *Labeo rohita* are subsurface dwellers while the other two, *Clarias batrachus* and *Heteropneustes fossilis* are bottom feeders. *Labeo rohita* has the maximum concentrations of all metals, espacially lead and cadmium.

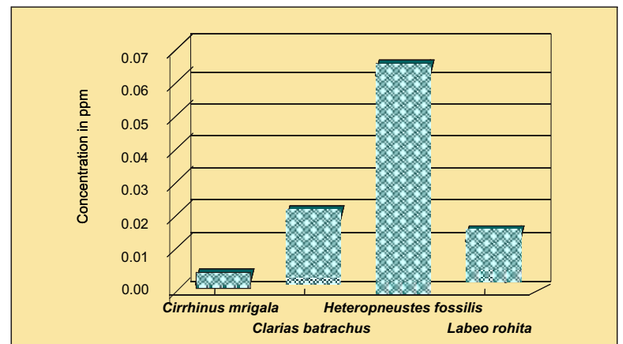
Pesticides

Organochlorine residues of Western Yamuna canal, Yamuna and associated wetlands were found to be 0.039 ppm and 0.006 ppm respectively. Among the four species analyzed, *Heteropneustes fossilis* has the highest load of pesticide residues, while *Clarias batrachus* and *Cirrhinus mrigala*, the least. Annual consumption of pesticides is estimated at 5049 mt. HCH and DDT were detected in 82 and 76% of the fishes examined respectively.

S.A. Hussain



Heavy metal contamination in select species of fishes



Total organochlorine residues among various species of fishes



B. Sinha

Maps not to scale

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Prioritized inland wetlands of Haryana



Prioritized Wetland

- *Rank 1*

- *Important Bird Areas*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *2B, Himalaya West Himalaya*
- *3A, Desert -Thar*
- *4A, Semi Arid Punjab Plains*
- *4B, Semi Arid Gujarat Rajputana*
- *7A, Gangetic Plan-Upper Gangetic Plain*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Haryana

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
BASAI	GURGAON	282900	765900	GURGAON	1	M	4A
MOHMEDABAD MARSHES	SONIPAT	290000	765500	SONIPAT	1	H	4A
WESTERN YAMUNA CANAL-WETLANDS	YAMUNANAGAR	300741	771930	YAMUNANAGAR	1	H	4A
YAMUNA RIVER ASSOCIATED WETLANDS	YAMUNANAGAR	301800	773300	YAMUNANAGAR	1	H	4A



B. Pnadav

Note:-M-Medium,H-High.

Maps not to scale

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B. Sinha

HIMACHAL PRADESH

HIMACHAL PRADESH

Habitat features

Himachal Pradesh has 92 wetlands of the size 2.25 ha and above, covering a total area of 547.65 km^2 (HPRSC & SAC,1998). Thus, 0.98% of the total geographic area of the state is constituted by wetlands.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.5	13	18	N.A.	N.A.	N.A.
Turtles	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1
Birds	N.A.	N.A.	N.A.	N.A.	2	1	N.A.

Prioritized Sites

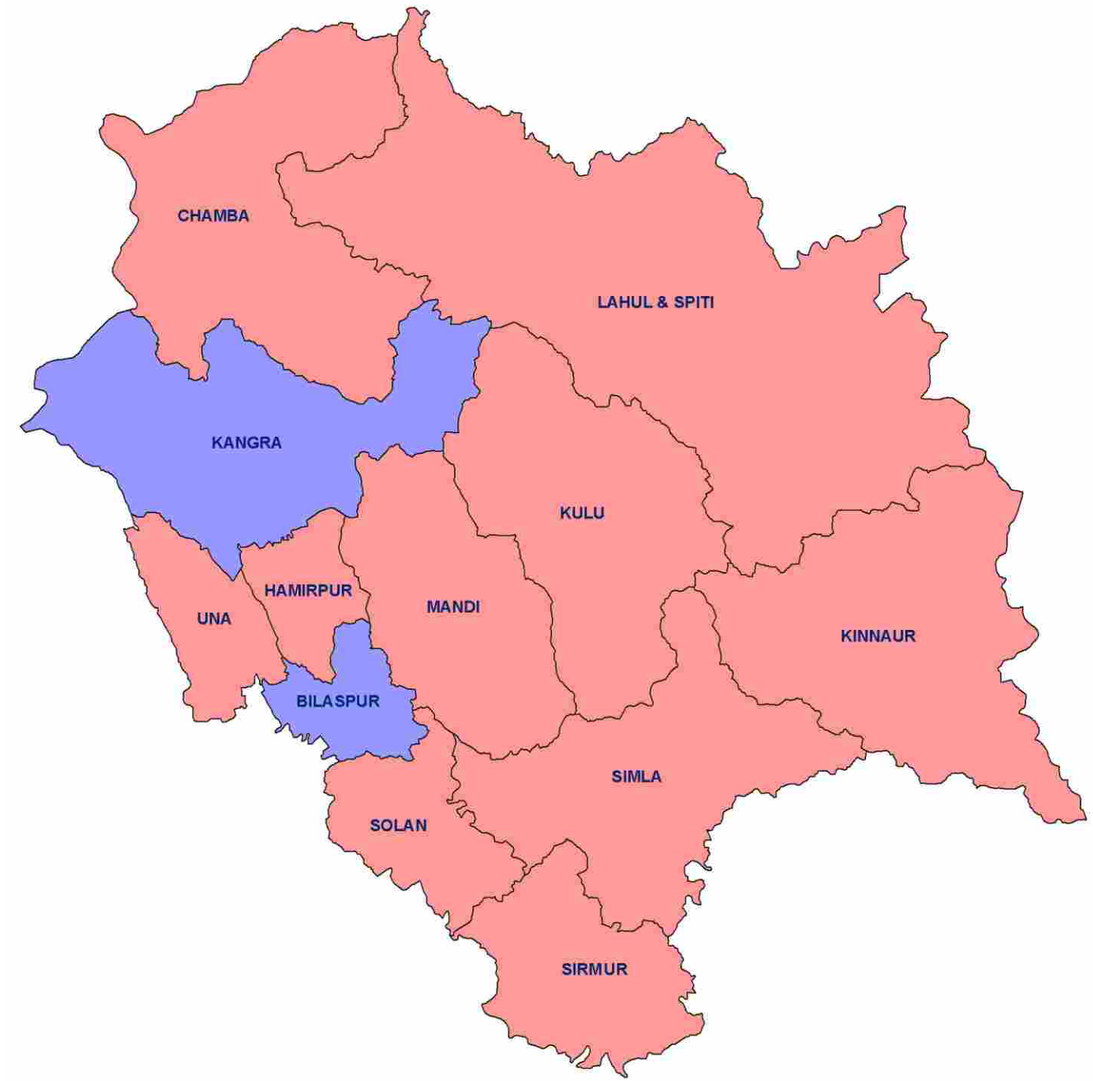
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Data Deficient
4	1	1	1	1

Four wetlands have been identified for long-term conservation (page 215).

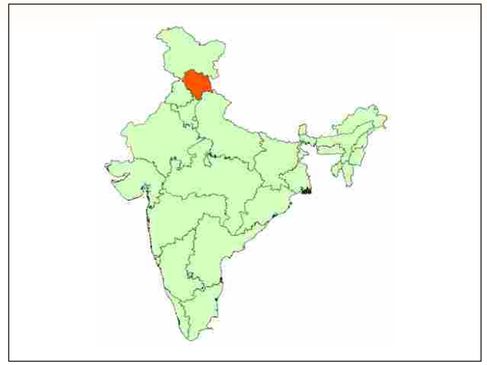


B. Pandav

A profile of wetlands in Himachal Pradesh



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BILASPUR	1167	257.25	22.04
CHAMBA	6528	16.21	0.25
HAMIRPUR	1118	N.A.	0.00
KANGRA	5739	257.29	4.48
KINNAUR	6401	0.34	0.01
KULU	5503	1.03	0.02
LAHUL & SPITI	13835	9.60	0.07
MANDI	3950	1.77	0.04
SIMLA	5131	0.34	0.01
SIRMUR	2825	3.82	0.14
SOLAN	1936	N.A.	0.00
UNA	1540	N.A.	0.00

Maps not to scale

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Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Prioritized inland wetlands of Himachal Pradesh



Prioritized Wetland

- *Rank 1*
- *Data Not Available*
- *Important Bird Areas*
- *Ramsar Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *1A, Trans Himalaya-Ladakh Mountains*
- *1B, Trans Himalaya-Tibetan Plateau*
- *2A, Himalaya-North West Himalaya*
- *2B, Himalaya-West Himalaya*
- *4A, Semi Arid Punjab Plains*
- *7A, Gangetic Plain-Upper Gangetic Plain*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Himachal Pradesh

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
GOVIND SAGAR	BILASPUR	312436	762554	CHANDIGARH	N.A.	H	4A
PONG DAM	KANGRA	315232	761200	MUKERIAN	1	H	4A



B. Pandav

Note:- In Sheetal Sagar and adjoining jheels and river Beas pools at Raison-Katrain information is not available; N.A.-Not Available/Data Deficient; H-High.

Maps not to scale

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Ramachandran

JAMMU & KASHMIR

JAMMU & KASHMIR

Habitat features

According to SAC (1998) estimate, 42 wetlands of the size 56.25 ha and above, covering an area of 4,068 km^2. Thus, the wetlands constitute 3.97% of the total geographic area of the state.

The present estimate of wetlands of the size two ha and above in the districts of Baramulla, Jammu and part of Ladakh shows that there were 454 wetlands, covering an area of 750.87 km^2. These are shown in pages 53 to 55. The ponds / lakes have low turbidity in the districts of Jammu, Baramulla and Ladakh, while the waterlogged areas have high turbidity in Jammu and low to medium in Baramulla. Aquatic vegetation is low in the ponds/ lakes of Jammu and Ladakh. Those in the Baramulla have comparatively more aquatic vegetation.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	16	20	N.A.	N.A.
Turtles	N.A.	N.A.	N.A.	2	N.A.	2	1
Birds	N.A.	N.A.	N.A.	N.A.	2	2	N.A.

Prioritized Sites

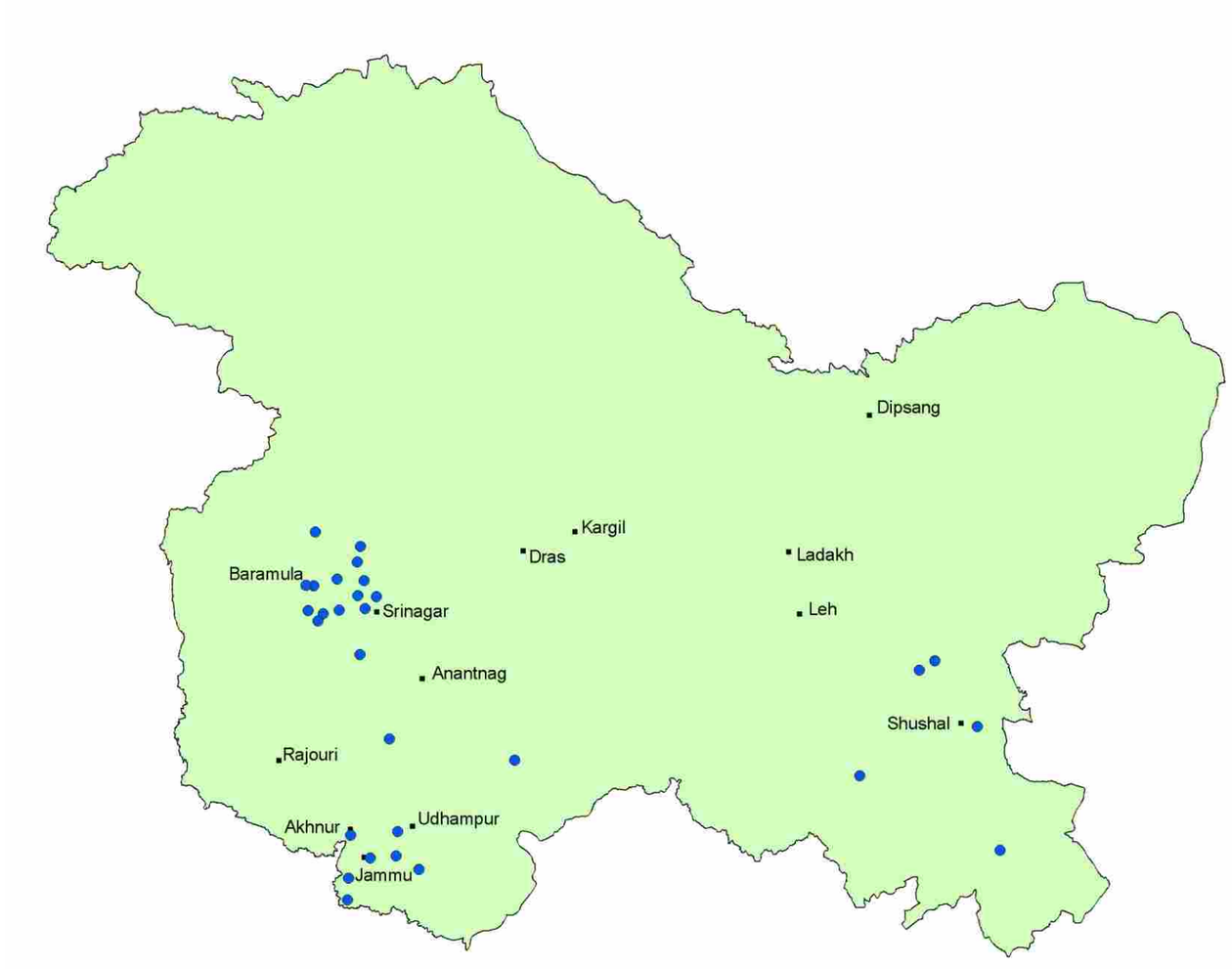
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Data Deficient
29	9	11	2	7

Seven wetlands qualify to be declared as Ramsar sites (page 215).

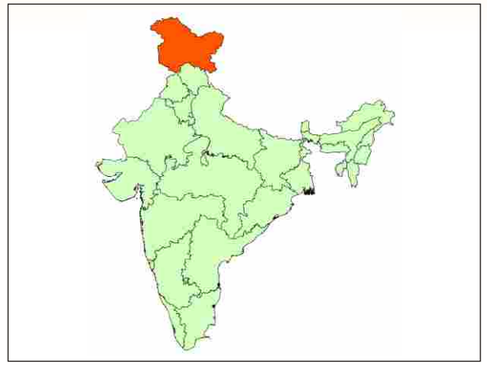


B. Pandav

A profile of wetlands in Jammu and Kashmir



Distribution of some key wetlands



DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BADGAM	1371	N.A.	0.00
BARAMULLA	4588	236.5	5.15
DODA	11691	N.A.	0.00
JAMMU	3097	20.12	0.65
KARGIL	14036	N.A.	0.00
KATHUA	2651	N.A.	0.00
KUPWARA	2379	N.A.	0.00
LEH (LADAKH)	45110	3655.14	8.10
PULWAMA	1398	N.A.	0.00
PUNCH	1674	103.68	6.19
RAJAURI	2630	N.A.	0.00
SRINAGAR	2228	N.A.	0.00
UDHAMPUR	4550	8.62	0.19

Maps not to scale

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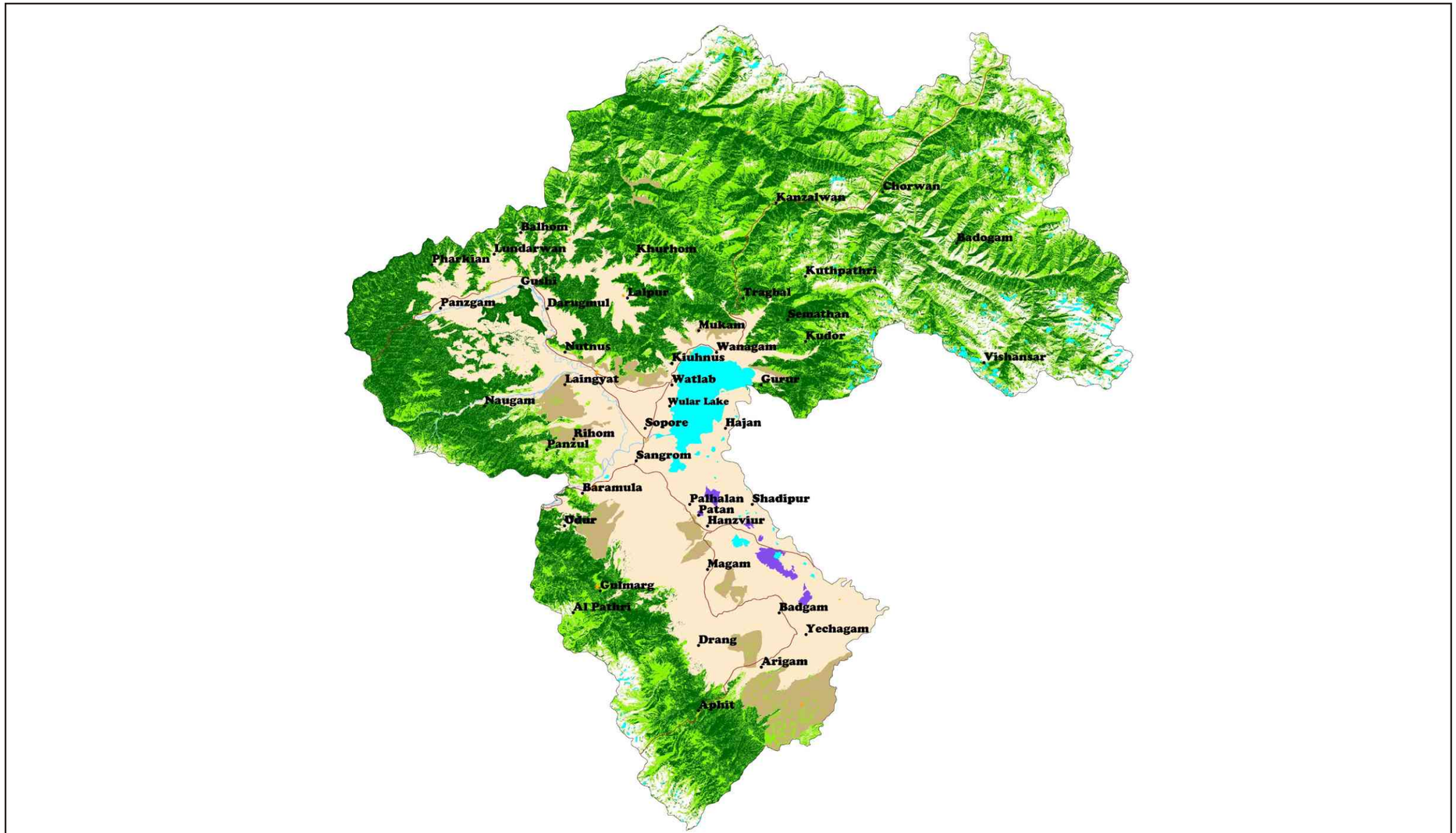
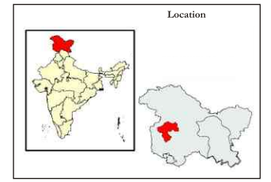
Integrated wetland and land use map

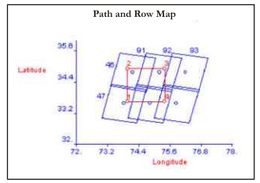
District Baramulla, Jammu and Kashmir



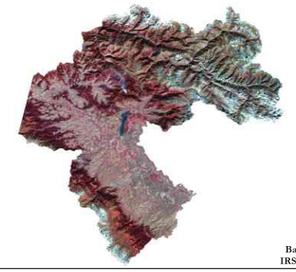
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	Water-logged	NP Sand	Snow	NP * Not Present
Open Forest	River	NP Reservoir	NP Coastal-water	NP Others/Salt	District Boundary	
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Road	Taluks/Tehsil Boundary	



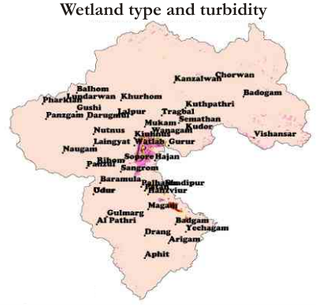


False colour composite



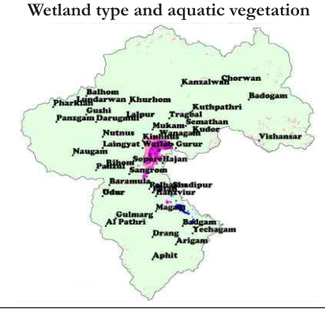
Band Combination: 3, 2, 1
IRS ID LISS III Data, 2000

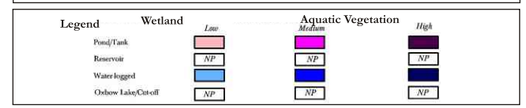
Wetland type and turbidity





Wetland type and aquatic vegetation





Maps not to scale

Regional Remote Sensing Service Centre, Dehradun and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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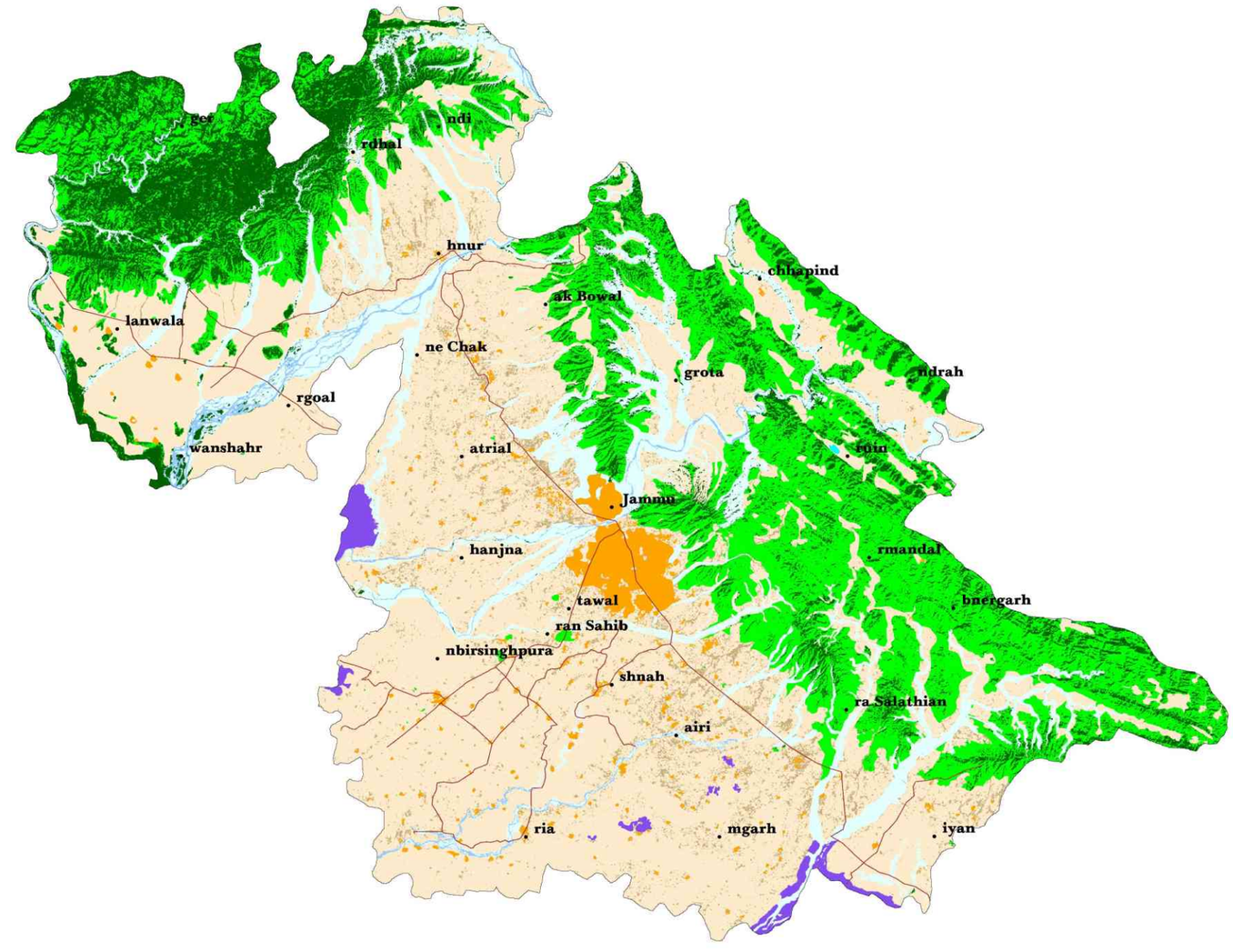
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads
Open Forest	River/Other Water Bodies	Ponds\Tanks	Water-logged	NP Sand	District Boundary
Arable Land	River Bed	NP Reservoir	NP Coastal-water	NP Others/Salt	NP * Not Present

Maps not to scale

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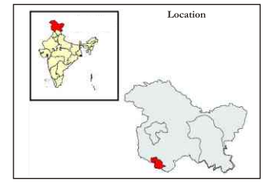
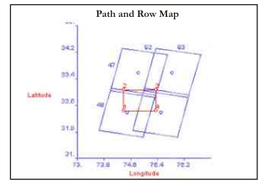
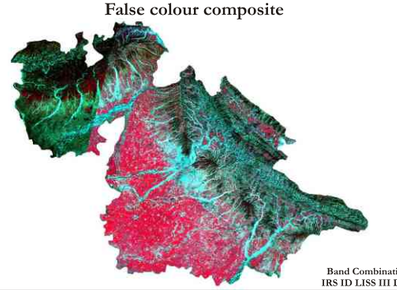
District Jammu, Jammu and Kashmir





False colour composite



Band Combination: 3, 2, 1
IRS ID LISS III Data, 2000

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	*Medium*	*High*
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

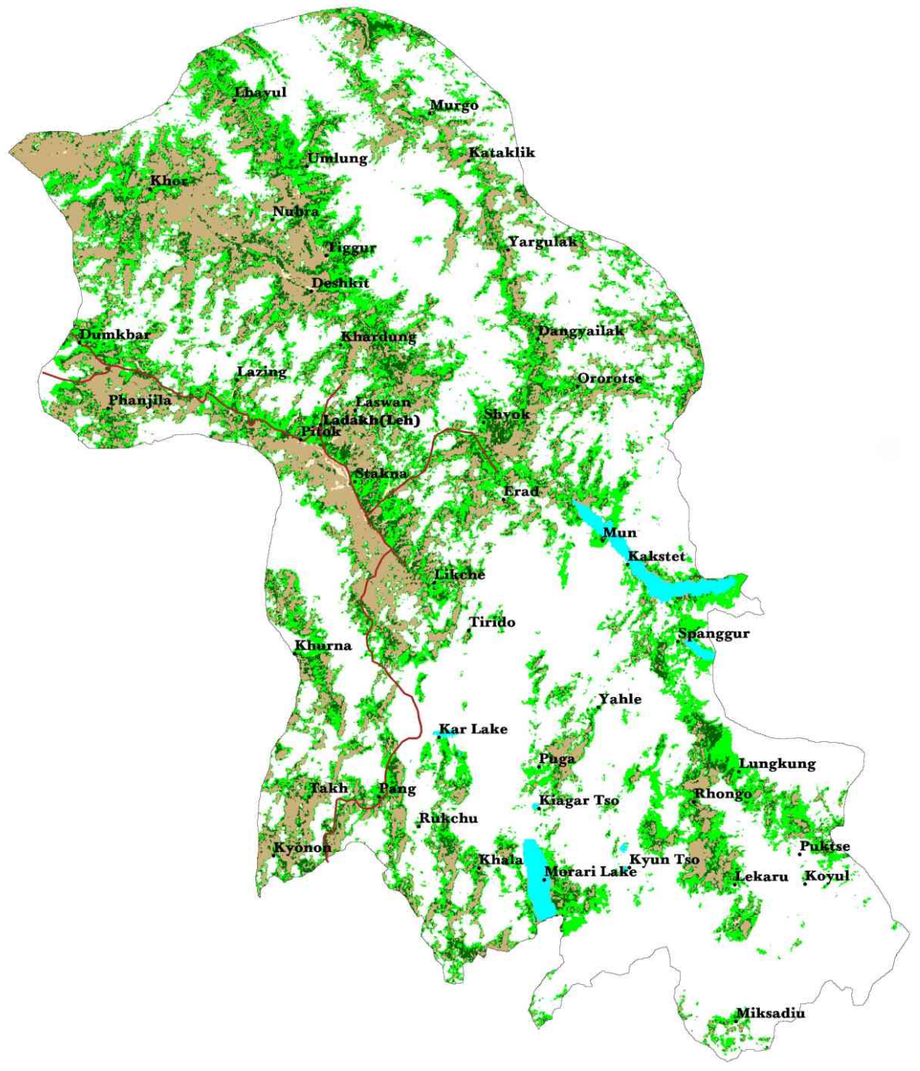
Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	*Medium*	*High*
Pond/Tank				
Reservoir		NP	NP	NP
Water-logged				
Oxbow Lake/Cut-off		NP	NP	NP

Integrated wetland and land use map

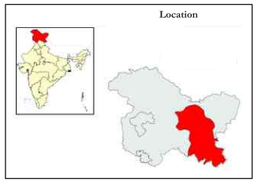
District Ladakh, Jammu and Kashmir



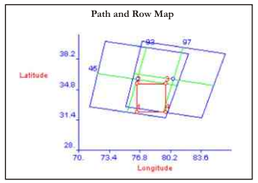
Integrated wetland type and land use

Pasture	Waste Land	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Snow	NP * Not Present
Seasonal Pasture	Pond/Lake	NP Water-logged	NP Sand	Road	
Arable Land	NP Reservoir	NP Coastal-water	NP Others	District Boundary	

Location



Path and Row Map



False colour composite



Band Combination: 3, 2, 1
IRS ID-WiFS Data

Wetland type and turbidity



Legend

Wetland	Turbidity: Low	Medium	High
Pond/Tank			
Reservoir	NP	NP	NP
Water-logged	NP	NP	NP
Oxbow	NP	NP	NP

Wetland type and aquatic vegetation

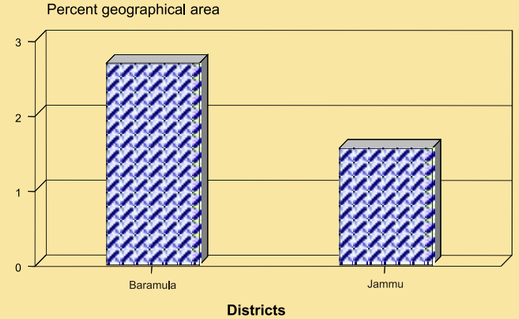


Legend

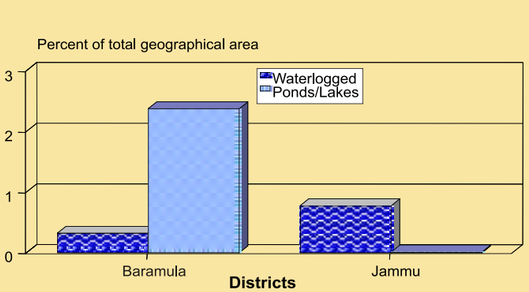
Wetland	Aquatic Vegetation: Low	Medium	High
Pond/Tank			
Reservoir	NP	NP	NP
Water-logged	NP	NP	NP
Oxbow	NP	NP	NP

Maps not to scale

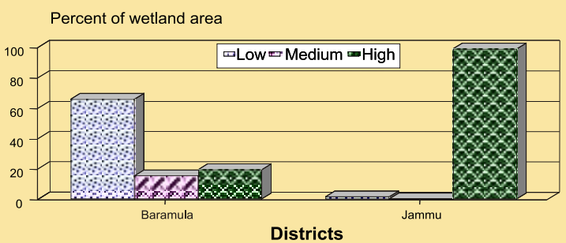
©SACON 2004



Area under wetland in select districts



Area under different wetland classes in select districts



Turbidity pattern in select districts

Attributes of wetlands and environmental contamination

Wetlands

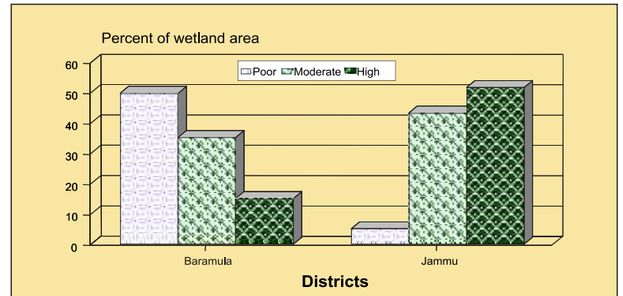
The area under wetlands varied from a minimum of 0.78% in Jammu to 2.69% in Baramula. Only two categories, namely waterlogged and lakes/ponds are found. Baramula district has relatively higher area under lakes/ponds than Jammu, which has a substantial waterlogged area.

Turbidity

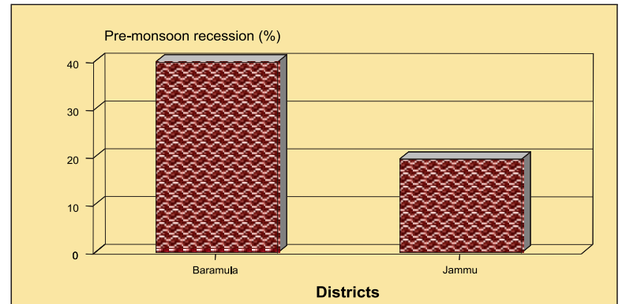
Very high levels of turbidity were found in the wetlands of Jammu region. Since many of these are located in the agricultural areas, the sediments do contribute to the observed high levels of turbidity. In contrast, Baramula has relatively less turbidity, due to its forested catchments.

Summer recession of water

Pre monsoon recession of water show drastic difference between the districts; recession is low in Baramula (65%), whereas it is high in Jammu (99%).



Aquatic vegetation in wetlands in select districts



Average summer recession in select districts



B. Pandav

G.S. Rawat

Maps not to scale

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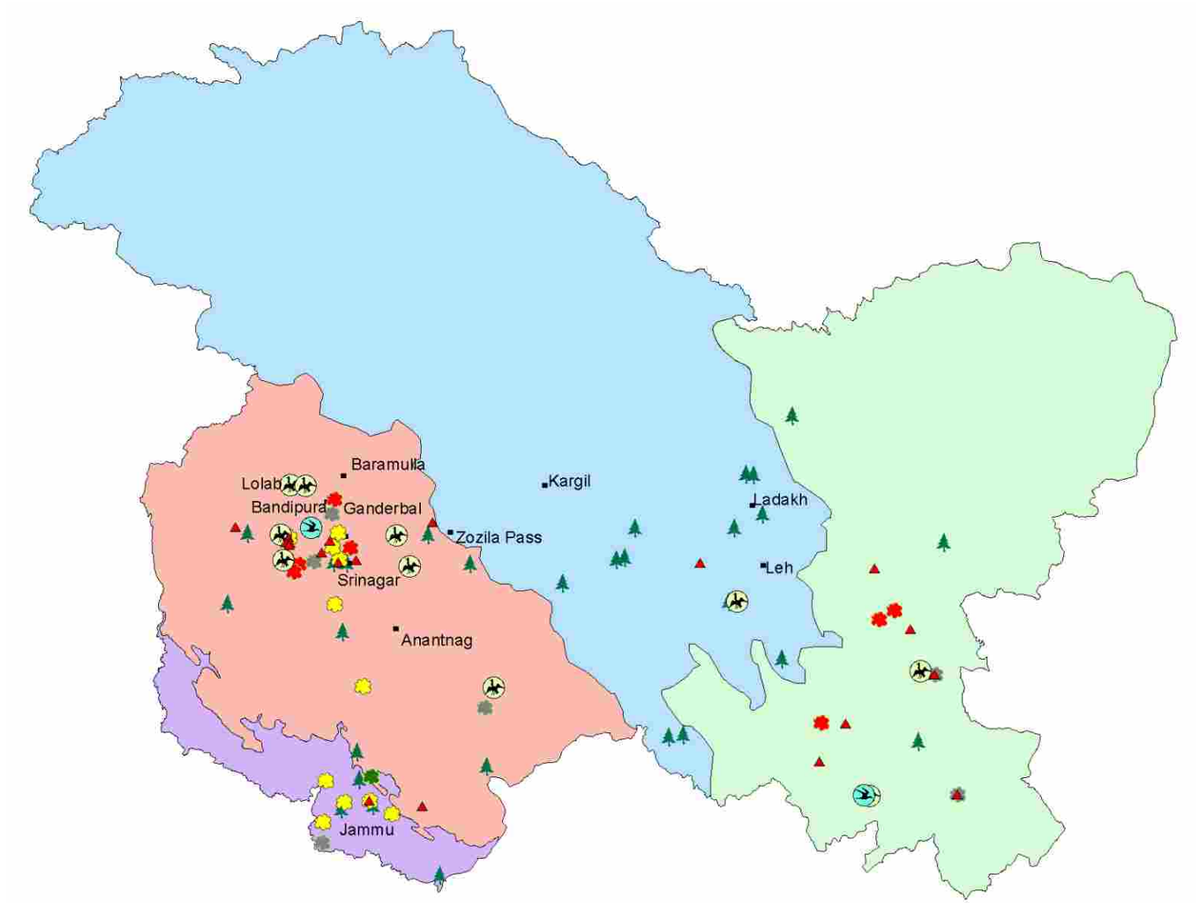
Prioritized inland wetlands of Jammu & Kashmir



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*
- *Ramsar Sites*

Biogeographic Provinces

- *1A, Trans Himalaya-Ladakh Mountains*
- *1B, Trans Himalaya-Tibetan Plateau*
- *2A, Himalaya-North West Himalaya*
- *4A, Semi Arid Punjab Plains*

* *District Boundaries were not available*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Jammu and Kashmir

PRIORITIZED SITE	LATITUDE	LONGITUDE	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
AHANSAR	341230	744100	2	M	2A
ANCHAR	341000	748200	1	H	2A
CHATLAM	341500	745600	3	L	2A
DAL LAKE	340600	744500	2	H	2A
GHARANA	323100	744400	N.A.	M	4A
HENLEY	325500	785500	N.A.	L	1B
HOKERA	340335	744800	1	H	2A
HYGAM	341230	742130	1	H	2A
INDRANAGAR	325400	750200	3	L	2A
KUKRIAN	324500	748667	2	M	2A
MANASBAL	341500	744400	2	H	4A
MANSAR LAKE	324200	751100	2	M	2A
MIRGUND	340415	743800	1	M	4A
NANGA	332400	749500	2	M	2A
NARANBAGH	342100	744100	N.A.	M	2A
NARKARA	340110	744500	1	H	2A
NILNAGH	335100	744400	2	L	4A
PANGONG TSO	335600	782800	1	M	2A
PARAGWAL	325200	747333	2	M	2A
SANGRAL	323800	747333	2	L	1B
SARKOOTSAR	331900	757667	N.A.	L	4A
SHALLBUGH	341000	744200	2	H	2A
SURINSAR	324600	750200	2	M	4A
TIKIPORA KHANSAR	343000	744000	N.A.	M	2A
TRIGAMSAR	340500	743500	N.A.	M	2A
TSOGUL TSO	333500	784500	N.A.	L	1B
TSOKAR TSO	331800	780000	1	L	1B
TSOMORARI	335300	782200	1	L	1B
WULAR LAKE	342600	744200	1	H	2A

B. Pandav

Note:- District names and nearest town is not available; N.A.-Not Available/Data Deficient; L-Low,M-Medium, H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Maps not to scale

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Ramachandran

KARNATAKA KARNATAKA

Habitat features

Karnataka has 622 wetlands of the size 56.25 ha and above, covering an area of 2,288.16 km^2 (KSRSTUC, 1996 & SAC, 1998), constituting 1.19% of the total geographic area of the state. Wetland distribution in sixteen districts is given in pages 59 to 62.

In a sample of seven districts alone, the number of wetlands of two ha and above is 1647, covering an area of 2049.17 km^2. These are shown in pages 63 to 69. In most of the wetlands, the aquatic vegetation is not dense as shown by satellite imageries.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	64	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	3	12	N.A.	15	N.A.	N.A.
Turtles	N.A.	N.A.	1	1	N.A.	1	1
Birds	N.A.	N.A.	N.A.	N.A.	5	7	N.A.

Prioritized Sites

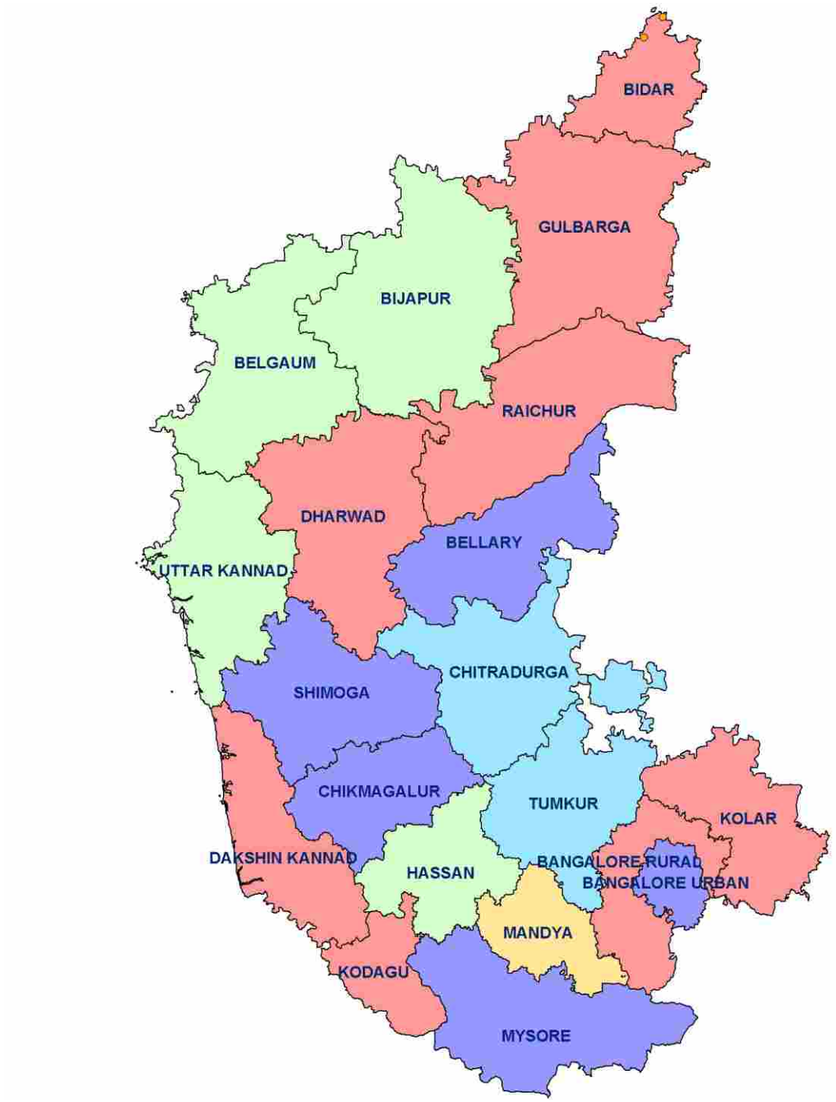
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
75	11	21	23	20

Twenty one wetlands are qualified to be assigned as Ramsar sites (page 215).

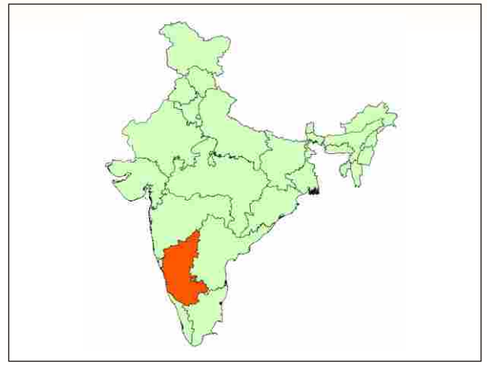


Ameen Ahmed

A profile of wetlands in Karnataka



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BANGALORE RURAL	7980.39	N.A.	0.00
BANGALORE URBAN	2190.00	105.12	9.01
BELGAUM	13415	197.33	1.47
BELLARY	8450.00	353.00	4.18
BIDAR	5448	8.87	0.16
BIJAPUR	10494.00	129.93	1.24
CHIKMAGALUR	7201.00	197.75	2.75
CHITRADURGA	8440.00	130.87	1.55
DAKSHIN KANNAD	4560.00	0.93	0.02
DHARWAD	13507.14	44.00	0.33
GULBARGA	16224.00	46.25	0.29
HASSAN	6814.00	98.43	1.44
KODAGU	4102.00	4.62	0.11
KOLAR	8223.00	10.29	0.13
MANDYA	4961.00	33.12	0.67
MYSORE	12004.73	264.50	2.20
RAICHUR	13742.72	30.99	0.23
SHIMOGA	10420.84	457.56	4.39
TUMKUR	10597.00	182.49	1.72
UTTAR KANNAD	10291.00	151.12	1.47

Maps not to scale

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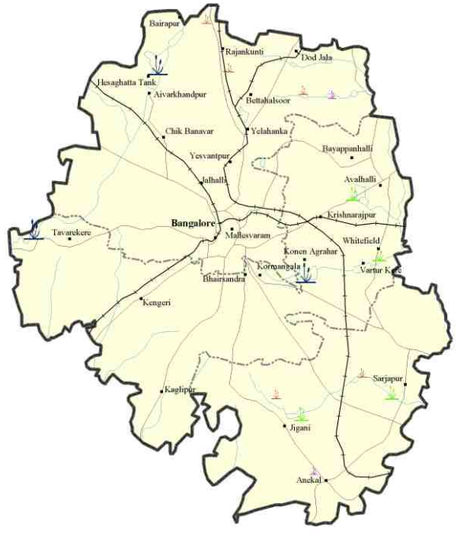
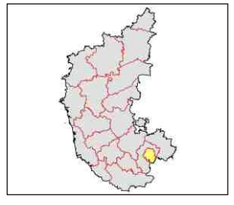
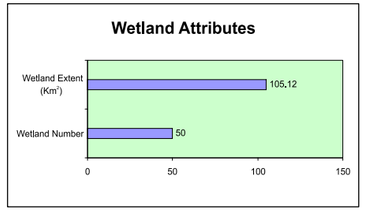
District - wise spatial distribution of wetlands



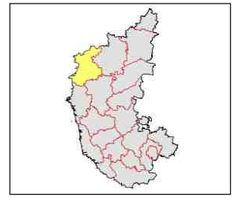
District Banglore Urban

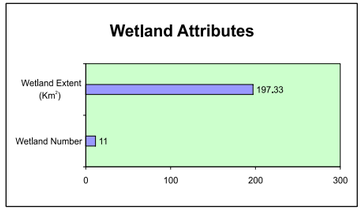






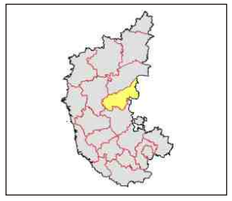
District Belgaum

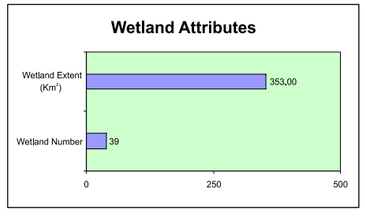






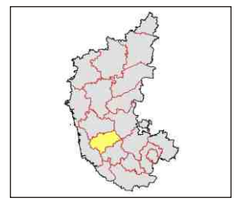
District Bellary

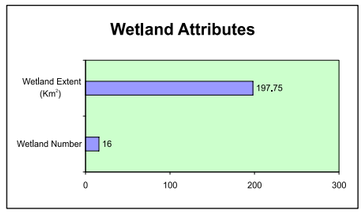






District Chikmagalur





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Karnataka State Remote Sensing Technology Utilization Centre, Bangalore

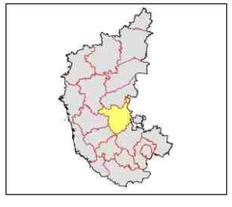
Maps not to scale

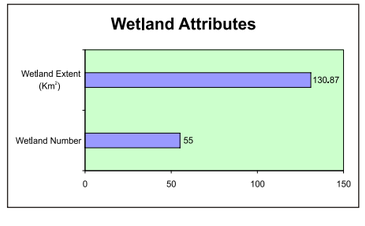
©SACON 2004

District - wise spatial distribution of wetlands



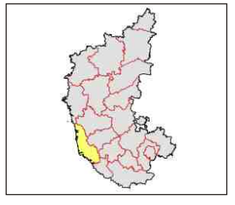
District Chitradurga

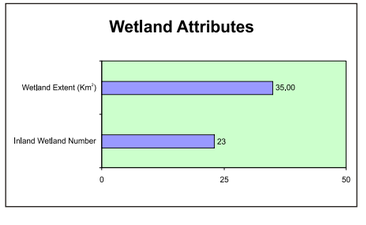






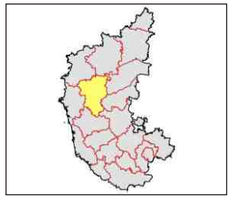
District Dakshin Kannad

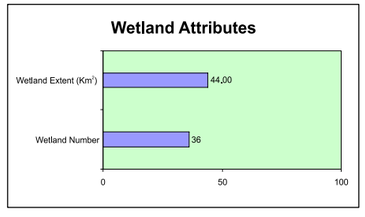






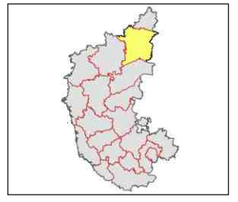
District Dharwar

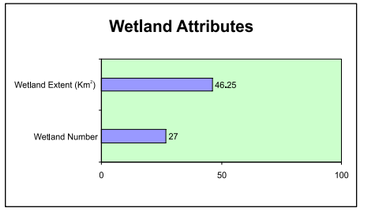






District Gulbarga





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Karnataka State Remote Sensing Technology Utilization Centre, Bangalore

Maps not to scale

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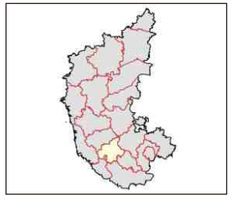
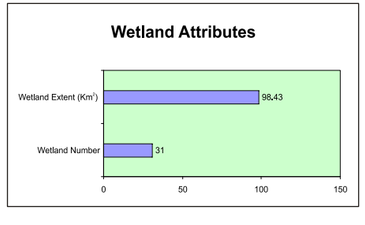
District - wise spatial distribution of wetlands



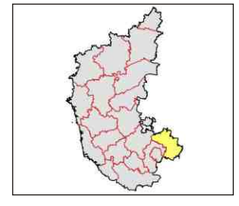
District Hassan

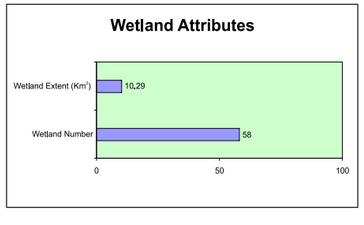






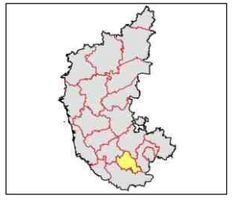
District Kolar

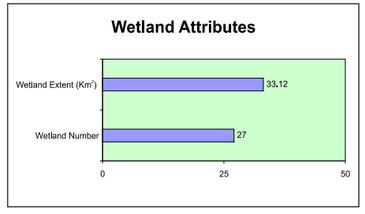






District Mandya







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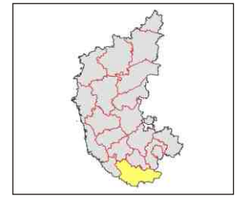
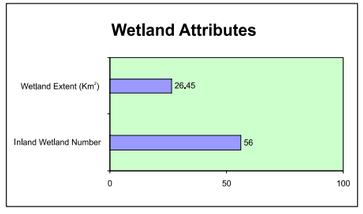




Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Karnataka State Remote Sensing Technology Utilization Centre, Bangalore

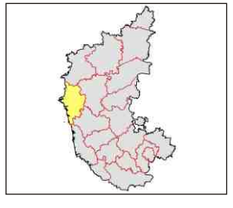
Maps not to scale

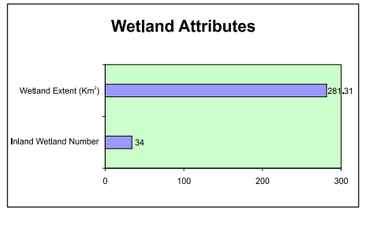
©SACON 2004

District - wise spatial distribution of wetlands



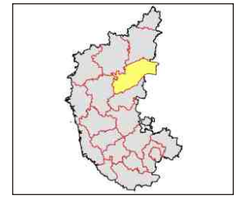
District North Kanara

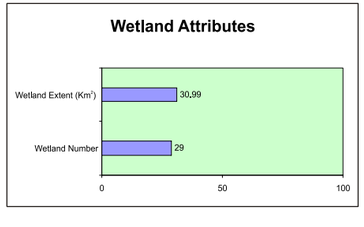






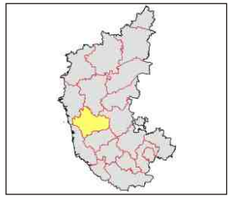
District Raichur

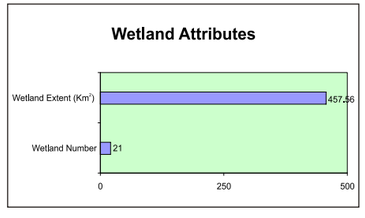






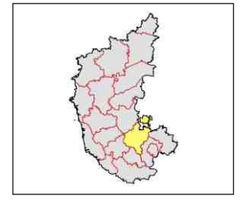
District Shimoga

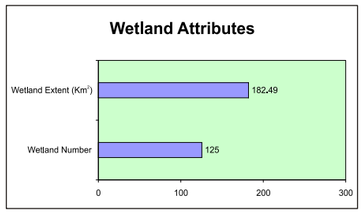






District Tumkur





Source: Wetland point data; Karnataka State Remote Sensing Technology Utilization Centre, Bangalore

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

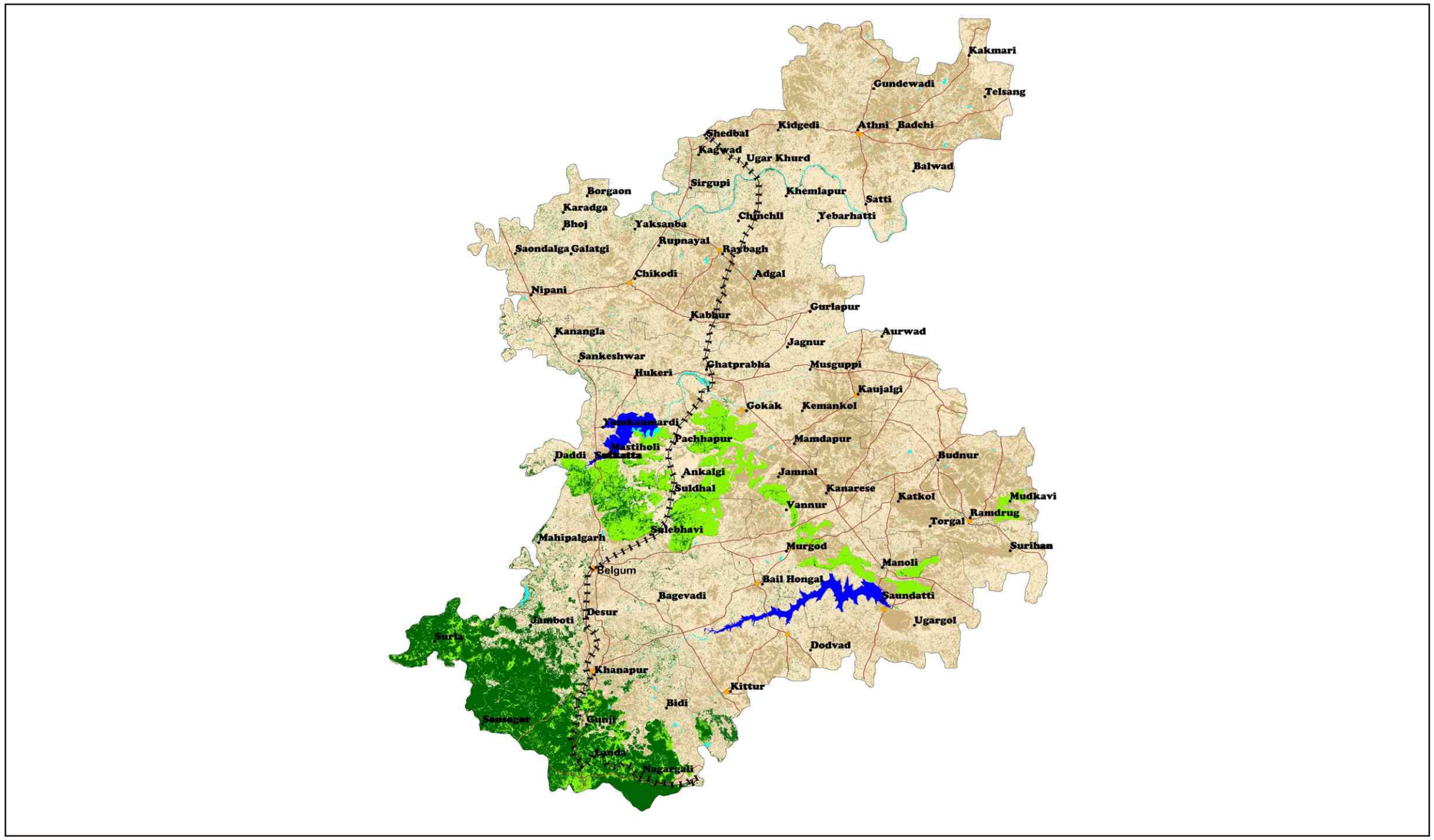
Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

©SACON 2004

Integrated wetland and land use map

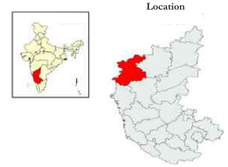
District Belgaum, Karnataka



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Lake	NP Oxbow Lake/Cut-off	NP Sand	Railway	NP * Not Present
Open Forest	Township	Reservoir	NP Coastal-water	NP Others	District Boundary	
Arable Land	River	NP Water-logged	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary	

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS-ID LISS III (13 November-05 December 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir		NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Wetland type and aquatic vegetation



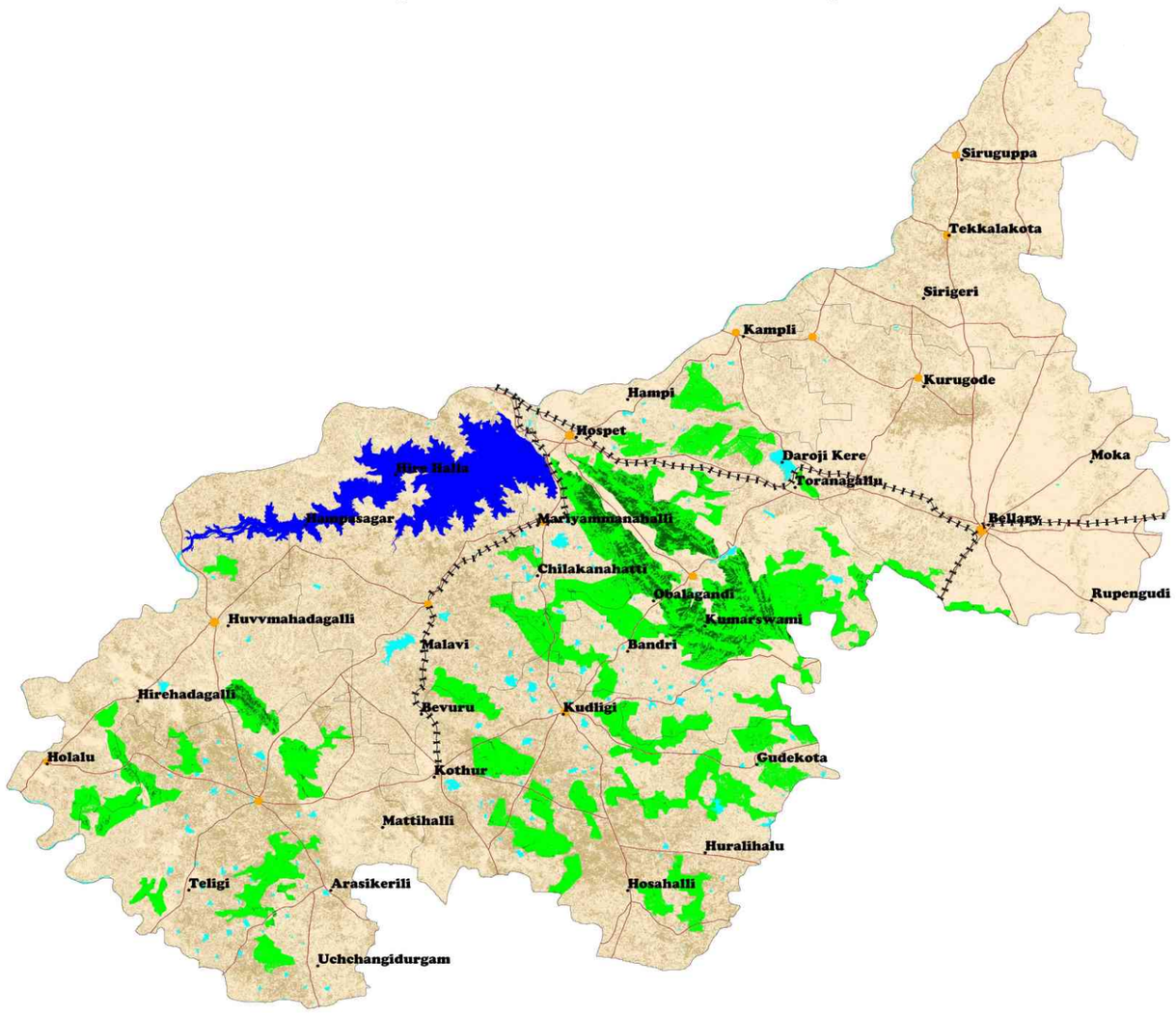
Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir		NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Maps not to scale

©SACON 2004

Regional Remote Sensing Service Centre, Banglore and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	NP Others/Salt	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Road	Taluks/Tehsil Boundary

Maps not to scale

©SACON 2004

District Bellary, Karnataka

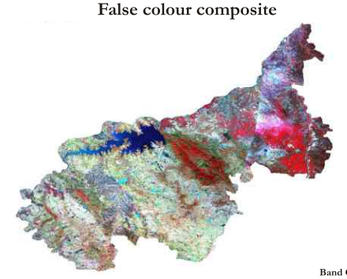
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (06 December-17 December)

Wetland type and turbidity



Legend — Wetland / Turbidity

Wetland	Low	Medium	High
Pond/Tank		NP	NP
Reservoir		NP	NP
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation

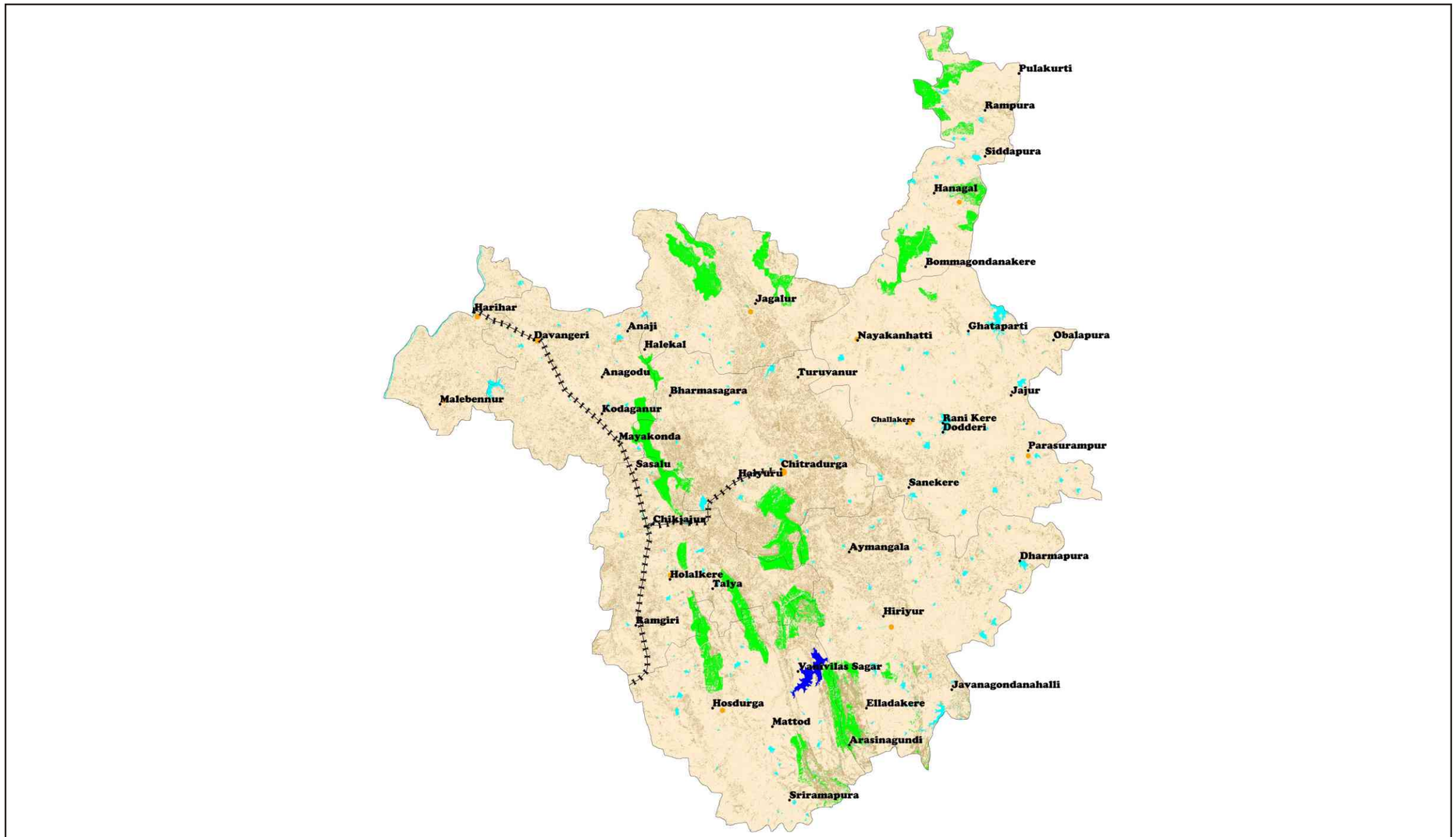


Legend — Wetland / Aquatic Vegetation

Wetland	Low	Medium	High
Pond/Tank		NP	NP
Reservoir		NP	NP
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Integrated wetland and land use map

District Chitradurga, Karnataka



Integrated wetland type and land use

NP Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railway NP * Not Present
Open Forest	Township	Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	NP River	NP Water-logged	NP Marsh/Mud	Road	Taluks/Tehsil Boundary

Location



Taluks/Tehsils

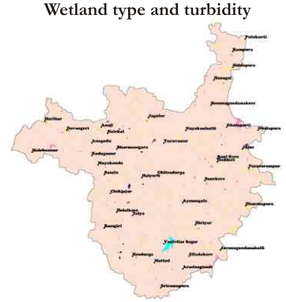


False colour composite



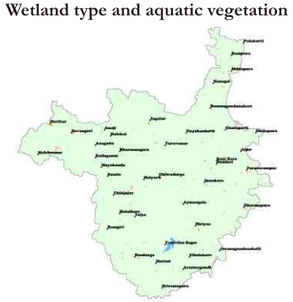
Band Combination: 3, 2, 1
IRS-1D LISS III (06 December-30December 1998)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir		NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir		NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Maps not to scale

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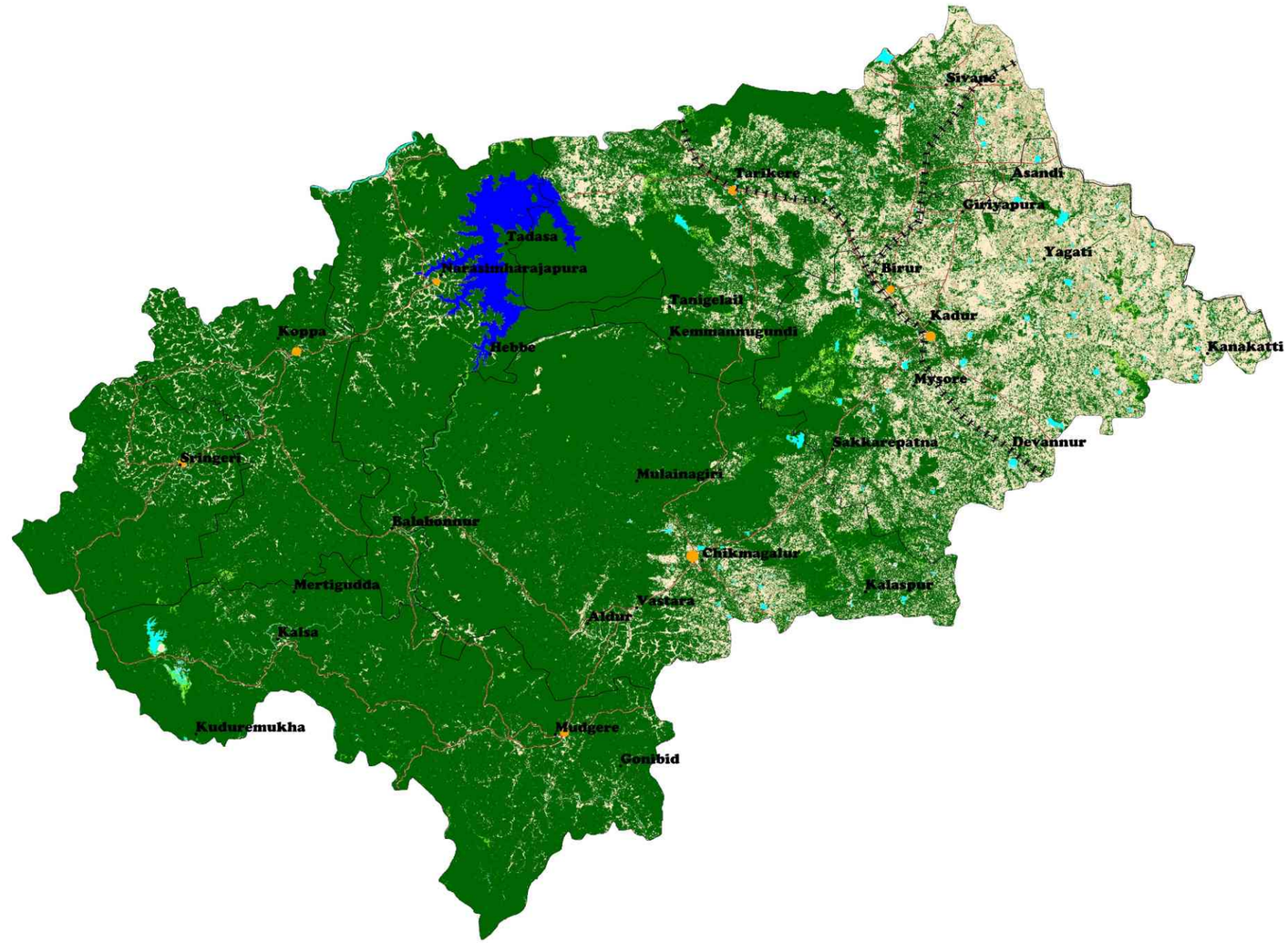
Regional Remote Sensing Service Centre, Banglore and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	NP Others/Salt	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Road	Taluks/Tehsil Boundary

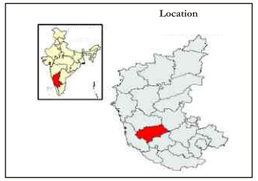
NP * Not Present

Maps not to scale

©SACON 2004

District Chikmagalur, Karnataka

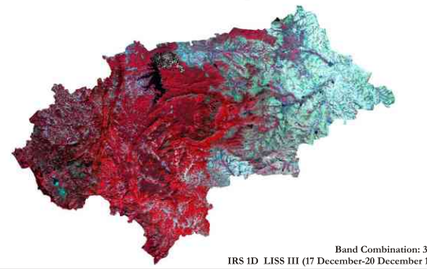
Location



Taluks/Tehsils



False colour composite



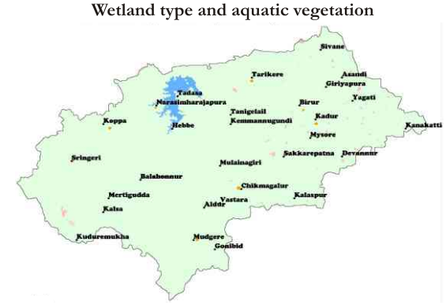
Band Combination: 3, 2, 1
IRS ID LISS III (17 December-20 December 1998)

Wetland type and turbidity



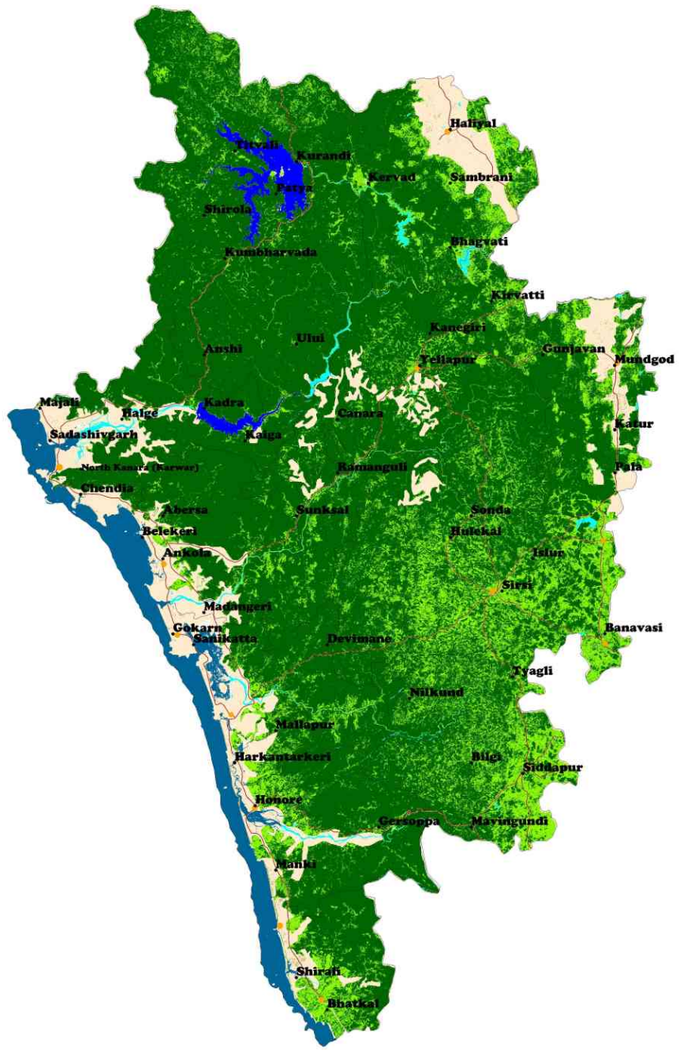
Legend	Wetland	Turbidity		
		Low	Medium	High
Pond/Tank			NP	NP
Reservoir				NP
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank			NP	NP
Reservoir			NP	NP
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Integrated wetland and land use map

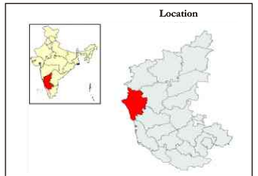


Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railway	NP * Not Present	
Open Forest	Township	Reservoir	Coastal-water	NP Others	District Boundary		
Arable Land	River	NP Water-logged	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary		

District North Kanara, Karnataka

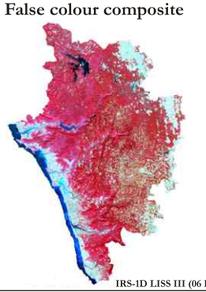
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS-1D LISS III (06 December -30 December 1998)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir		NP	NP
	Water-logged	NP	NP	NP
	Oxbow\Cut-off	NP	NP	NP
	Coastal Water			NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir		NP	NP
	Water-logged	NP	NP	NP
	Oxbow\Cut-off	NP	NP	NP
	Coastal Water			NP

Maps not to scale

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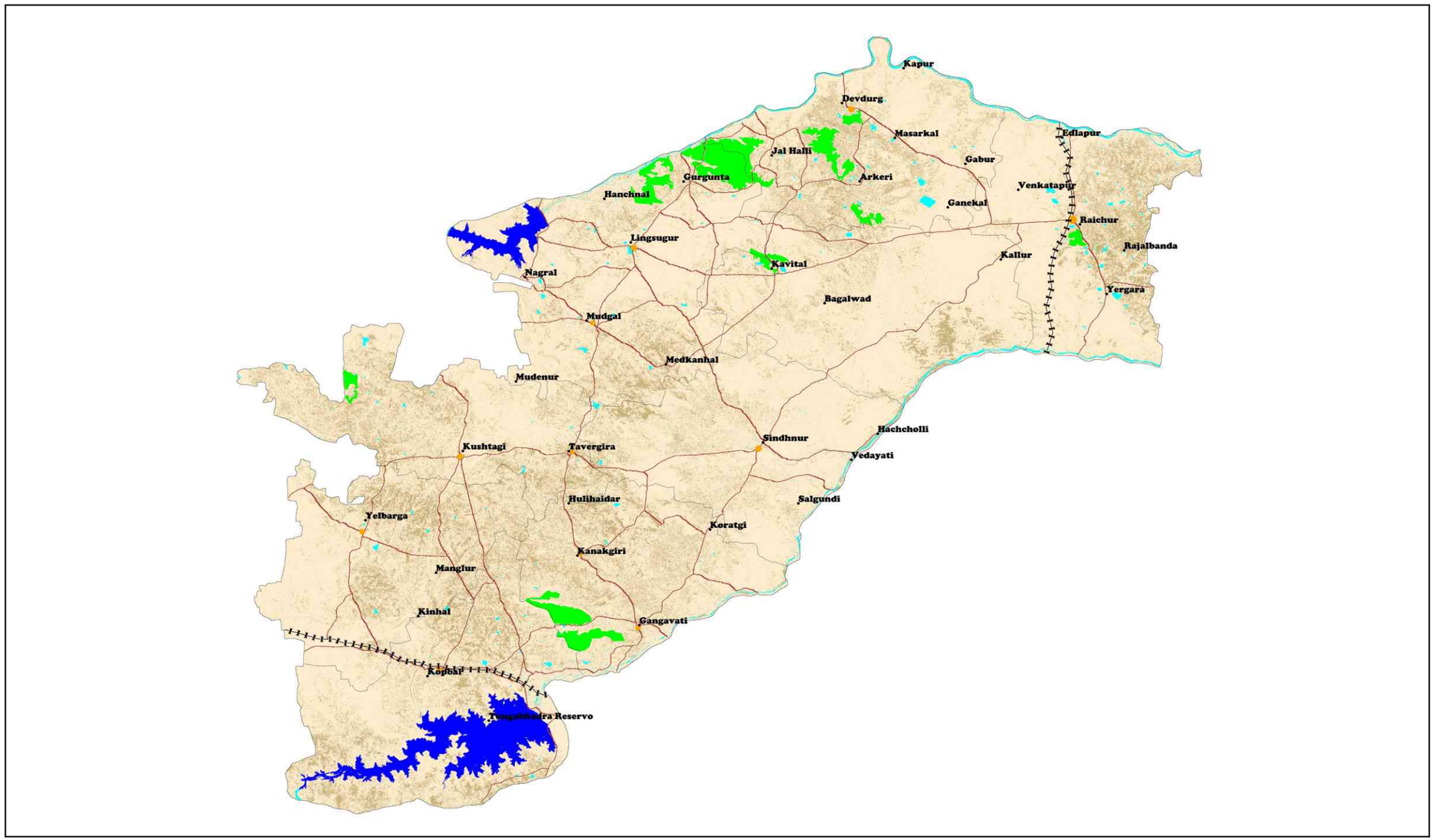
Integrated wetland and land use map

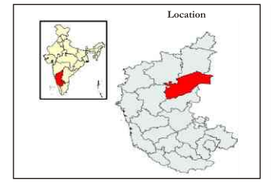
District Raichur, Karnataka

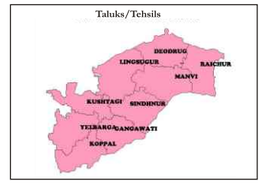


Integrated wetland type and land use

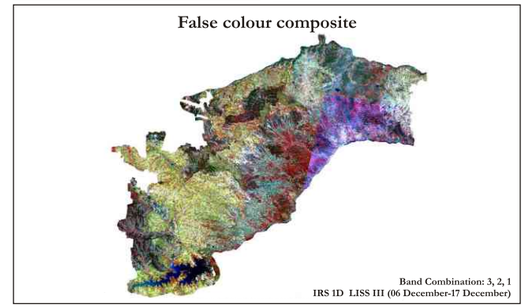
NP Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railway
Open Forest	River	Reservoir	NP Coastal-water	NP Others/Salt	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Road	Taluks/Tehsil Boundary

NP * Not Present



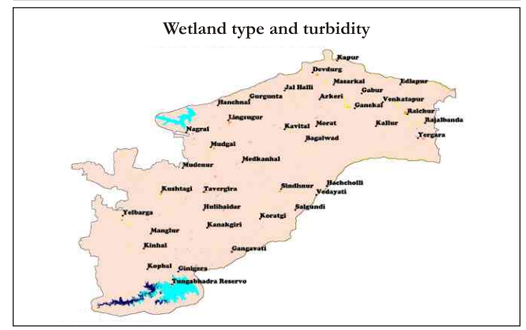


False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (06 December-17 December)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Maps not to scale

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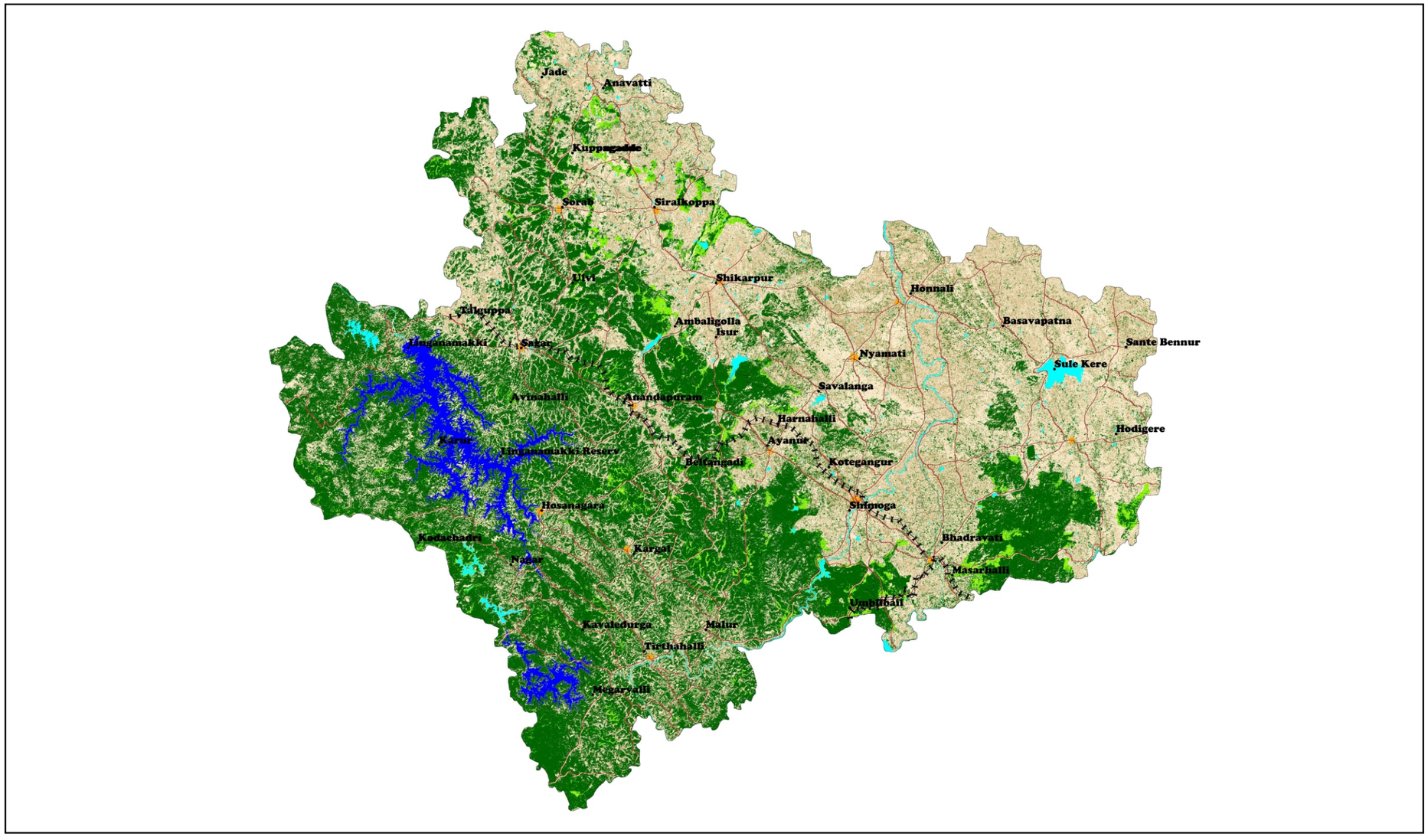
Integrated wetland and land use map

District Shimoga, Karnataka



Integrated wetland type and land use

NP Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways	NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	NP Others/Salt	District Boundary	
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary	

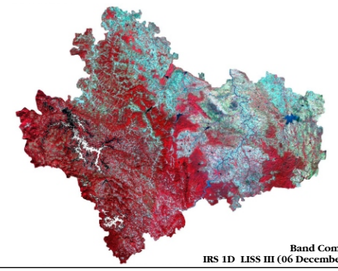
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (06 December-17 December)

Wetland type and turbidity



Legend Wetland	Turbidity Low	Medium	High
Pond/Tank			NP
Reservoir		NP	NP
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend Wetland	Aquatic Vegetation Low	Medium	High
Pond/Tank		NP	NP
Reservoir		NP	NP
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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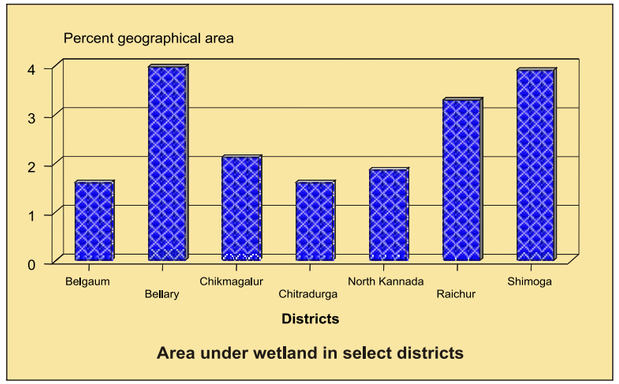
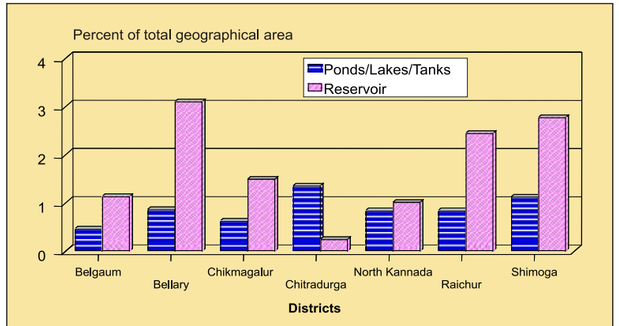
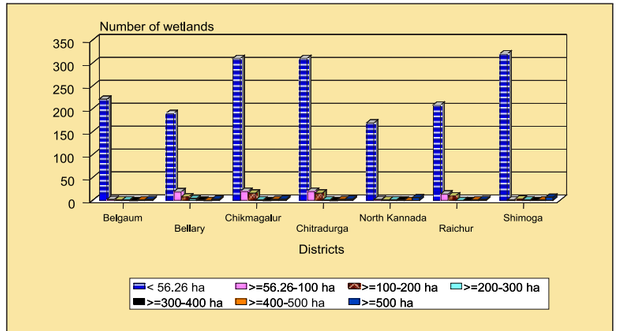


Area under wetland in select districts



Area under different wetland classes in select districts



Size class distribution in select districts

Attributes of wetlands and environmental contamination

Wetlands

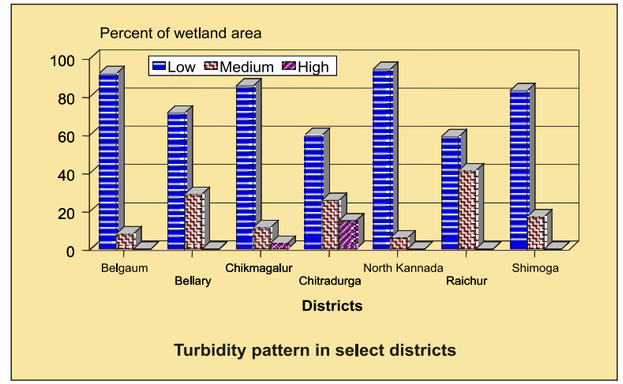
A variety of wetland types are encountered in Karnataka, ranging from huge reservoirs to village tanks and occasional oxbow lakes. The area covered under wetland is 1.19% of the entire state. The total number of wetlands above 56.25 ha. is estimated at 622 in the state. It is interesting to note that while the districts in the Western Ghats with heavy rainfall have fewer number of wetlands, the districts which are relatively drier have higher number of wetlands. Thus, Tumkur with a rainfall of less than 700 mm, has 125 wetlands, while South Kanara (Dakshina Kannada) district, with an excess of 2000 mm rainfall, has only 23 wetlands. The spatial distribution of wetlands for the entire state shows a skewed distribution of wetlands in the drier districts. This has a substantial bearing in the distribution and abundance of wetland birds and other aquatic species.

Turbidity

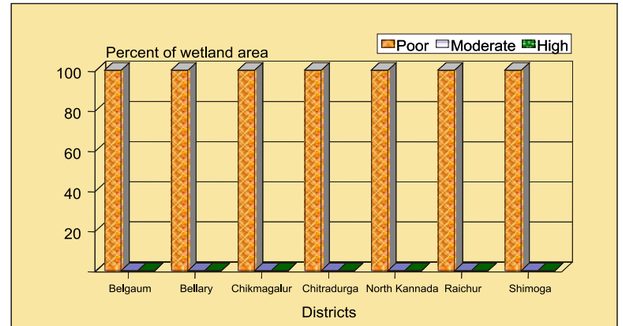
Turbidity of the wetland is low in all the wetlands except for a few wetlands of Chitradurga and Chikmagalur.

Summer recession of water

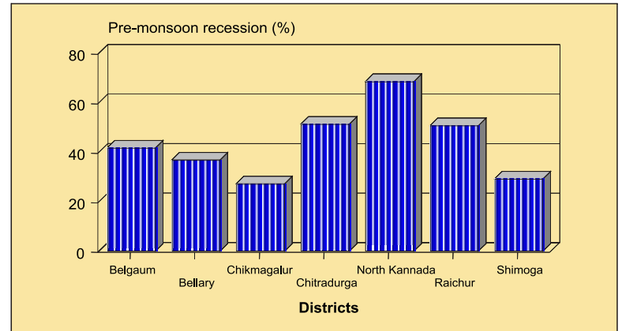
Summer recession of wetland area in North Kanara(Uttara Kannada) district is the maximum while minimum recession is found in Chikmagalur and Shimoga districts.



Turbidity pattern in select districts



Aquatic vegetation in wetlands of different districts



Average summer recession in select districts

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Maps not to scale

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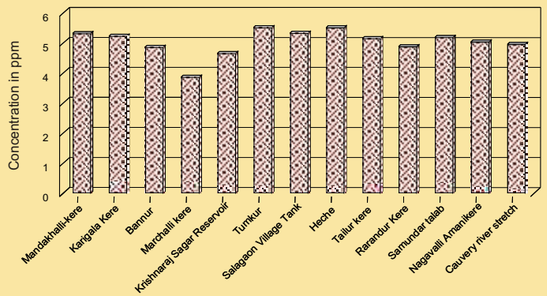
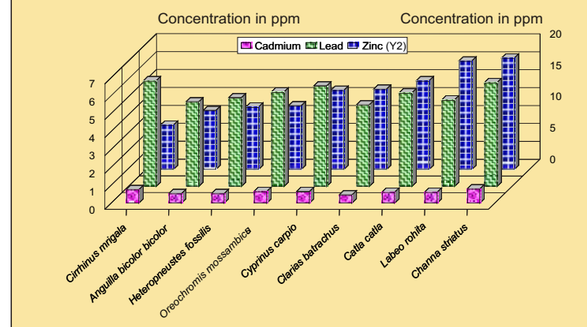


Lead contamination in select wetlands

Attributes of wetlands and environmental contamination

Heavy metals

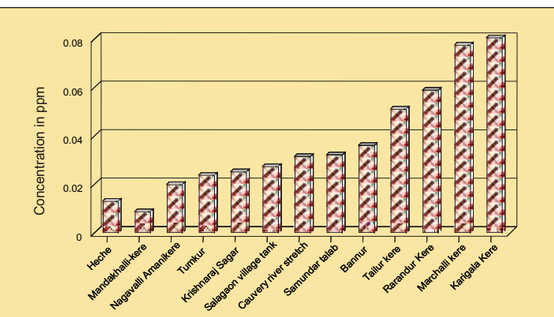
Among the wetlands studied, almost similar levels of concentrations of lead are recorded in Tumkur Amanikare and Heche tank of Shimoga districts. Although, appreciable concentrations of other metals, namely copper, cadmium and chromium are noticed, they are lower than the levels reported to be harmful. Among the nine species of fishes received from Karnataka, *Channa striatus* had the maximum concentrations of metals such as lead, zinc and cadmium. Surface dwellers such as *Cyprinus carpio* and *Catla catla,* and subsurface dwellers, namely *Labeo rohita* have lower metal levels than *Channa striatus,* a bottom dweller. Significant variation in contamination could be related to their feeding habits.



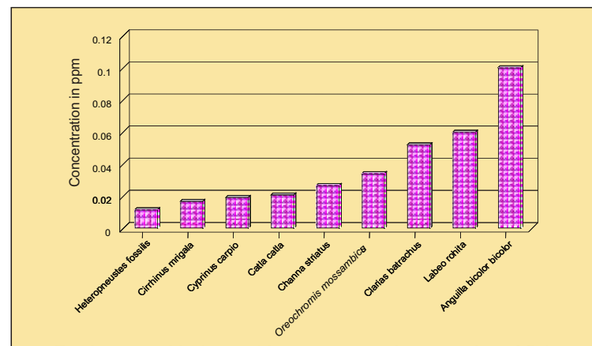
Heavy metal contamination in select species of fishes

Pesticides

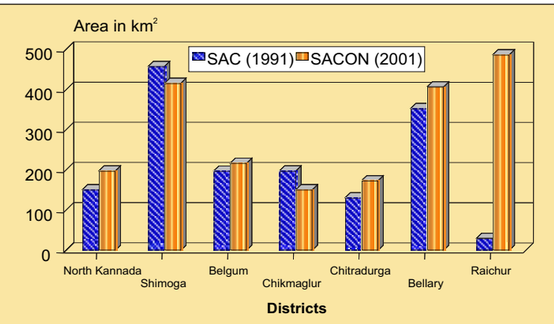
Annual consumption of pesticides in Karnataka is estimated at 3,127 mt. About 17.7% of bovine milk samples have pesticides above tolerable limits. Surprisingly, organochlorine concentrations in Karnataka wetlands are comparatively lower than those of other states. It ranked 12th in terms of total average organochlorine residues. The maximum load of total concentration of organochlorine residues was recorded in Karigala kere of Mysore district and Marchalli kere of Mandya district followed by Ravanduru kere of Mysore district. The minimum concentrations are recorded in Heche of Shimoga district and Mandakhalli of Mysore district. HCH, heptachlor epoxide and DDT are detected in 85, 71 and 70% of the fishes examined respectively.



Total organochlorine residues among various wetlands



Total organochlorine residues among various species of fishes



Difference in Total Wetland Area (km^2)



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Maps not to scale

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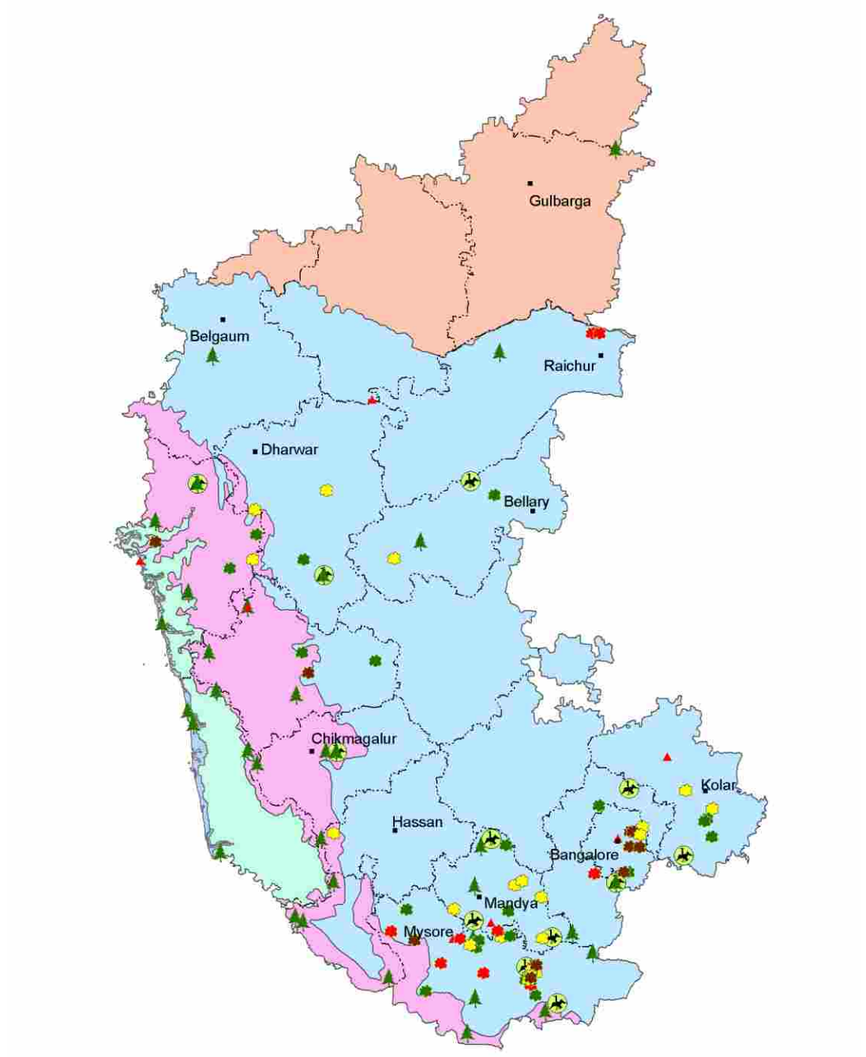
Prioritized inland wetlands of Karnataka



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*

Important Bird Areas

Wildlife Sanctuaries & National Parks

Biogeographic Provinces

- *5A, Western Ghats-Malabar Plains*
- *5B, Western Ghats-Western Ghats Mountains*
- *6D, Deccan Peninsula-Central Plateau*
- *6E, Deccan Peninsula-Deccan South*

District Boundaries

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Karnataka

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
AGARA TANK (YELANDUR CLUSTER)	CHAMARAJANAGAR	120300	770000	CHAMARAJANAGAR	3	M	6E
AMANAKATTE	MANDYA	122900	761100	MANDYA	3	M	6E
ARAKERE	MANDYA	121930	764930	MANDYA	2	M	6E
ATTIVERY BIRD SANCTUARY	UTTAR KANNAD	150500	750200	UTTAR KANNAD	2	L	6E
BADANE KERE	KOLAR	131300	781300	KOLAR	2	M	6E
BANNUR HEGGERE	MANDYA	122000	765300	MANDYA	3	M	6E
BELIKERE	MYSORE	121500	763930	MYSORE	3	H	6E
BELLANDUR	BANGALORE	125700	774000	BANGALORE	4	M	6E
BETHAMANGALA TANK	KOLAR	130200	781300	KOLAR	3	M	6E
BYRAMANGALA RESERVOIR	BANGALORE	124600	772600	BANGALORE	1	M	6E
DALAVAY TANK	MYSORE	115700	762000	MYSORE	3	L	6E
DAROJI TANK	BELLARY	151500	764000	BELLARY	3	H	6E
DUGGATTI TANK (YELANDUR CLUSTER)	CHAMARAJANAGAR	115700	770400	CHAMARAJANAGAR	3	M	6E
GENDE HOSALLI	MANDYA	122200	764800	MANDYA	1	M	6E
GUDAVI BIRD SANCTUARY	SHIMOGA	140100	752700	SHIMOGA	4	H	6E
HECHE TANK	SHIMOGA	145000	742200	SHIMOGA	4	H	5B
HEGGARI (HAVERI) TANK	HAVERI	144600	752300	HAVERI	3	L	6E
HENNAGARA TANK	BANGALORE	124700	774000	BANGALORE	3	H	6E
HIREKERE LAKE	CHAMARAJANAGAR	120100	770200	CHAMARAJANAGAR	1	L	6E
HOSKOTE TANK	BANGALORE	130500	774500	BANGALORE	2	H	6E
IRSAWADI LAKE (YELANDUR CLUSTER)	CHAMARAJANAGAR	120900	770300	CHAMARAJANAGAR	1	M	6E
ISLOOR VILLAGE TANK	UTTAR KANNAD	144100	745300	UTTAR KANNAD	3	H	5B
JIGINI LAKE	BANGALORE	124700	773800	BANGALORE	4	L	6E
KABINI RIVER	MYSORE	121754	764035	MYSORE	3	H	6E
KAGGALIPURA KERE	MANDYA	123000	765200	MANDYA	3	H	6E
KALKERE TANK	BANGALORE	130300	774000	BANGALORE	4	H	6E
KALLUR LAKE(YELANDUR CLUSTER)	CHAMARAJANAGAR	120500	770100	CHAMARAJANAGAR	2	M	6E
KAMASAMUDRAM KERE	KOLAR	130900	781100	KOLAR	3	H	6E
KARANJI TANK	MYSORE	120825	762535	MYSORE	1	L	6E
KARIGALA KERE	MYSORE	121700	761435	MYSORE	4	H	6E
KENCHANA KERE	MYSORE	123000	763000	MYSORE	2	H	6E
KESTHUR LAKE (YELANDUR CLUSTER)	CHAMARAJANAGAR	120700	770200	CHAMARAJANAGAR	2	L	6E
KOLAR AMMANIKERE	KOLAR	130800	781000	KOLAR	3	M	6E
KOPPA	MANDYA	124200	765700	MANDYA	2	M	6E
KRISHNARAJASAGAR DAM	MYSORE	121818	763300	MYSORE	1	H	6E
KUKKARAHALLI TANK	MYSORE	121600	763700	MYSORE	2	L	6E
KUNTHUR LAKE (YELANDUR CLUSTER)	CHAMARAJANAGAR	120500	770200	CHAMARAJANAGAR	2	M	6E
LINGAMBUDHI TANK	MYSORE	120500	764300	MYSORE	1	L	6E
MADDUR KERE	MANDYA	125800	754000	MANDYA	2	M	5B
MADDUR LAKE(YELANDUR CLUSTER)	MANDYA	131300	772700	MANDYA	3	H	6E
MAGADI TANK	GADAG	151400	753100	GADAG	2	M	6E
MALAGI DHARMA DAM	UTTAR KANNAD	144500	750200	UTTAR KANNAD	2	H	5B
MANSALAPUR TANK	RAICHUR	162100	771900	RAICHUR	1	M	6E
MAREHALLIKERE	MANDYA	125600	765000	MANDYA	3	M	6E
MULLUR LAKE(YELANDUR CLUSTER)	CHAMARAJANAGAR	120900	770400	CHAMARAJANAGAR	4	H	6E
NARASAMBUDI TANK	MYSORE	122000	760500	MYSORE	1	M	6E
NEREGAL TANK	HAVERI	144800	756000	HAVERI	2	L	6E
RAMPURA TANK	BANGALORE	130300	774100	BANGALORE	4	M	6E
RAVANDURU KERE	CHAMARAJANAGAR	120600	770400	CHAMARAJANAGAR	2	H	6E
SALAGAON TANK	UTTAR KANNAD	145500	750300	UTTAR KANNAD	3	H	5B
SAMUNDER TALAB	RAICHUR	162100	771800	RAICHUR	1	M	6E
SHIDLAGHATTA AMMANIKERE	KOLAR	132000	780200	KOLAR	2	M	6E
SHIMSHA RIVER STRETCH	MANDYA	140700	755400	MANDYA	3	M	6E
SULEKERE	MANDYA	123600	770500	MANDYA	2	H	6E
TAILUR TANK	MYSORE	121940	770556	MYSORE	2	H	6E
TUNGABADRA RIVER-ELE-BICHALI POINT	RAICHUR	162100	772100	RAICHUR	1	H	6E
URAGANAHALLI TANK	SHIMOGA	140900	752400	SHIMOGA	3	H	5B
VARTUR TANK	BANGALORE	125700	774400	BANGALORE	4	M	6E
YELANDUR TANK (YELANDUR CLUSTER)	CHAMARAJANAGAR	120300	770200	CHAMARAJANAGAR	2	H	6E
YELLAMALLAPPA	BANGALORE	130200	774400	BANGALORE	2	L	6E
YERIYRU TANK (YELANDUR CLUSTER)	CHAMARAJANAGAR	120400	770200	CHAMARAJANAGAR	4	N.A.	6E

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Note:- In Doddajala tank, Hebbur Ammanikere, Kuigal doddakere, Chikkajala tank, Kalambellan tank, Nagavalli tank, Chikka Hoskote, Kaggaladu Chikkakere, Kunigal Chikkakere, Kothagere kere, Maralur Ammanikere, Tumkur Ammanikere and Kaggalladu Dodda kere information is not available;N.A.-Not Available/Data Deficient; L-Low,M-Medium,H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



V.S. Vijayan

KERALA KERALA

Habitat features

The CESS(1996) & SAC (1998) have mapped wetlands of the size 56.25 ha and above, covering an area of 342 km^2 constituting 0.83% of the total geographic area of the state.

It includes 29 reservoirs, 16 waterlogged areas and the remaining ponds/ lakes.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	65	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	4	16	17	37	N.A.	N.A.
Turtles	N.A.	N.A.	1	2	N.A.	1	1
Birds	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Prioritized Sites

Number of Prioritized Wetlands	Rank 1	Rank 2
4	1	3

Kole wetlands have already been declared as complex Ramsar site (page 215).



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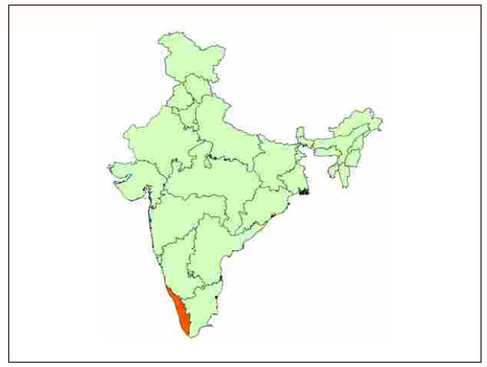
A profile of wetlands in Kerala



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
ALLEPPEY	1454	20.69	1.42
CANNANORE	2966	9.0	40.30
ERNAKULAM	2950	6.81	0.23
IDUKKI	4476	108.94	2.43
KASARAGOD	1992	N.A.	0.00
KOTTAYAM	2208	27.04	1.22
KOZHIKODE	2344	13.11	0.56
MALAPPURAM	3550	20.2	0.57
PALGHAT	4480	34.7	0.77
PATTANAMTITTA	2637	16.89	0.64
TRICHUR	2491	27.53	1.11
TRIVANDRUM	3032	39.13	1.29
QUILON	2192	17.7	0.81
WAYANAD	2131	N.A.	0.00

Maps not to scale

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B. Sinha

MADHYA PRADESH & CHHATTISGARH

Habitat features

Madhya Pradesh and Chhattisgarh together have 407 wetlands of the size 56.25 ha and above, covering an area of 2941.18 km^2. (MPRSAC & SAC, 1998) and constituting 0.7% of the total geographic area of the state. Wetland distribution in forty-four districts is given in pages 75 to 85.

In the eight districts studied by SACON, 4767 wetlands of the size two ha and above were estimated covering an area of 1978.9 km^2. These are shown in pages 86 to 93. Reservoirs have comparatively low turbidity while the ponds/ lakes mostly have either medium or high turbidity. Density of vegetation as per the satellite imageries is low in reservoirs of five districts, whereas it is medium in one and high in two districts. In the ponds/ lakes vegetation is dense in five districts, medium in one and low in two districts.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	20	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	12	16	N.A.	N.A.
Turtles	N.A.	1	2	4	N.A.	3	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	5	6	N.A.

Prioritized Sites

Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4	Data Deficient
48	11	12	13	5	7

Five wetlands in Madhya Pradesh are qualified to be declared as Ramsar sites (page 215).



Ameen Ahmed

A profile of wetlands in Madhya Pradesh and Chhattisgarh



Maps not to scale

Aerial extent of wetland cover

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BALAGHAT	9229.00	8.81	0.10
BASTAR	39114.00	11.49	0.03
BETUL	10043.00	32.59	0.32
BHIND	4459.00	14.38	0.32
BHOPAL	2772.00	35.87	1.29
BILASPUR	19167.87	198.31	1.03
CHHATARPUR	8687.00	70.70	0.81
CHHINDWARA	11815.00	74.60	0.63
DAMOH	7306.00	12.07	0.17
DATIA	2691.00	95.62	3.55
DEWAS	7020.00	2.32	0.03
DHAR	8153.00	5.83	0.07
DURG	8549.00	139.52	1.63
EAST NIMAR	10776.00	6.90	0.06
GUNA	11064.00	83.50	0.75
GWALIOR	4560.00	63.13	1.38
HOSHANGABAD	10037.00	152.23	1.52
INDORE	3898.00	11.02	0.28
JABALPUR	5211.00	455.28	8,74
JHABUA	6778.00	5.67	0.08
MANDLA	13270.00	78,37	0,59
MANDSAUR	9791.00	317.55	3.24
MORENA	11595.00	201.58	1.74
NARSIMHAPUR	5133.00	2.10	0.04
PANNA	7135.00	1.30	0.02
RAIGARH	12924.00	7.26	0.06
RAIPUR	21257.00	250.77	1.18
RAISEN	8466.00	106.03	1.25
RAJ NANDGAON	12291.00	44.51	0.36
RAJGARH	5838.00	2.53	0.04
RATLAM	4861.00	8.61	0.18
REWA	6314.00	14.00	0.22
SAGAR	10252.00	13.83	0.13
SATNA	7502.00	42.75	0.57
SEHORE	6578.00	20.86	0.32
SEONI	8758.00	31.61	0.36
SHAHDOL	14028.00	53.08	0.38
SHAJAPUR	6195.00	9.03	0.15
SHIVPURI	10277.00	75.43	0.73
SIDHI	10526.00	6.77	0.06
SURGUJA	22335.00	21.04	0.09
TIKAMGARH	5048.00	55.89	1.11
UJJAIN	6091.00	11.51	0.19
VIDISHA	7371.00	62.10	0.84
WEST NIMAR	13452.00	22,83	0.17

Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

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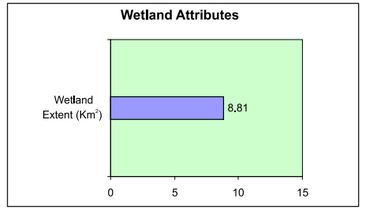
District - wise spatial distribution of wetlands



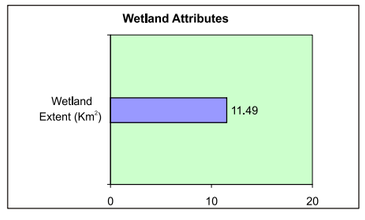
District Balaghat





District Betul

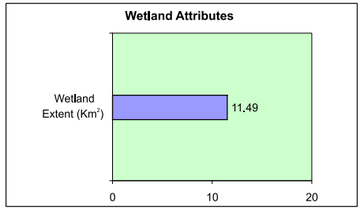






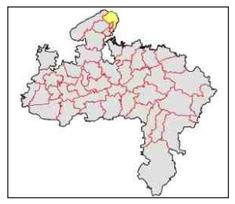
District Bastar

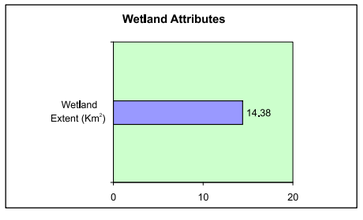






District Bhind





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

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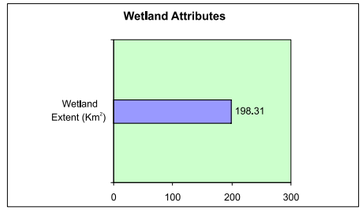
District - wise spatial distribution of wetlands



District Bilaspur

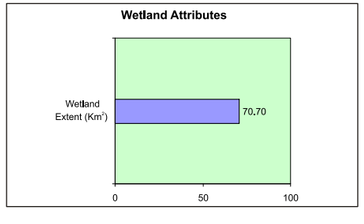






District Chhatarpur

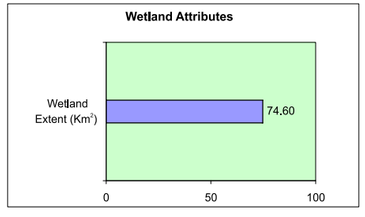






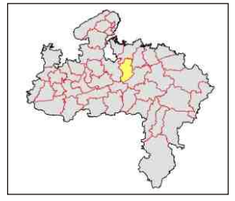
District Chhindwara

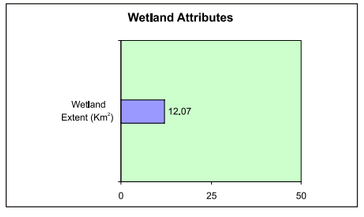






District Damoh





Wetlands

- Area >= 500 ha
- Area >= 400 ha and <500 ha
- Area >= 300 ha and < 400 ha
- Area >= 200 ha and < 300 ha
- Area >= 100 ha and < 200 ha
- Area >= 56 ha and < 100 ha
- Area <= 56 ha
- Rivers/Streams
- Cities/Towns/Villages
- Railways
- Roads
- International Boundary
- State Boundary
- District Boundary
- Taluk Boundaries

Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

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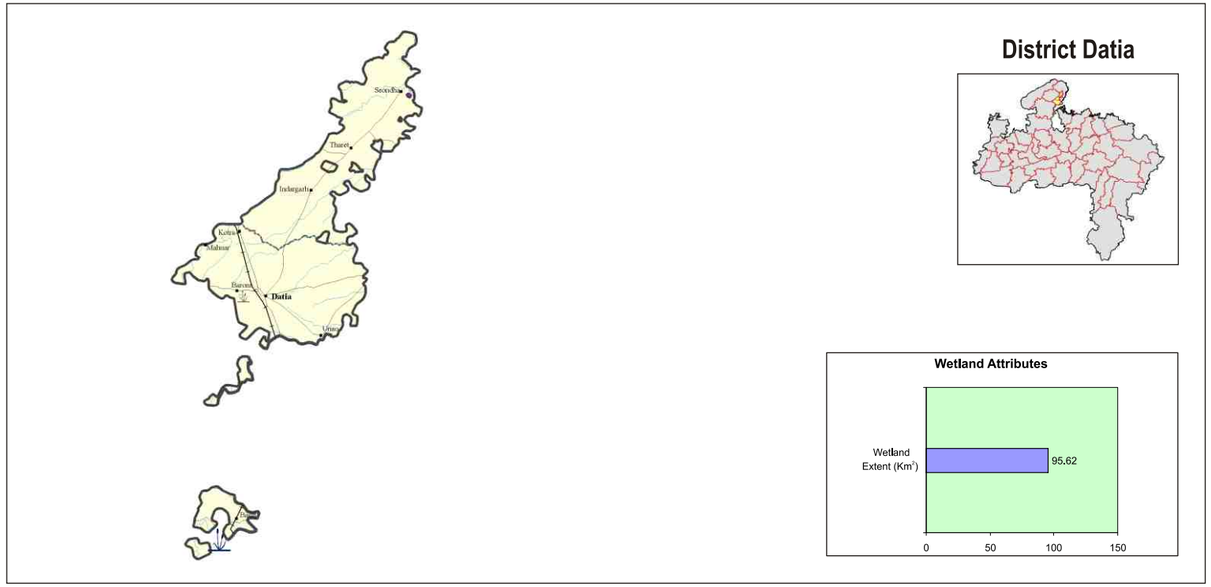
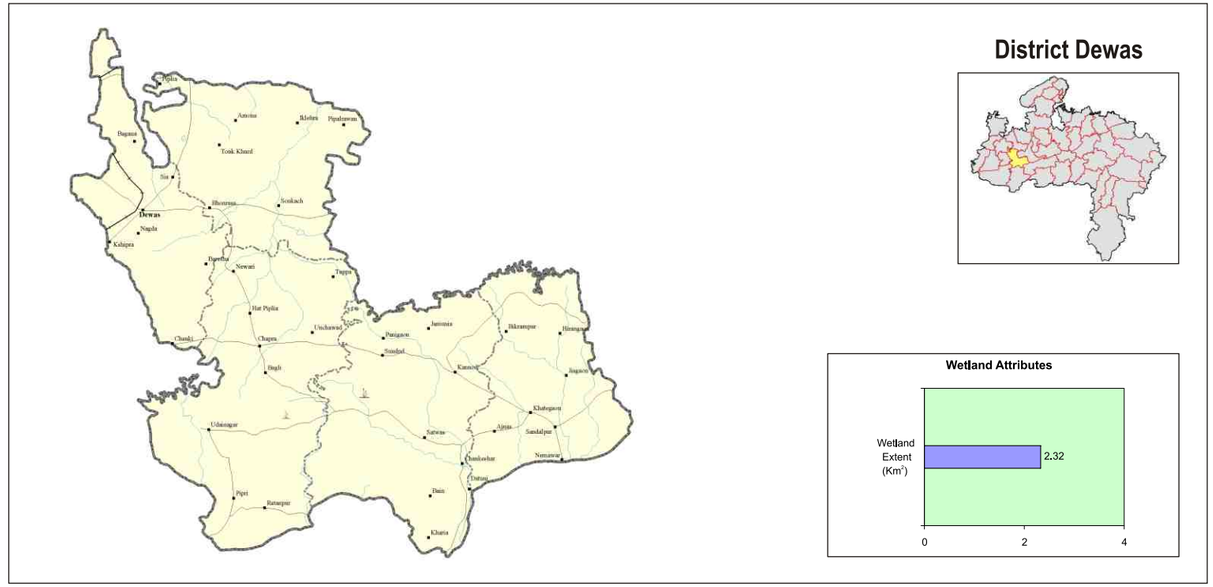
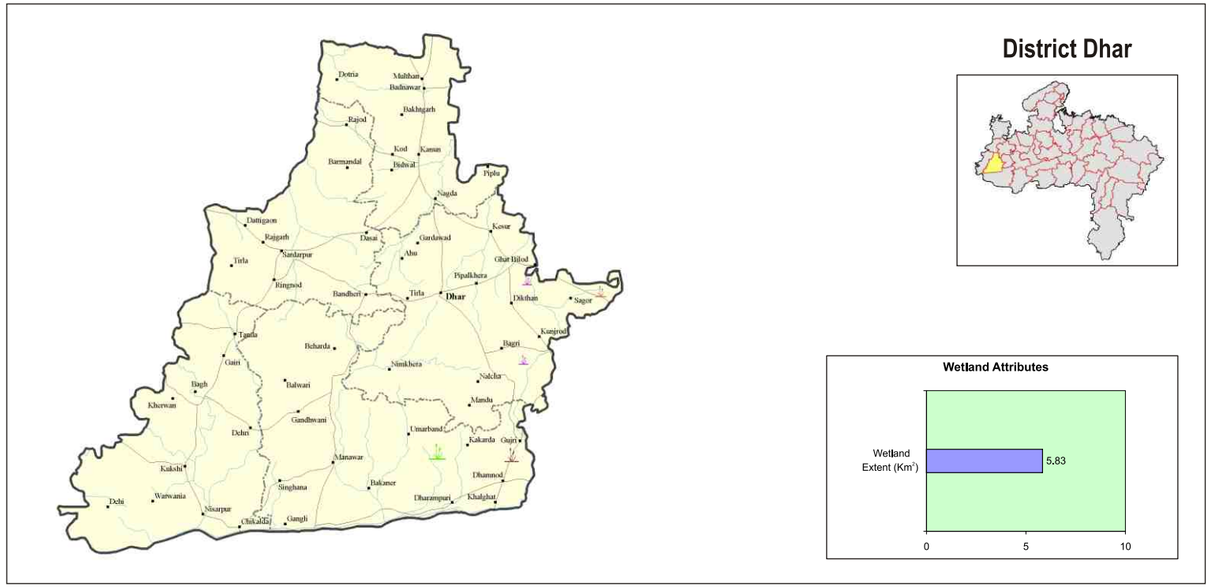
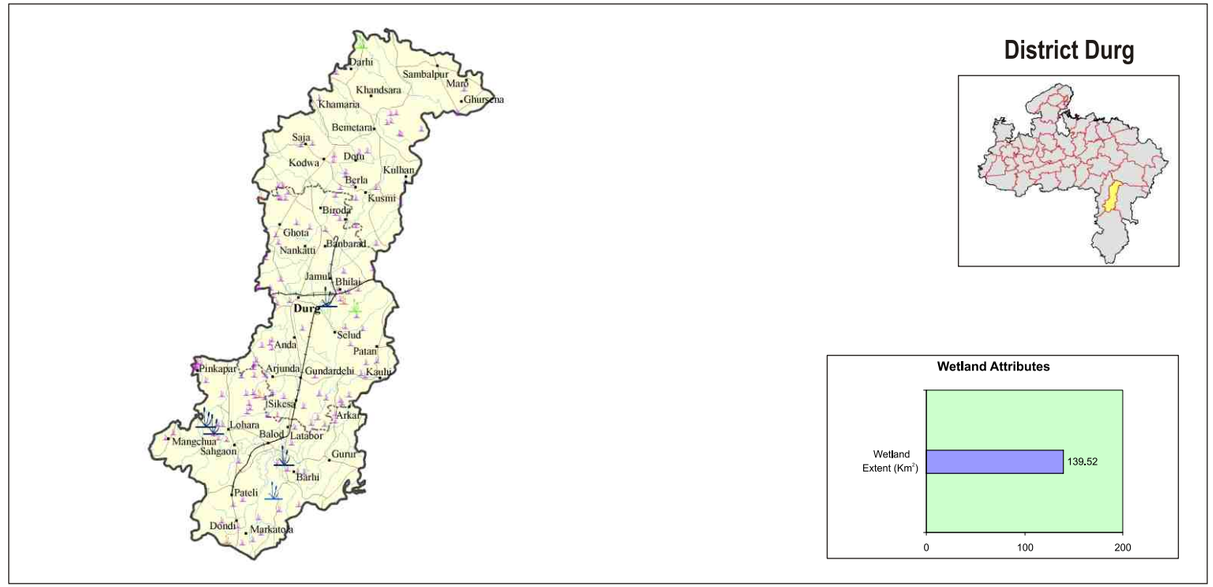
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

District - wise spatial distribution of wetlands









Wetlands

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- International Boundary
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Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

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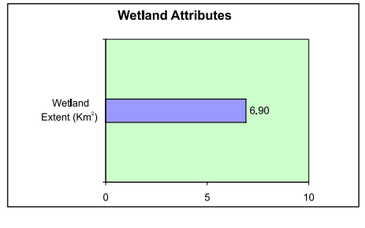
District - wise spatial distribution of wetlands



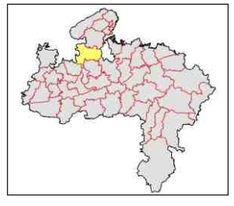
District East Nimar

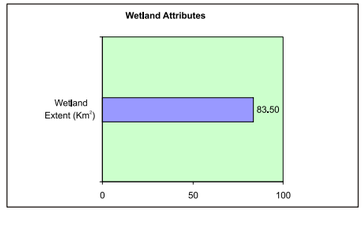






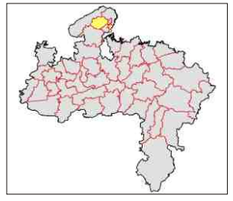
District Guna

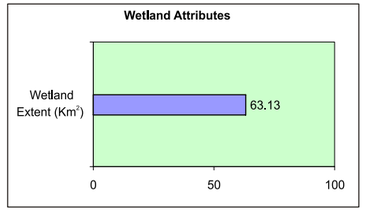


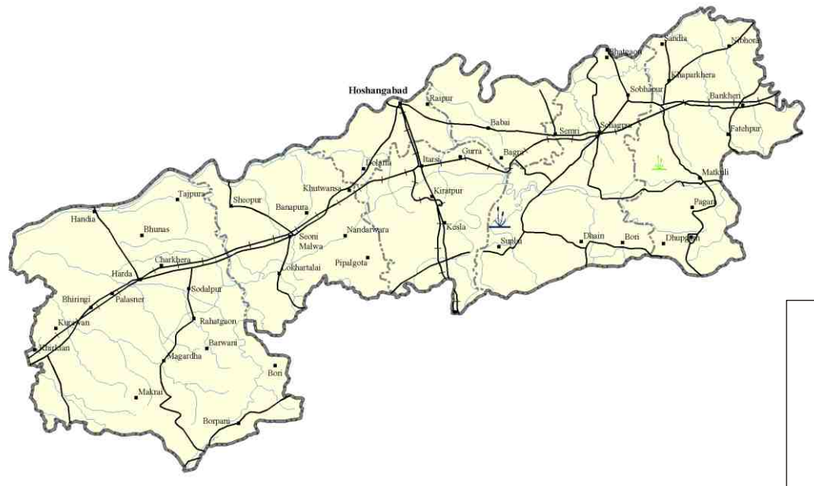




District Gwalior

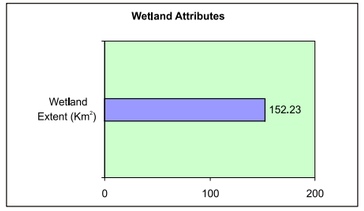






District Hosangabad





Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

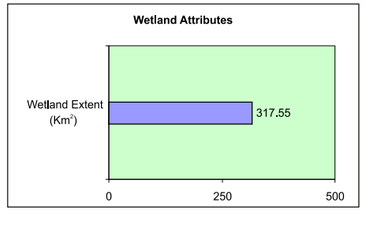
©SACON 2004

District - wise spatial distribution of wetlands



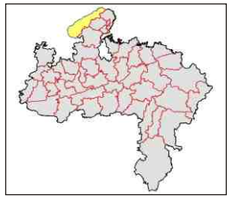
District Mandsaur

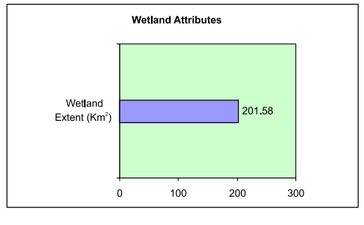


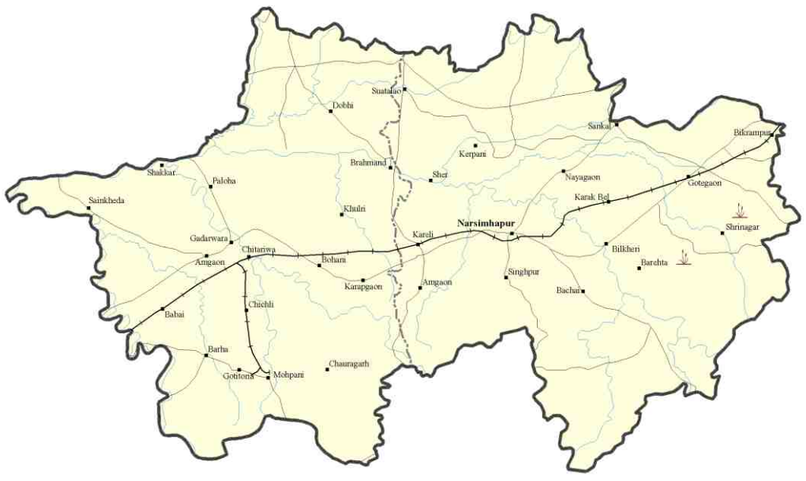




District Morena

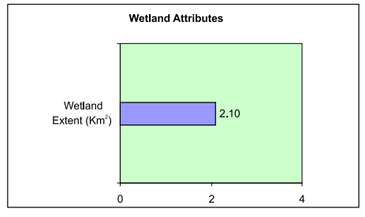


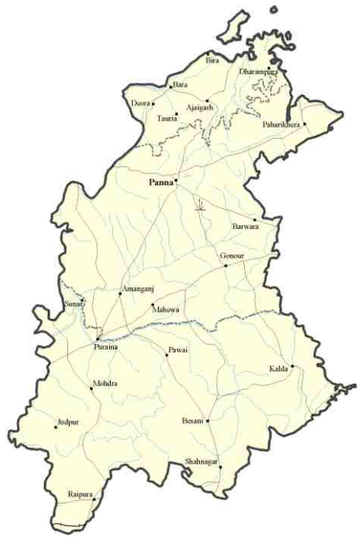




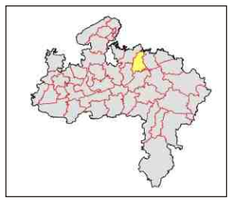
District Narsimhapur

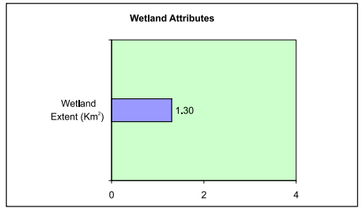






District Panna





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

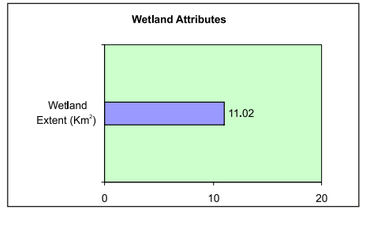
©SACON 2004

District - wise spatial distribution of wetlands



District Indore

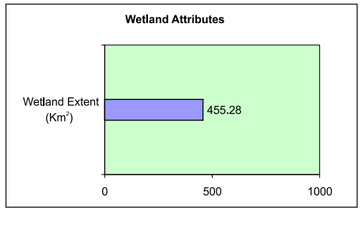






District Jabalpur

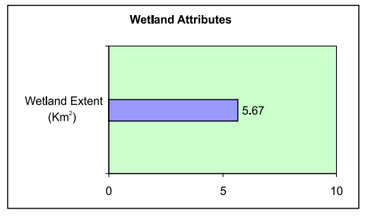






District Jhabua

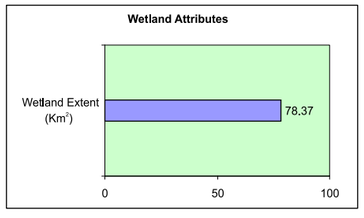






District Mandla





Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

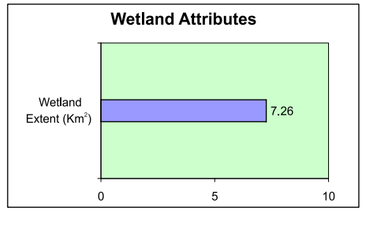
©SACON 2004

District - wise spatial distribution of wetlands



District Raigarh

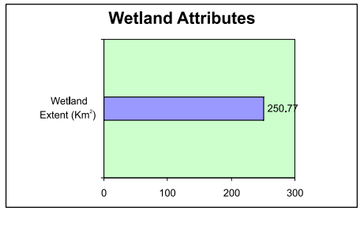


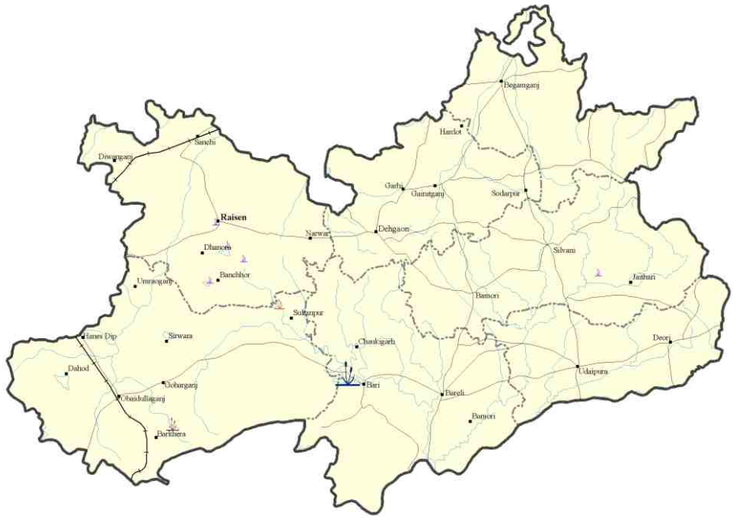




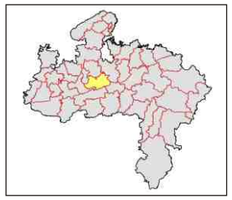
District Raipur

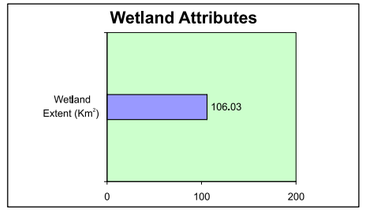






District Raisen

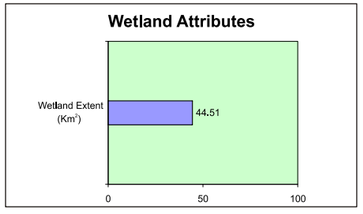






District Raj Nandgaon





Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

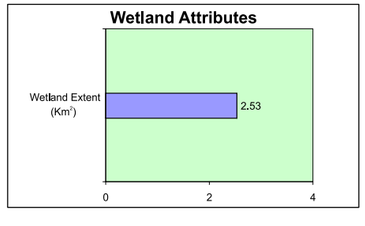
©SACON 2004

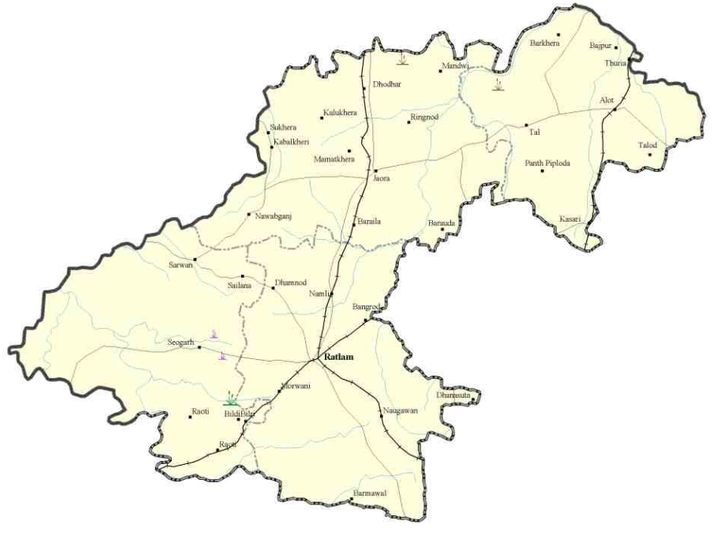
District - wise spatial distribution of wetlands



District Rajgarh

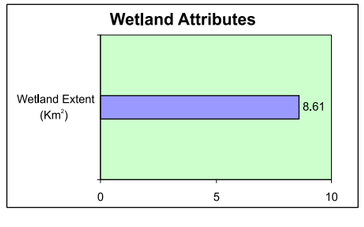






District Ratlam

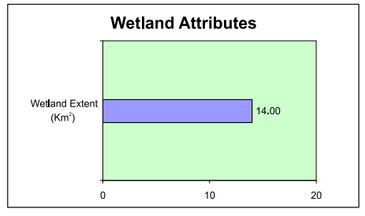






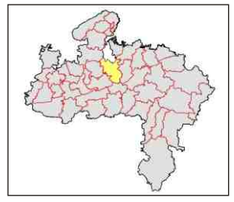
District Rewa

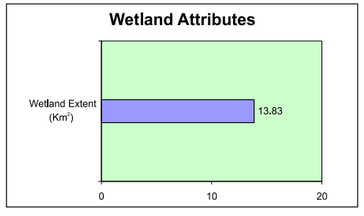






District Sagar





Wetlands

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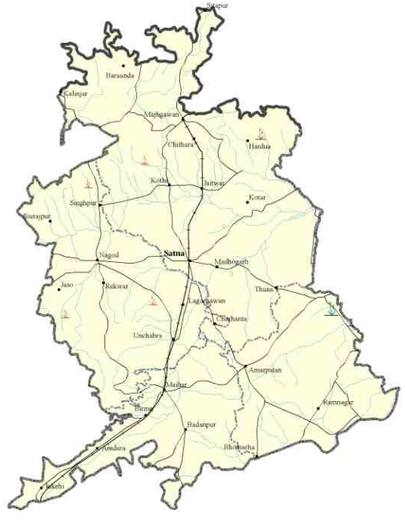
Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

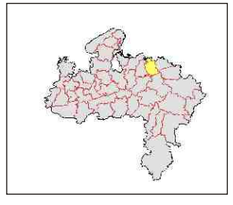
Maps not to scale

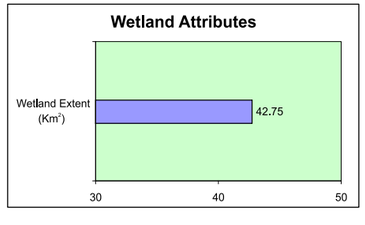
©SACON 2004

District - wise spatial distribution of wetlands



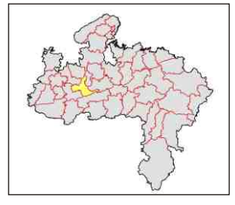
District Satna

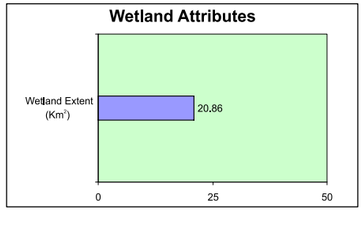






District Sehore

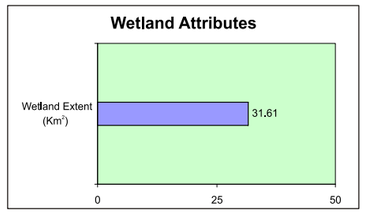






District Seoni

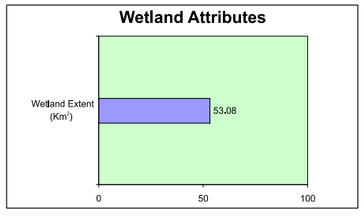






District Shahdol





Wetlands

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Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

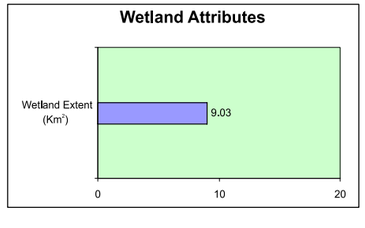
©SACON 2004

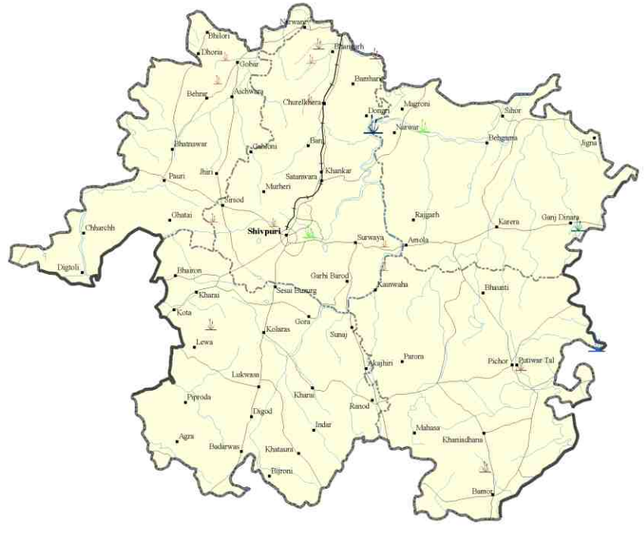
District - wise spatial distribution of wetlands



District Shajapur

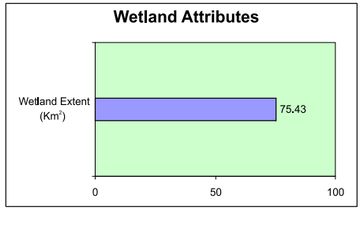


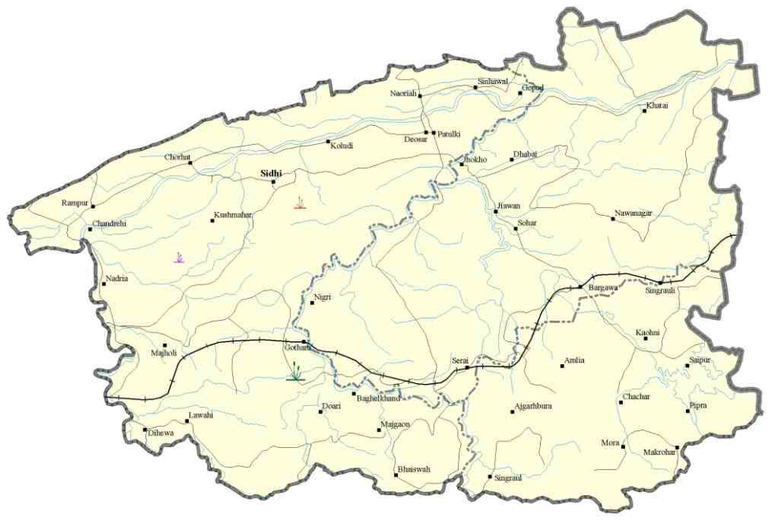




District Shivpuri

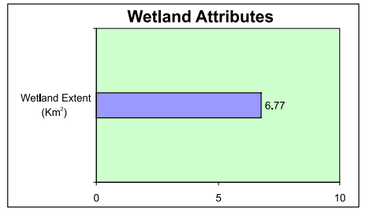






District Sidhi

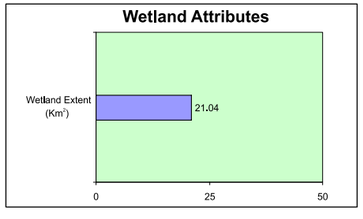






District Sarguja





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

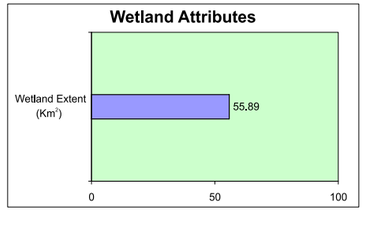
©SACON 2004

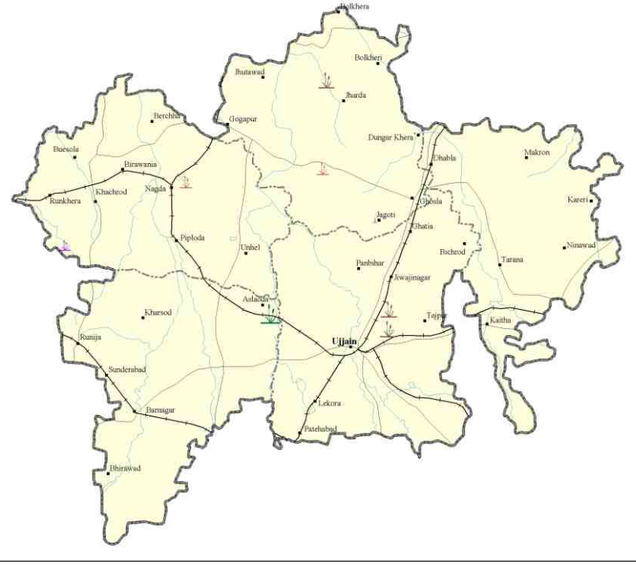
District - wise spatial distribution of wetlands



District Tikamgarh

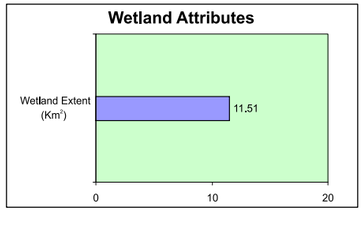






District Ujjain

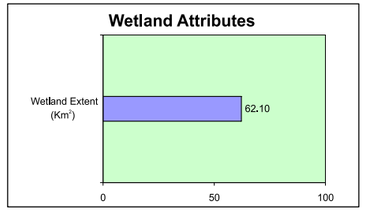






District Vidisha

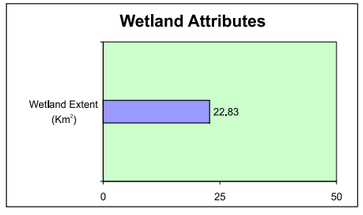






District West Nimar





Legend : Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

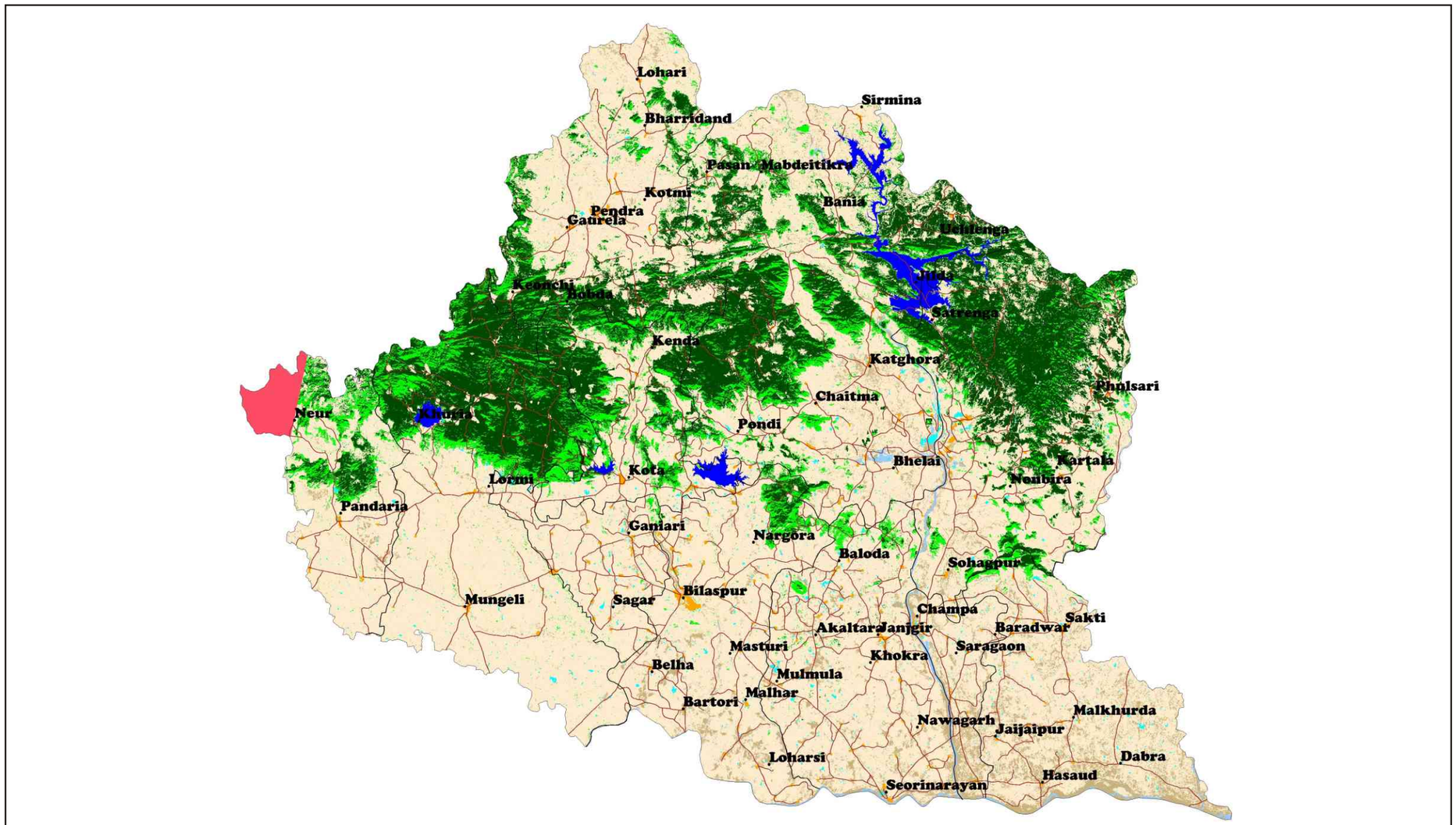
Source: Wetland point data; Madhya Pradesh Remote Sensing Applications Centre, Bhopal

Maps not to scale

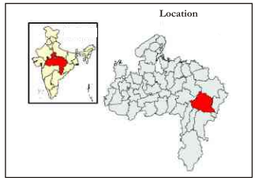
©SACON 2004

Integrated wetland and land use map

District Bilaspur, Madhya Pradesh



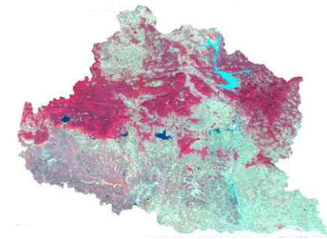
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS LISS III (17 November-18 December 1999)

Wetland type and turbidity



Legend

Wetland	Turbidity		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend

Wetland	Aquatic Vegetation		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	District Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	Taluks/Tehsil Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	NP * Not Present

Maps not to scale

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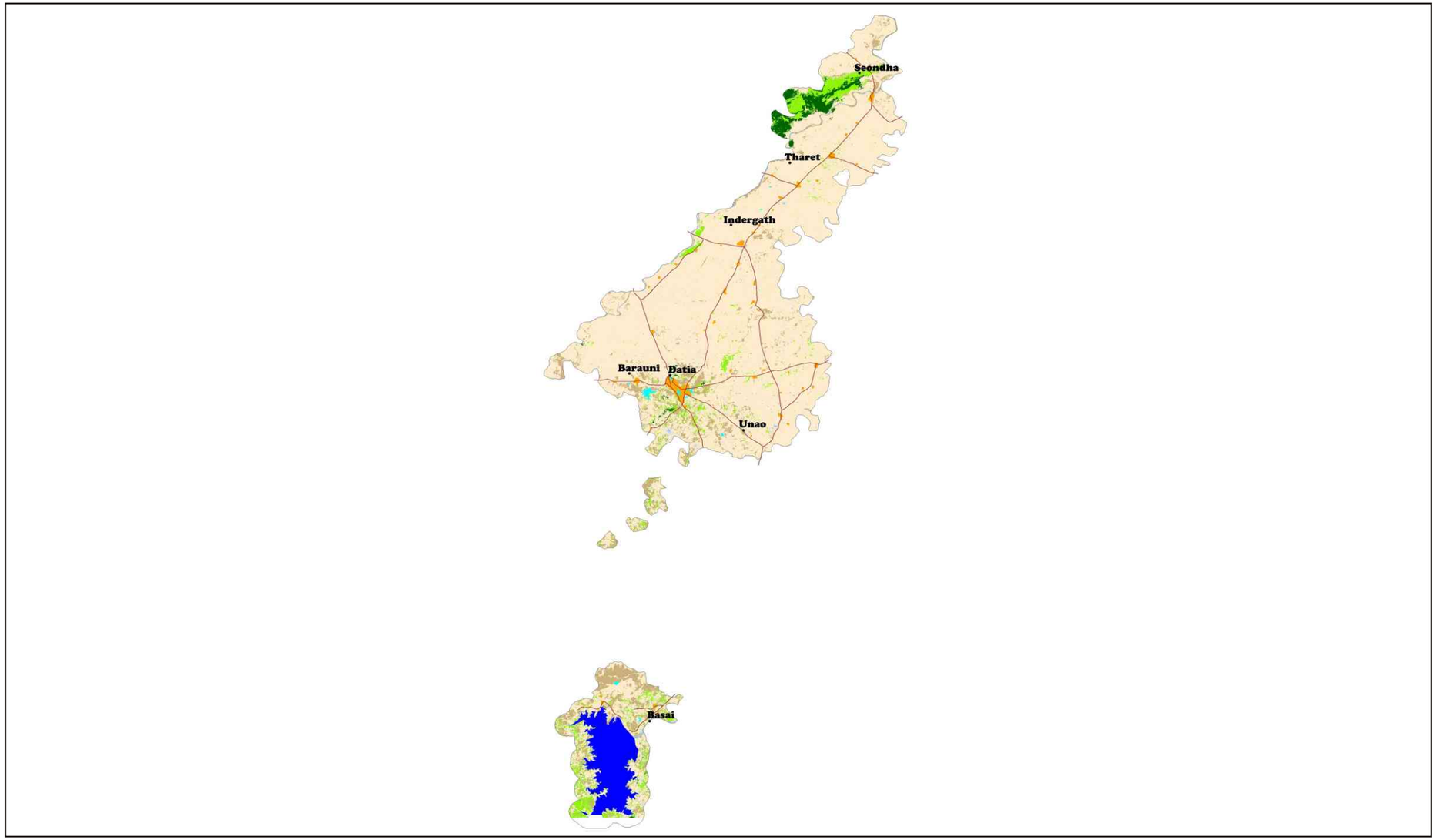
Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

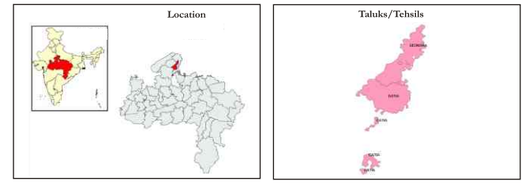
Integrated wetland and land use map

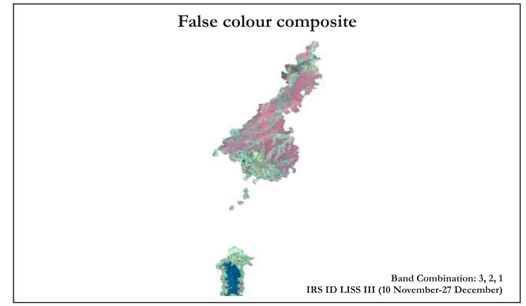
District Datia, Madhya Pradesh

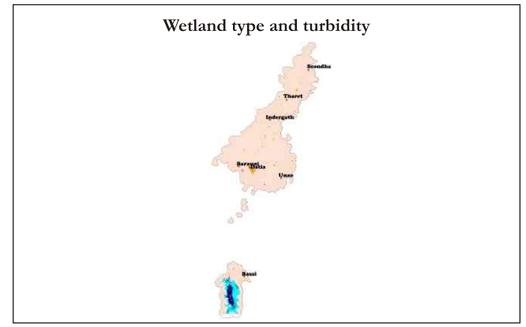


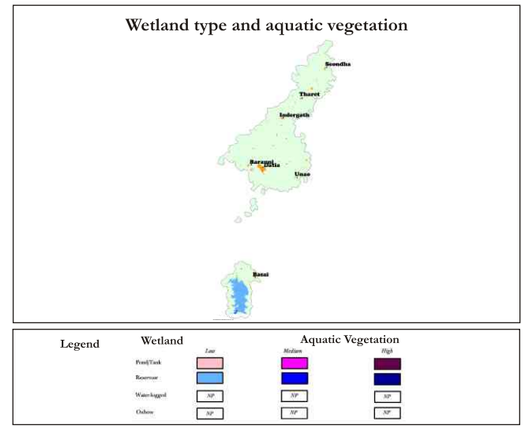
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	District Boundary
Open Forest	Township	Reservoir	NP Coastal-water	NP Others	NP * Not Present
Arable Land	River	NP Water-logged	NP Marsh/Mud	Roads	







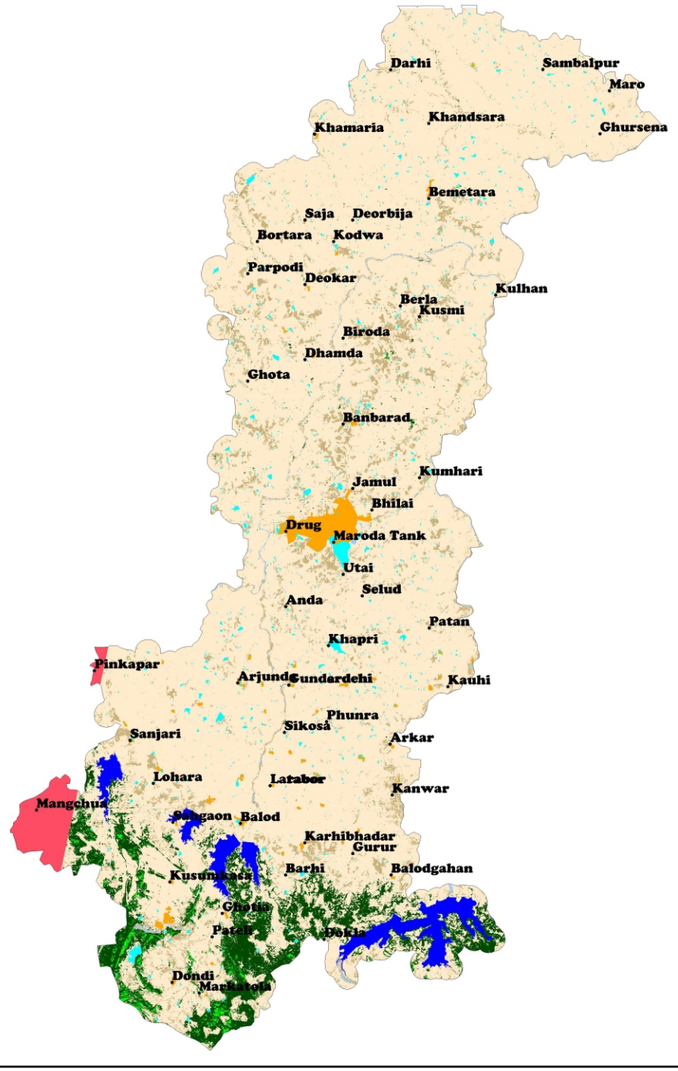


Maps not to scale

©SACON 2004

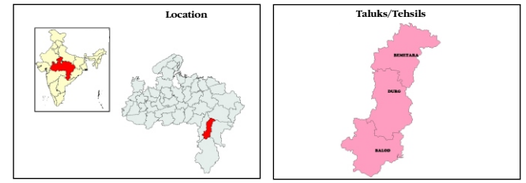
Integrated wetland and land use map

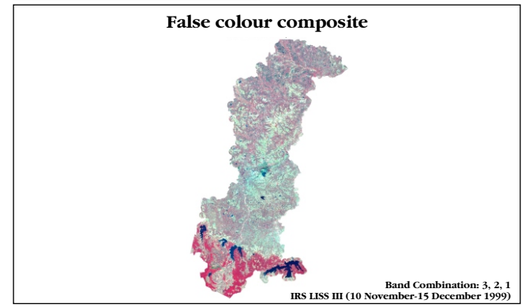
District Durg, Madhya Pradesh

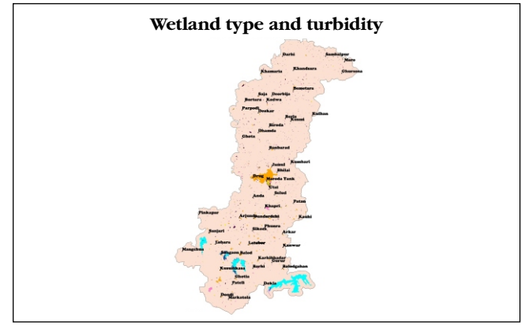


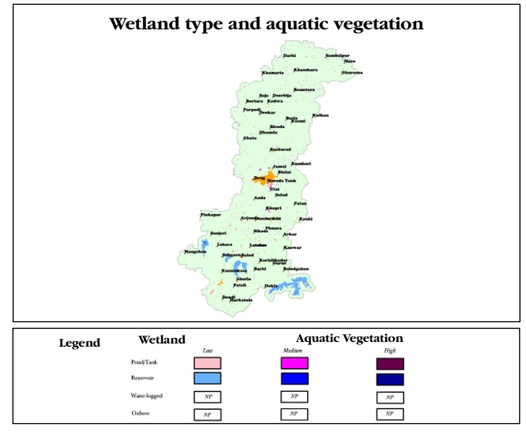
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	NP * Not Present
Open Forest	Township	Reservoir	NP Coastal-water	Others	
Arable Land	River	NP Water-logged	NP Marsh/Mud	District Boundary	









Maps not to scale

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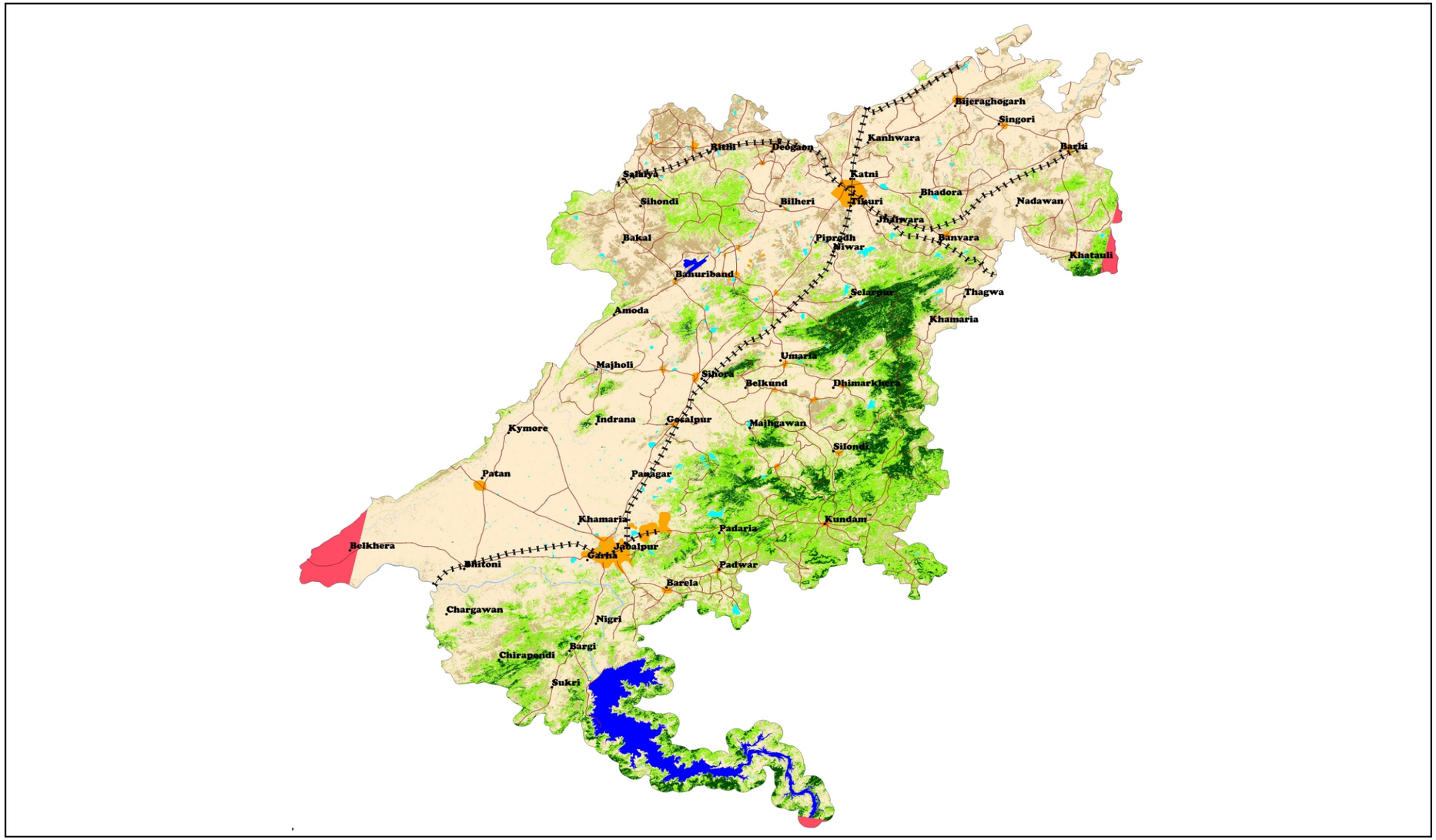
Integrated wetland and Land Use Map

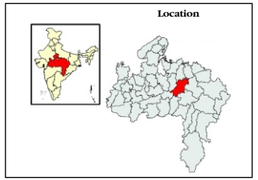
District Jabalpur, Madhya Pradesh



Integrated Wetland Type and Land Use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	NP * Not Present

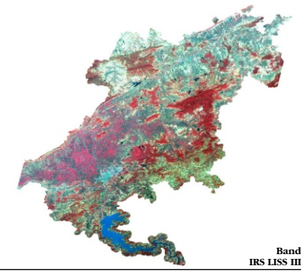
Location



Taluks/Tehsils

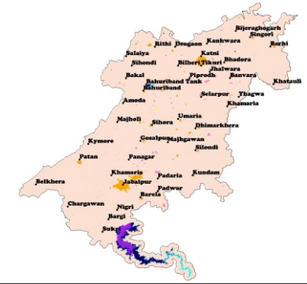


False Colour Composite



Band Combination: 3, 2, 1
IRS LISS III (21 December 1999)

Wetland Type and Turbidity



Legend Wetland	Turbidity Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland Type and Aquatic Vegetation



Legend Wetland	Aquatic Vegetation Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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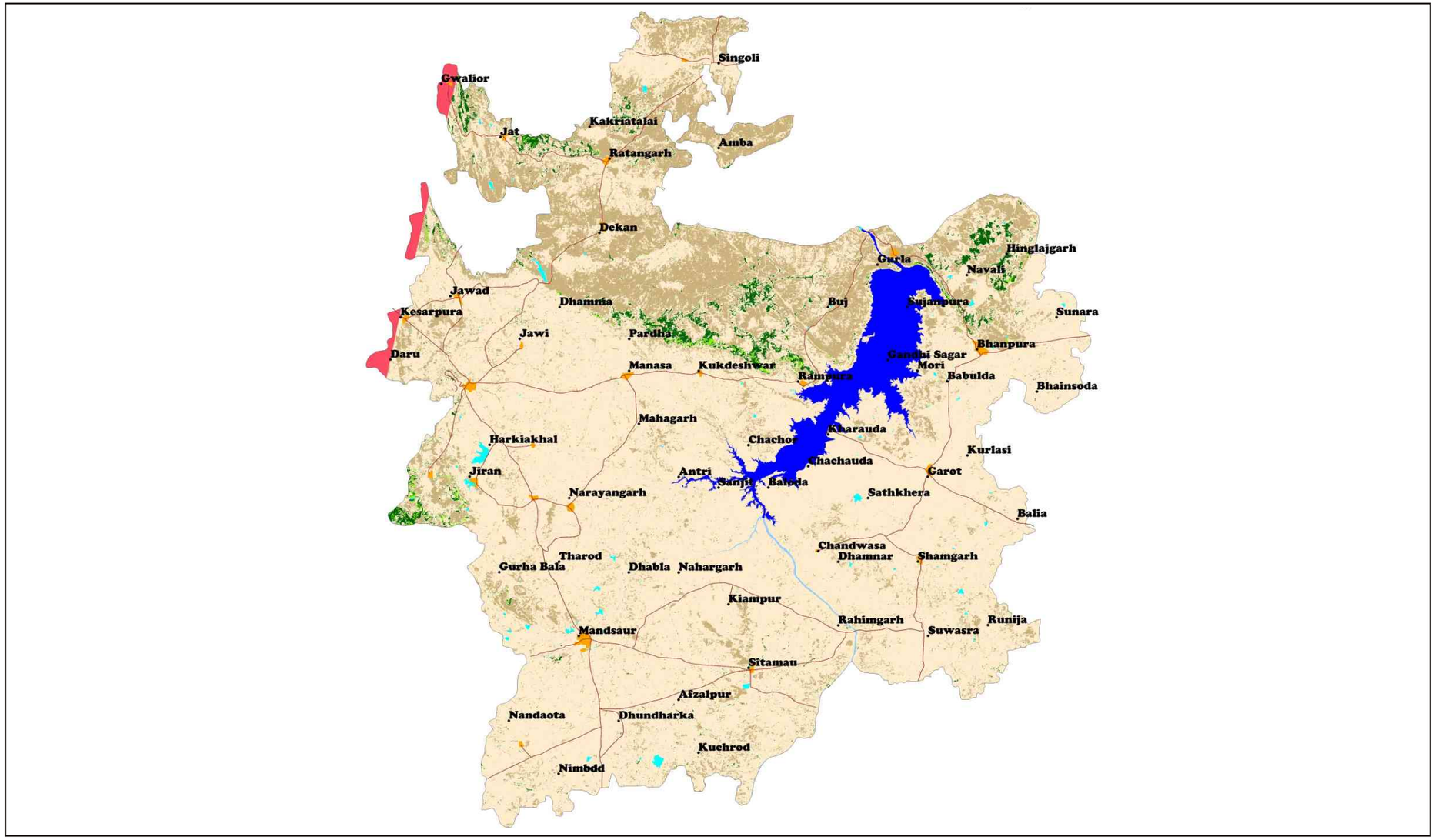
Integrated wetland and land use map

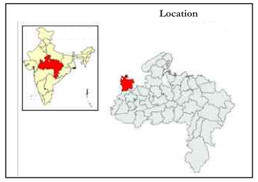
District Mandsaur, Madhya Pradesh



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	District Boundary
Open Forest	Township	Reservoir	NP Coastal-water	Others	NP * Not Present
Arable Land	River	NP Water-logged	NP Marsh/Mud	Roads	

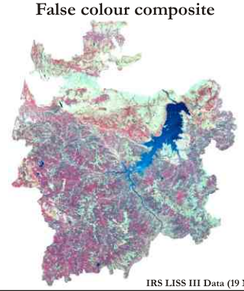
Location



Taluks/Tehsils

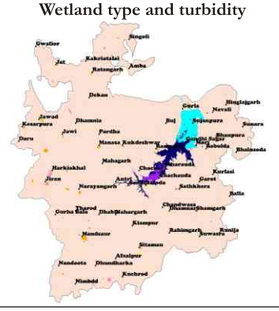


False colour composite



Band Combination: 3, 2, 1
IRS LISS III Data (19 November-11 December 1999)

Wetland type and turbidity



Legend	Wetland			Turbidity		
		Low		Medium		High
Pond/Tank						
Reservoir						
Water-logged		NP		NP		NP
Oxbow		NP		NP		NP

Wetland type and aquatic vegetation



Legend	Wetland			Aquatic Vegetation		
		Low		Medium		High
Pond/Tank						
Reservoir						
Water-logged		NP		NP		NP
Oxbow		NP		NP		NP

Maps not to scale

©SACON 2004

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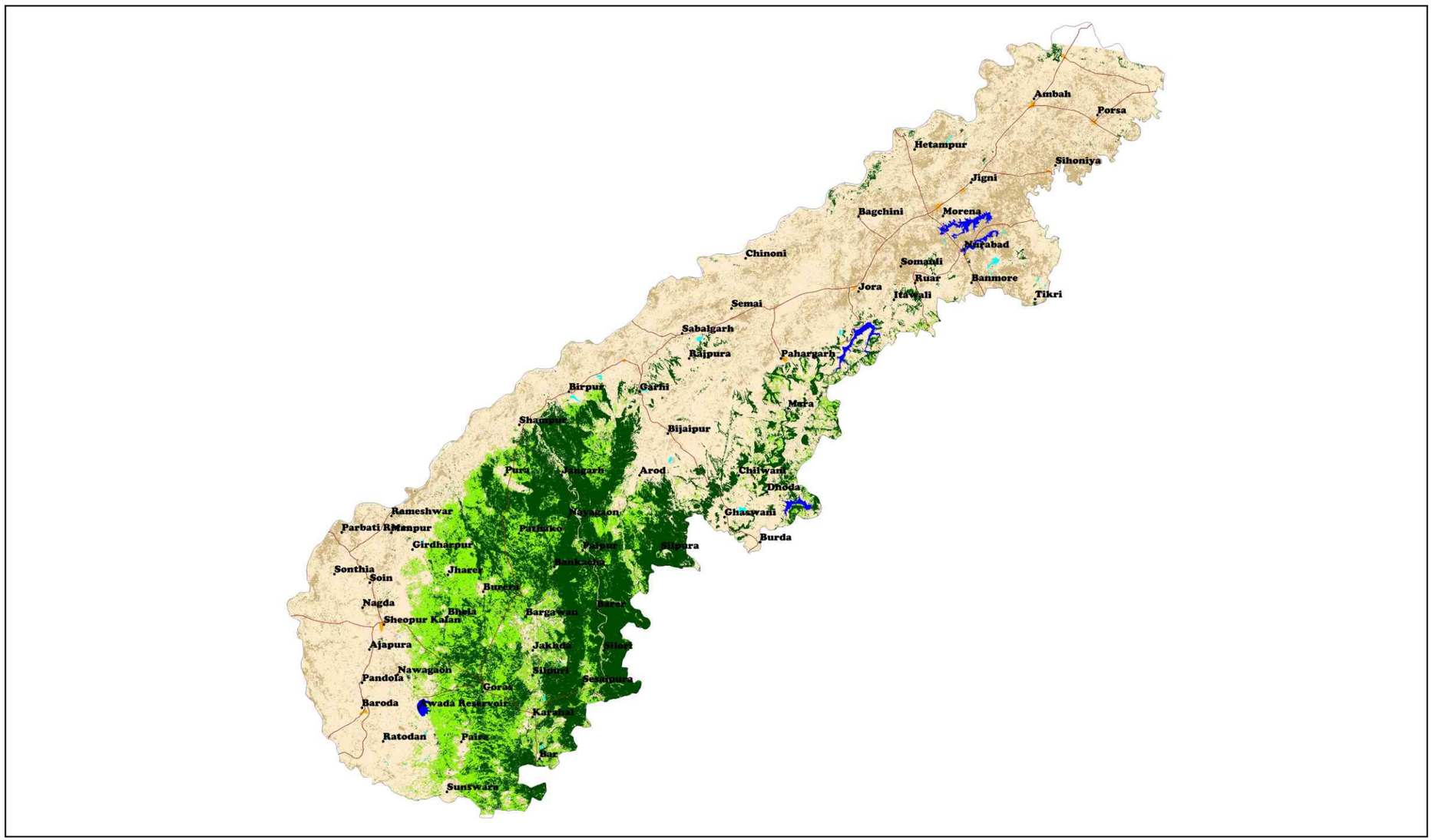
Integrated wetland and land use map

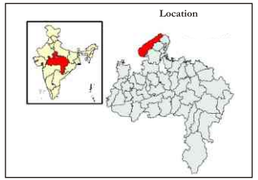
District Morena, Madhya Pradesh



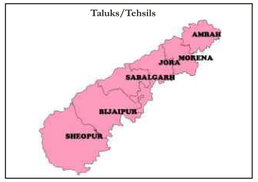
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	District Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	

Location



Taluks/Tehsils



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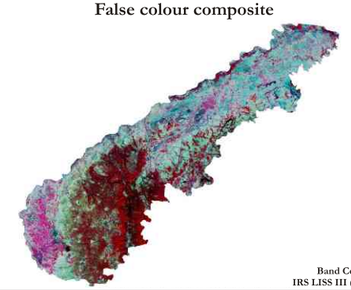
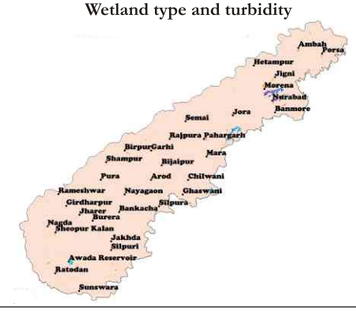


Band Combination: 3, 2, 1
IRS LISS III (10-19 November)

Wetland type and turbidity



Legend — Wetland — Turbidity

	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend — Wetland — Aquatic Vegetation

	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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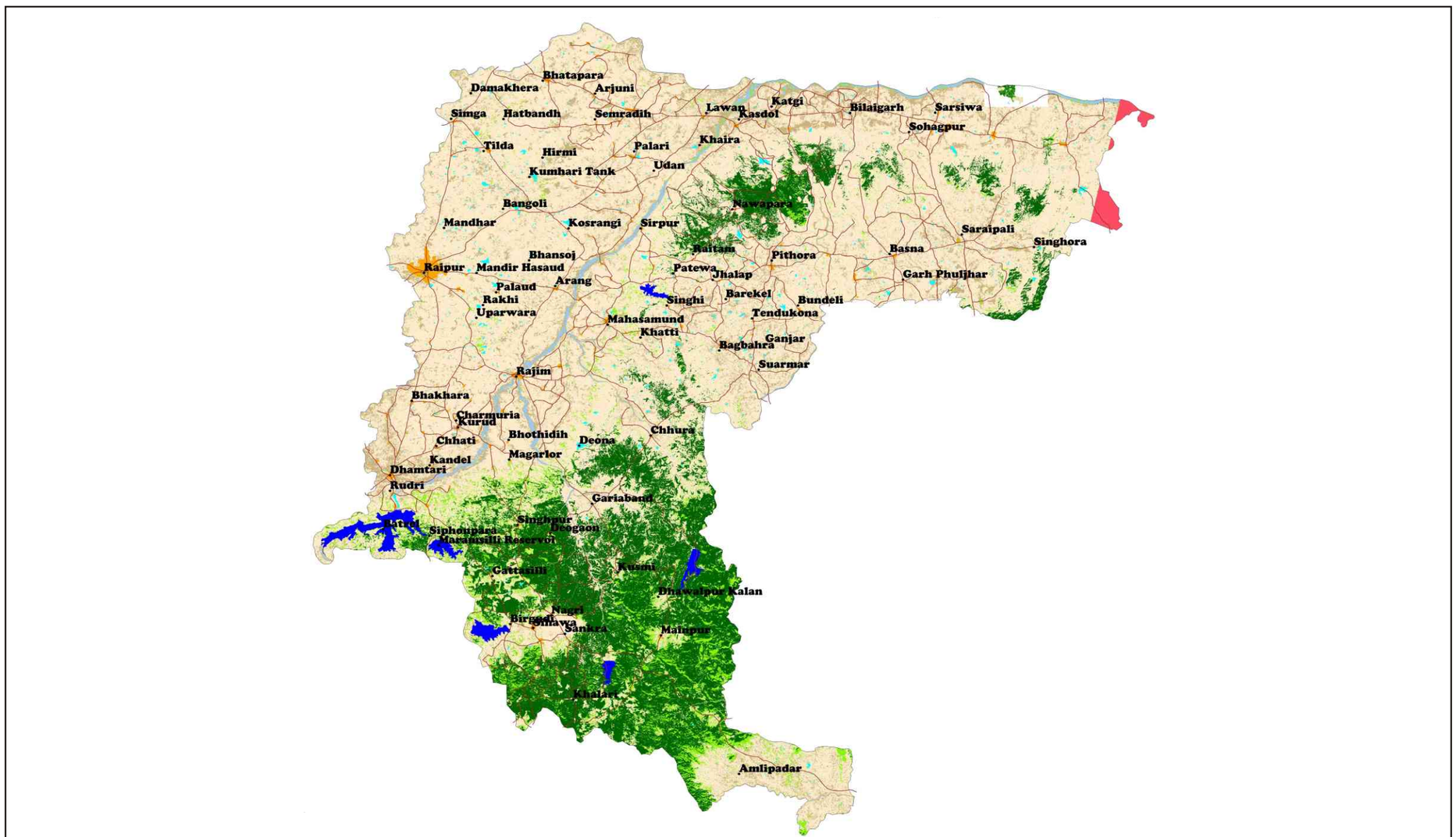
Integrated wetland and land use map

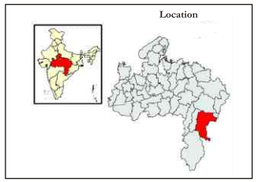
District Raipur, Madhya Pradesh



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	District Boundary
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	

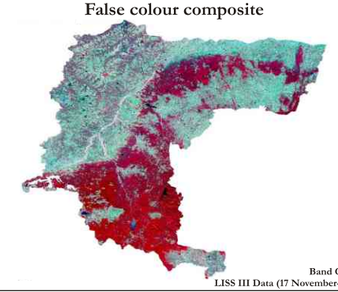
Location



Taluks/Tehsils

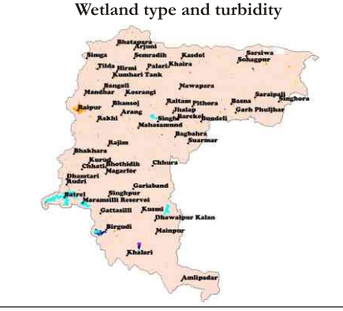


False colour composite



Band Combination: 3, 2, 1
LISS III Data (17 November-15 December 1999)

Wetland type and turbidity



Legend Wetland	Turbidity: Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend Wetland	Aquatic Vegetation: Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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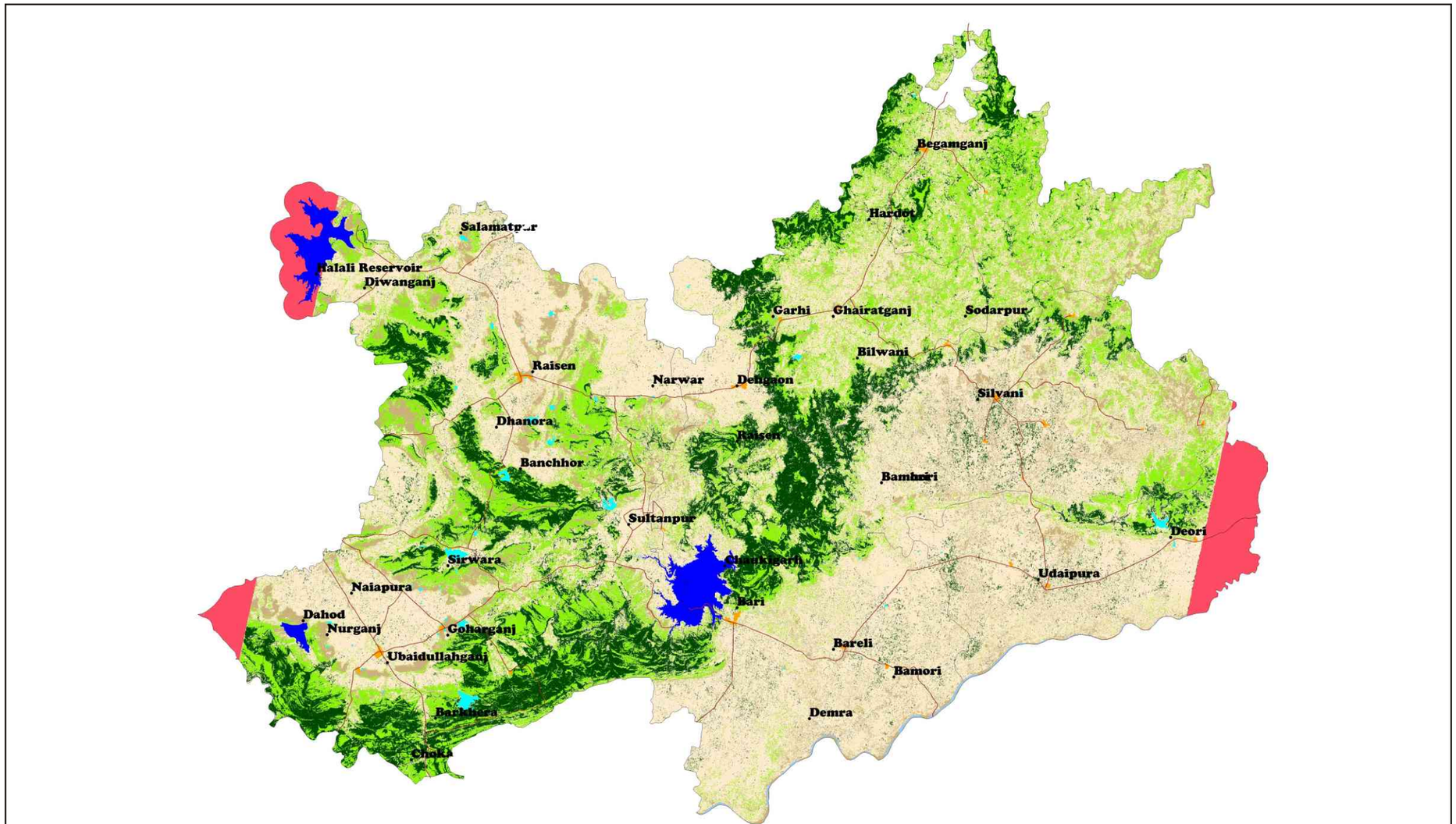
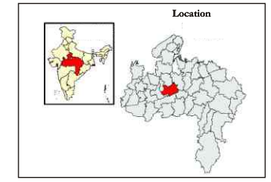
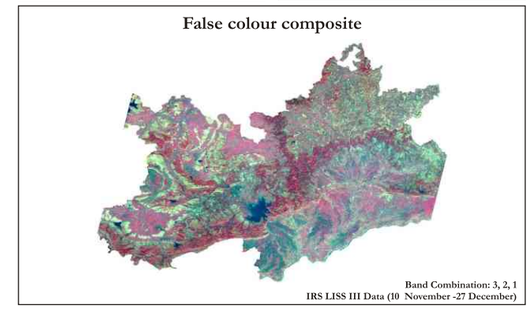
Integrated wetland and land use map

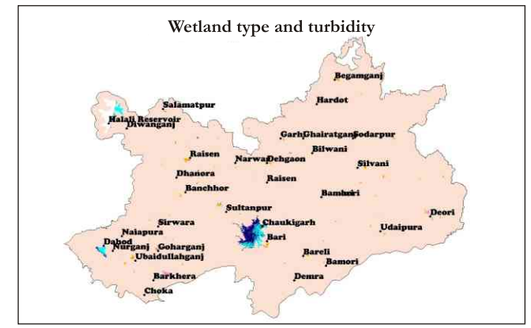
District Raisen, Madhya Pradesh













Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	Others/Salt	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary

NP * Not Present

Maps not to scale

Regional Remote Sensing Service Centre, Nagpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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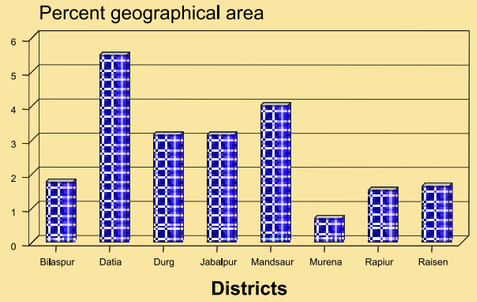
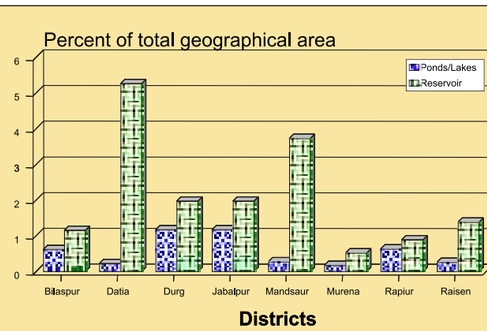
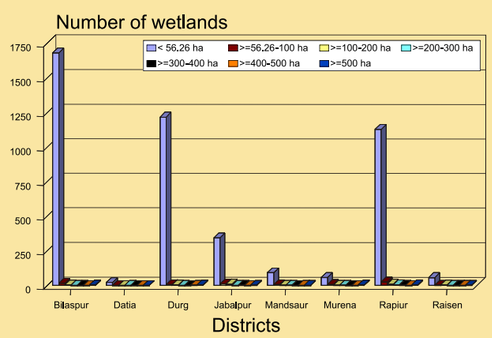


Area under wetland in select Districts



Area under different wetland classes in select districts



Size class distribution in select districts

Attributes of wetlands and environmental contamination

Wetlands

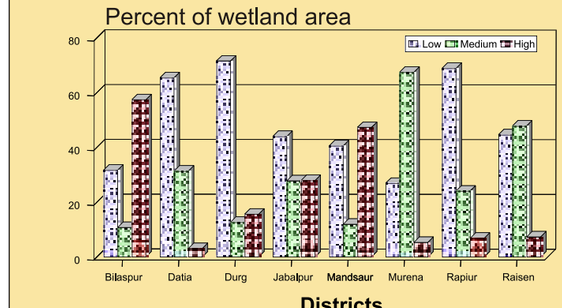
The total area of wetlands in the eight districts is 1978.90 km^2.Out of which, the reservoirs occupy 505.09 km^2 and the rest by ponds/ lakes. Although the wetlands occupy a very small percent of the total geographical area of each district, the difference in the total area under wetland among the districts is discernible, varies between 0.69% (Morena) and 5.48% (Datia). The larger extent of wetland in Datia is due to the reservoirs.

Turbidity

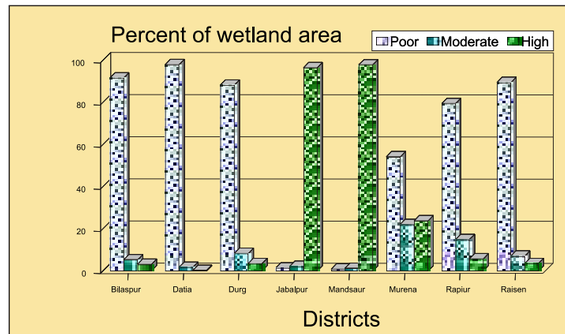
The reservoirs have low turbidity in the districts of Bilaspur, Datia, Raipur, whereas in Durg and Morena it is high. In the other districts it is medium to high or low to medium. In the case of ponds/ lakes, turbidity is high in the wetlands of Bilaspur, Jabalpur, Mandsaur, whereas it is medium in Datia, medium to high in Bilaspur, medium and low in Durg.

Summer recession of water

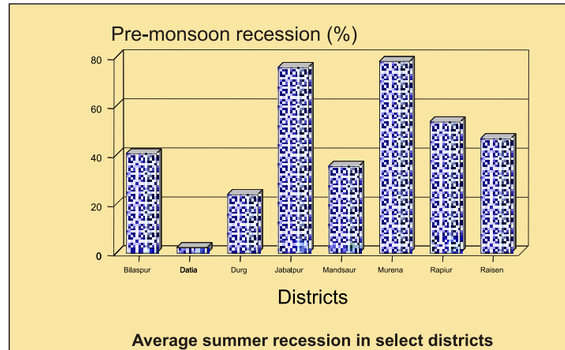
Summer recession among the wetlands varied from 32.84% in Madsaur district to 78.16% in Morena.



Turbidity pattern in select districts



Aquatic vegetation in select wetlands



Average summer recession in select districts

Pratap Singh

Maps not to scale

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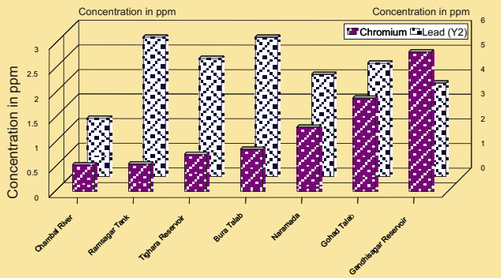
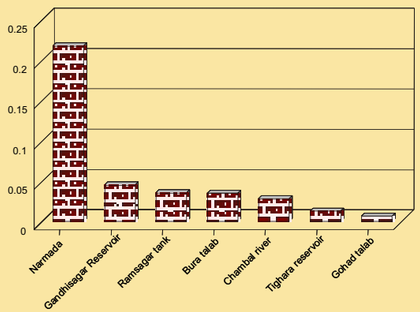
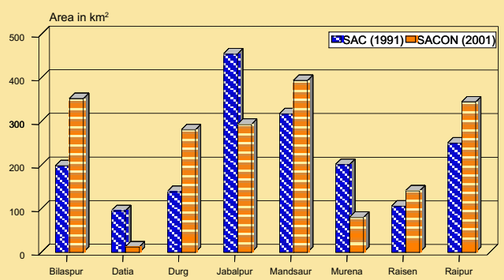


Lead and Chromium contamination among select wetlands



Total organochlorine residues among select wetlands



Difference in total wetland area (km²) in select districts

Attributes of wetlands and environmental contamination

Heavy metals

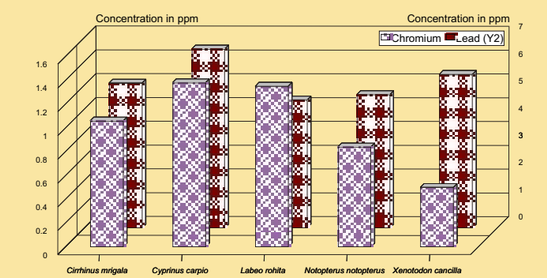
On an average, among the wetlands, Ramsagar of Datia district and Barua Talab of Rajpur district have the highest concentrations of lead. Gandhisagar has the maximum concentration of chromium, which is higher than the level recorded in other states. Although detectable concentrations of zinc and cadmium are recorded, they fall within the permissible limits. Among the species, *Cyprinus carpio* ranked high in the concentration of lead and chromium. Although significantly varying levels of lead, zinc and copper are recorded in other species; the levels are not harmful - at least for the present.

Pesticides

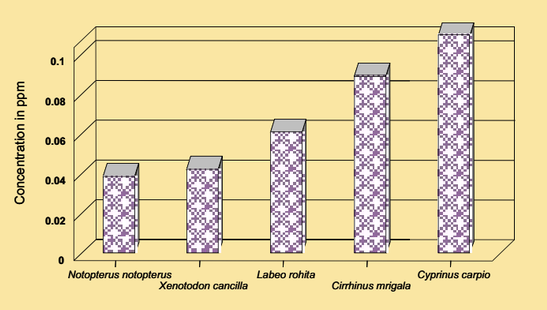
The maximum load of total organochlorine residues is detected in Narmada of Bhopal and Gandhisagar Reservoir of Mandsaur district, whereas the least concentrations in Gohad talab of Bhind district. Among the various species of fishes analyzed, *Cyprinus carpio* has the maximum load of total organochlorine residues followed by *Cirrhinus mrigala* and *Labeo rohita*. *Notopterus notopterus* is the least contaminated species.

The variations in organochlorine residues among the wetlands are not significant. Of the various pesticide residues analyzed, DDT is recorded in 93% of the fishes sampled. The annual pesticide consumption is 1544 mt. About 21.7% of the bovine milk exceeded the tolerance limits of DDT.

Sinha



Lead and Chromium contamination among fishes



Total organochlorine residues among various species of fishes

Maps not to scale

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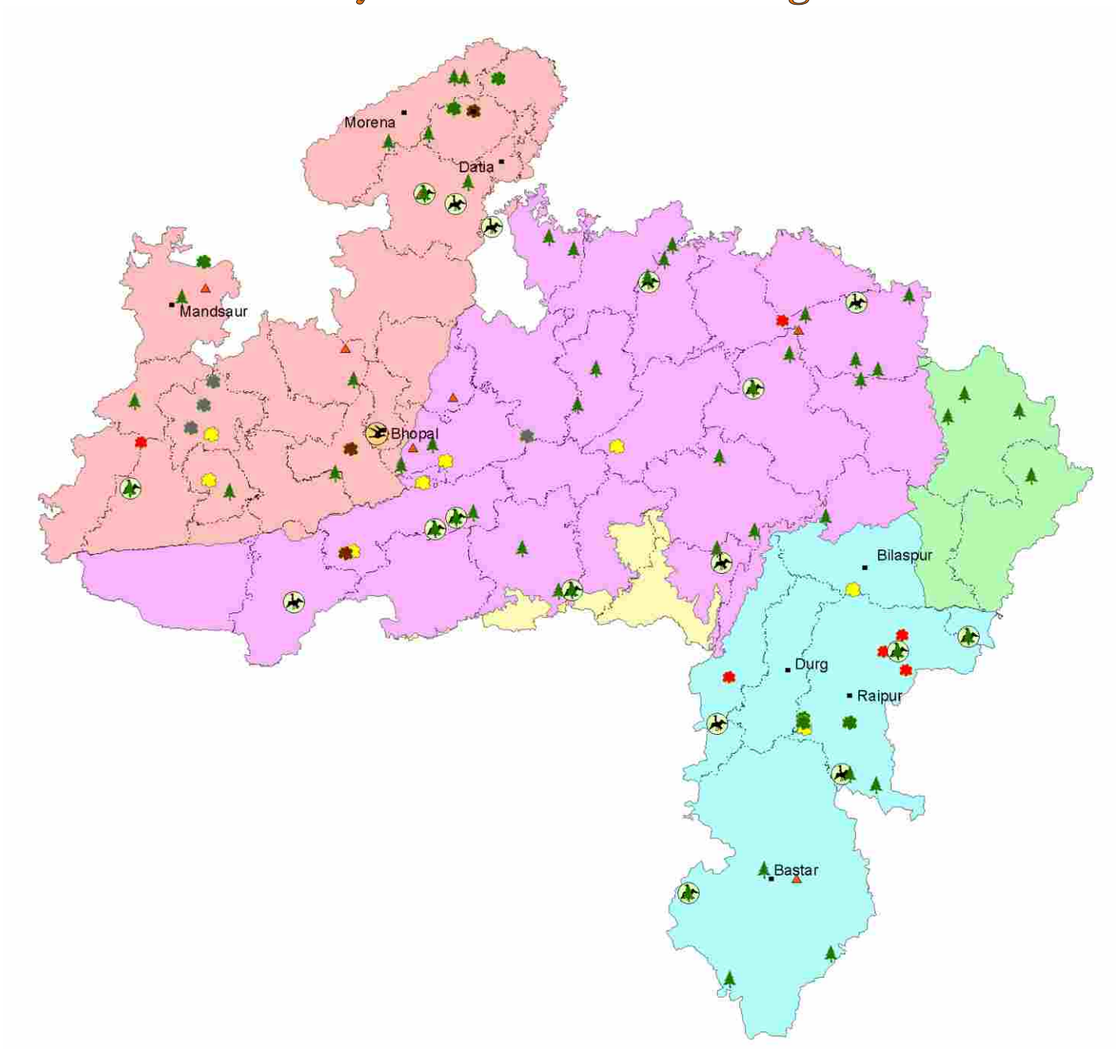
Prioritized inland wetlands of Madhya Pradesh and Chhattisgarh



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*
- *Ramsar Sites*

Biogeographic Provinces

- *4A, Semi Arid Punjab Plains*
- *4B, Semi Arid Gujarat Rajputana*
- *6A, Deccan Peninsula-Central Highlands*
- *6B, Deccan Peninsula-Chotta Nagpur*
- *6C, Deccan Peninsula-Eastern Highlands*
- *6D, Deccan Peninsula-Central Plateau*
- *7A, Gangetic Plain-Upper Gangetic Plain*
- *District Boundaries*

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Madhya Pradesh and Chhattisgarh

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ARNIA	UJJAIN	233900	754200	MELRIDPUR	N.A.	M	4B
BARRUSOT	SEHORE	220900	770800	N.A.	2	M	6A
BARUA RESERVOIR	RAISEN	230000	780100	BARI	2	H	6A
BOLAR BANDH	RAIPUR	212800	823100	PITHORA	1	M	6C
CHANDPATA	SHIVPURI	252600	774200	SHIVPURI	N.A.	L	4B
CHICKLOD	BHOPAL	244400	753300	BHOJPUR	3	H	4B
DEOGAON	RAIPUR	211900	822000	PITHORA	1	M	6C
GAJGIDHNI TANK	MAHASAMUND	210900	823300	PITHORA BAGBAHARA	1	H	6C
GAMBHIR	UJJAIN	232600	753700	UJJAIN	N.A.	M	4B
GANDHISAGAR DAM	MANDSAUR	244400	753300	BHANPURA	1	H	4B
GANGREL	DHAMTARI	203700	813400	DHAMTARI	2	M	6C
GOHAD TALAB	BHIND	263000	782630	N.A.	3	H	4B
GOVINDGARH	REWA	242000	812000	REWA	1	M	6A
HALALI DAM	BHOPAL	230500	770500	BHOPAL	1	H	4B
ICCHAWAR LAKE	SEHORE	230500	770500	BHANPURA	4	H	4B
KOLAR BARRAGE	SEHORE	220800	770400	OBAIDULLAHGANJ	4	H	6A
MADAMSILLI	DHAMTARI	204225	813300	N.A.	3	M	6C
MANIYARI RESERVOIR	BILASPUR	215248	820200	N.A.	2	H	6C
MOD SAGAR	JHABUA	230400	750100	N.A.	1	M	4B
NAI TALAB	DHAR	231000	794200	N.A.	2	M	6A
PHOOLGAVADI TALAB	DHAR	231000	754200	DHAR	2	M	4B
RAMAOWA	GWALIOR	261200	781200	N.A.	4	M	4B
RUDRI BARAJ	DHAMTARI	204000	813300	N.A.	3	M	6C
SAIHEB KHEDI	UJJAIN	231453	784900	UJJAIN	N.A.	H	6A
SONDUR	DHAMTARI	204000	820000	N.A.	3	M	6C
TAPPA TANK	RAJNANDGAON	210500	805000	N.A.	1	H	6C
TAWA RESERVOIR	HOSHANGABAD	224800	774800	ITRSI	2	M	6A
TIGHRA	GWALIOR	261300	780000	GWALIER	3	L	4B
UNDASA	UJJAIN	231300	753000	UJJAIN	N.A.	M	4B
UPPER LAKE	BHOPAL	231500	772130	BHOPAL	1	H	4B
YASHWANT SAGAR	INDORE	224500	754200	INDORE	2	M	4B

V.S. Vijayan

Note:- In Sanwat tank, Besala tank, Indergarh dam, Sirpur talab, Kotri tank, Kothadi tank, Chhonda, Narmada, Ghongha reservoir, Dugoli talab, Kutru, Dongam dam, Kuenar tank, Phersegarh, Pithapur dam, Bijapur tank and Kutru irrigation tank information is not available; N.A.-Not Available/Data Deficient; L-Low,M-Medium,H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



B. Sinha

MAHARASHTRA

MAHARASHTRA

Habitat features

Maharashtra has 609 wetlands of the size 56.25 ha and above covering 2849.42 km^2 (MRSAC & SAC, 1998). The wetlands constitute 0.9% of the total geographic area of the state. Wetland distribution in 27 districts is given in pages 98-104.

1874 wetlands of the size two ha and above, seven select districts have covered an area of 2229.96 km^2. Among these, there are 1832 lakes/ponds and forty two reservoirs, covering 634.49 km^2 and 1595.47 km^2 respectively. These are shown in pages 105 to 111. 70% of the wetlands has low turbidity while most of the wetlands has low vegetation according to satellite imageries.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	69	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	6	12	18	N.A.	N.A.
Turtles	N.A.	N.A.	1	2	N.A.	3	1
Birds	N.A.	N.A.	N.A.	N.A.	2	6	N.A.

Prioritized Sites

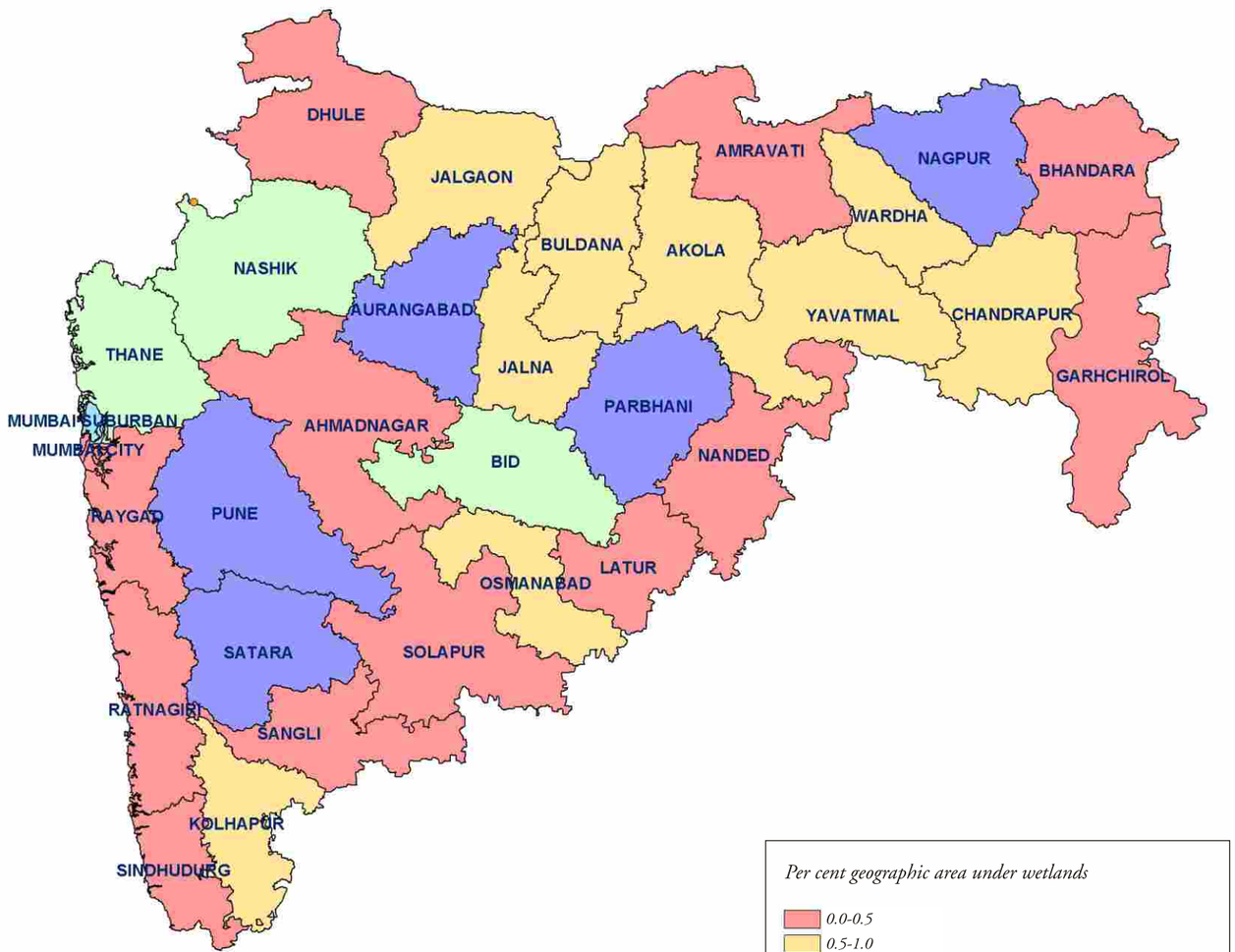
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
33	11	9	10	3

The first eleven wetlands qualify to be declared as Ramsar sites (page 215).

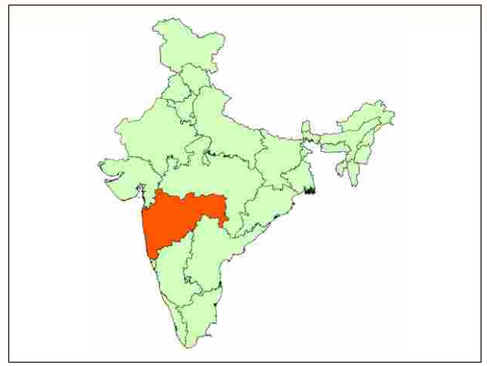


E. Bharucha

A profile of wetlands in Maharashtra



Aerial extent of wetland cover



DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLAND
AURANGABAD	10107.00	321.74	3.18
BHANDARA	9320.00	N. A.	0.00
BID	10693.00	135.43	1.27
BULDANA	9661.00	51.19	0.53
CHANDRAPUR	11443.00	76.91	0.67
DHULE	13097.00	47.8	60.37
GARHCHIROL	14412.00	12.49	0.09
JALGAON	11765.00	60.30	0.51
JALNA	7718.00	39.34	0.51
KOLHAPUR	7685.00	66.31	0.86
LATUR	7157.00	N. A.	0.00
MUMBAI CITY	157.00	N. A.	0.00
MUMBAI SUBURBAN	446.00	7.49	1.68
NAGPUR	9802.00	204.86	2.09
NANDED	10528.00	52.51	0.50
NASHIK	15530.00	211.20	1.36
OSMANABAD	7569.00	71.74	0.95
PARBHANI	11041.00	235.82	2.14
PUNE	15643.00	528.67	3.38
RATNAGIRI	8208.00	6.96	0.08
RAYGAD	7152.00	1.87	0.03
SANGLI	8572.00	22.49	0.26
SATARA	10480.00	218.71	2.09
SINDHUDURG	5207.00	2.50	0.05
SOLAPUR	14895.00	26.58	0.18
THANE	9558.00	108.06	1.13
WARDHA	6309.00	39.35	0.62
YAVATMAL	13582.00	85.58	0.63

Maps not to scale

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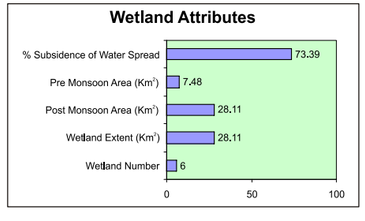
District - wise spatial distribution of wetlands



District Ahmednagar

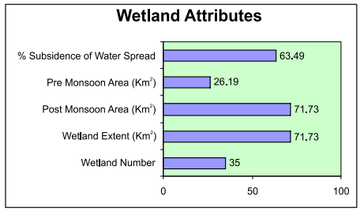


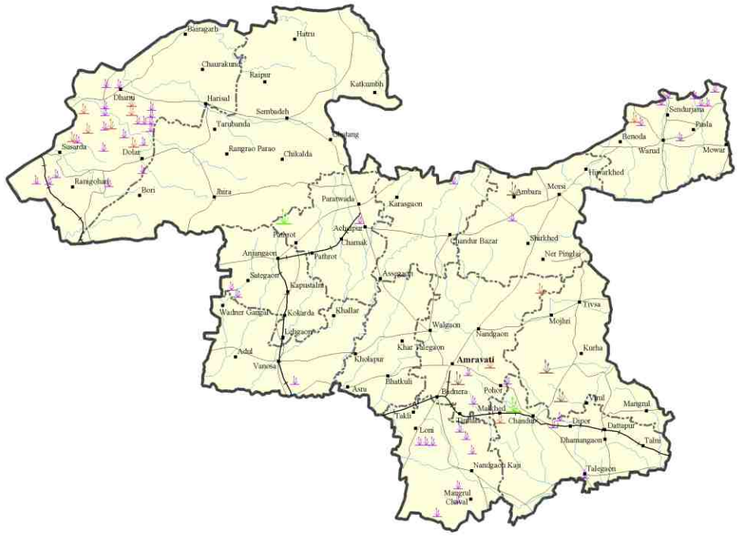




District Akola

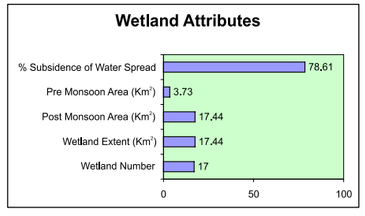






District Amravati

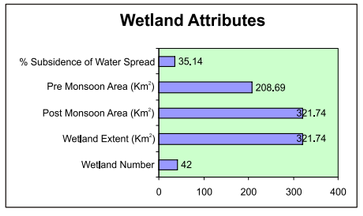






District Aurangabad





Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

Legend : Wetlands

- Area >= 500 ha
- Area >= 400 ha and <500 ha
- Area >= 300 ha and < 400 ha
- Area >= 200 ha and < 300 ha
- Area >= 100 ha and < 200 ha
- Area >= 56 ha and < 100 ha
- Area <= 56 ha
- Rivers/Streams
- Cities/Towns/Villages
- Railways
- Roads
- International Boundary
- State Boundary
- District Boundary
- Taluk Boundaries

Maps not to scale

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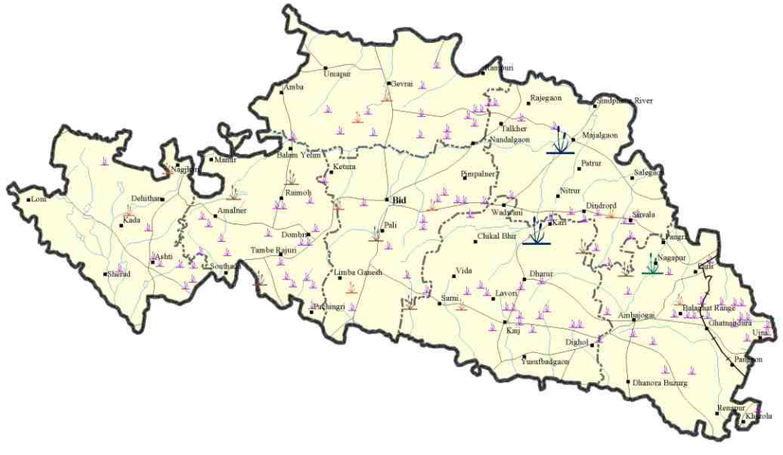
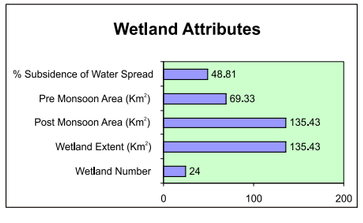
District - wise spatial distribution of wetlands



District Bid



Wetland Attributes

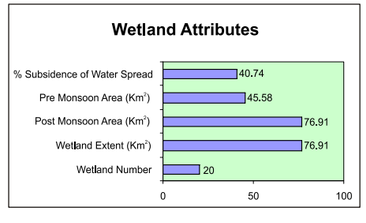




District Chandrapur



Wetland Attributes

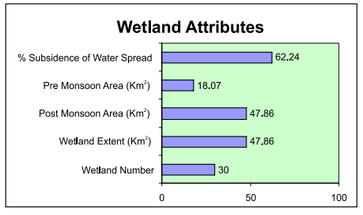




District Dhule

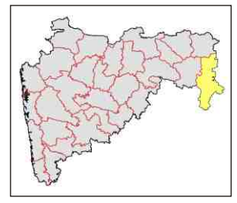


Wetland Attributes

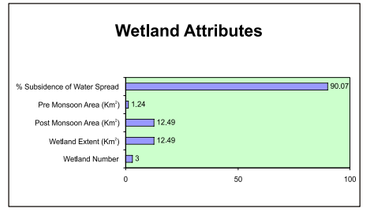




District Gadchirolli



Wetland Attributes



Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

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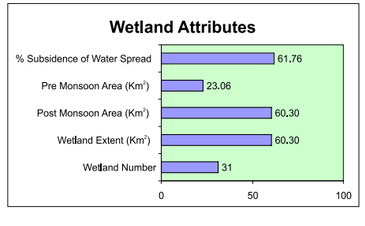
District - wise spatial distribution of wetlands



District Jalgaon

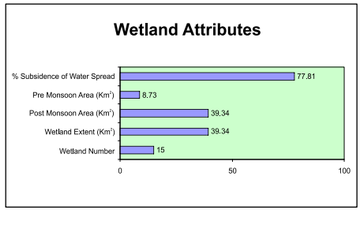






District Jalna

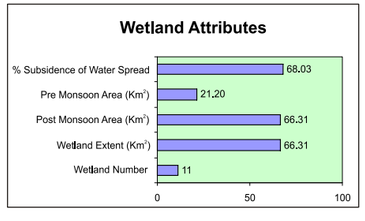


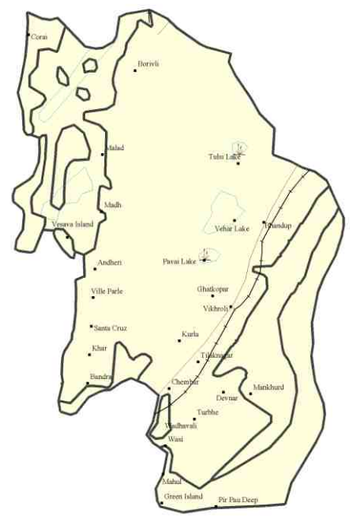




District Kolhapur

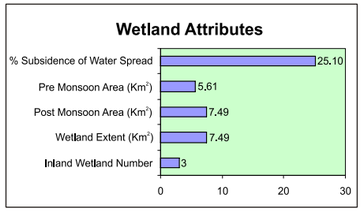






District Mumbai Suburban





Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

Wetlands

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Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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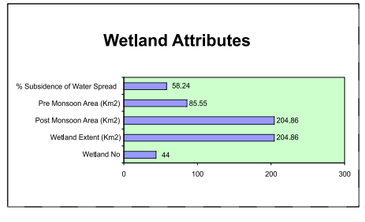
District - wise spatial distribution of wetlands



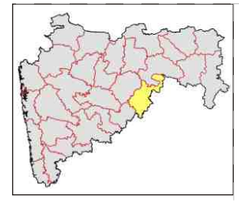
District Nagpur

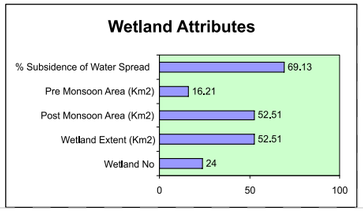






District Nanded

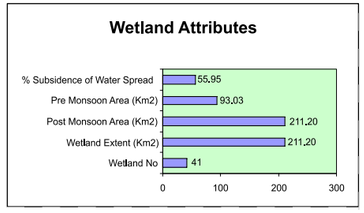






District Nashik

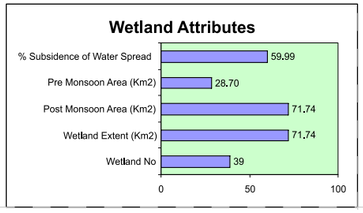






District Osmanabad





Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

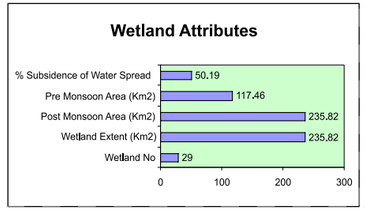
©SACON 2004

District - wise spatial distribution of wetlands



District Parbhani

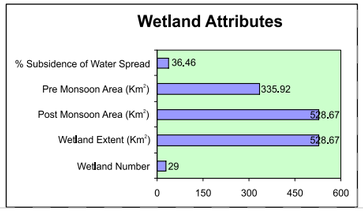


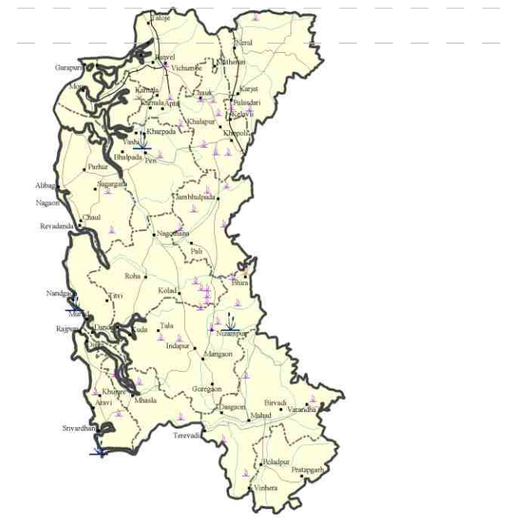




District Pune

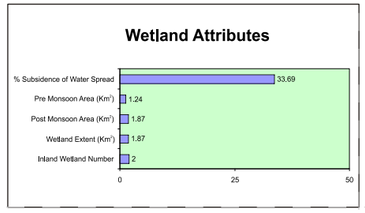






District Raigarh

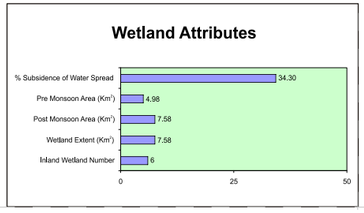






District Ratnagiri





Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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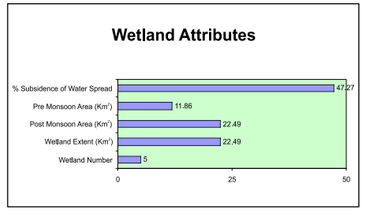
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

District - wise spatial distribution of wetlands



District Sangli

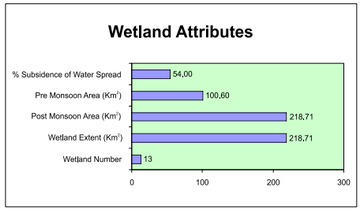






District Satara

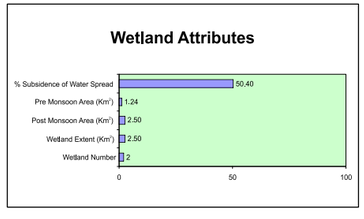






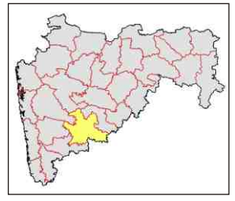
District Sindhudurg

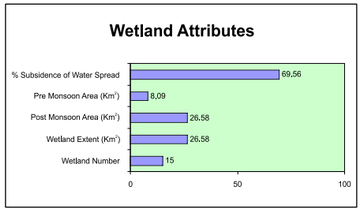






District Solapur





Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

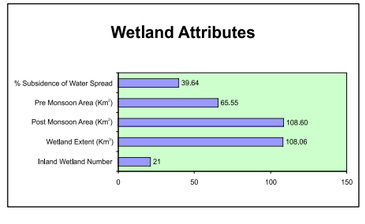
©SACON 2004

District - wise spatial distribution of wetlands



District Thane

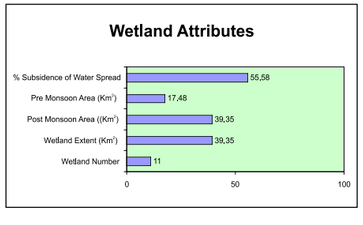






District Wardha

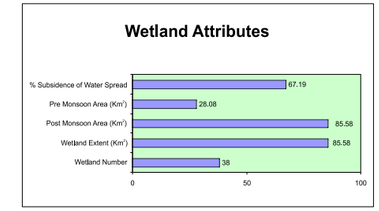






District Yavatmal







B.Pandav

Source: Wetland point data; Mahashtra Remote Sensing Applications Centre, Pune

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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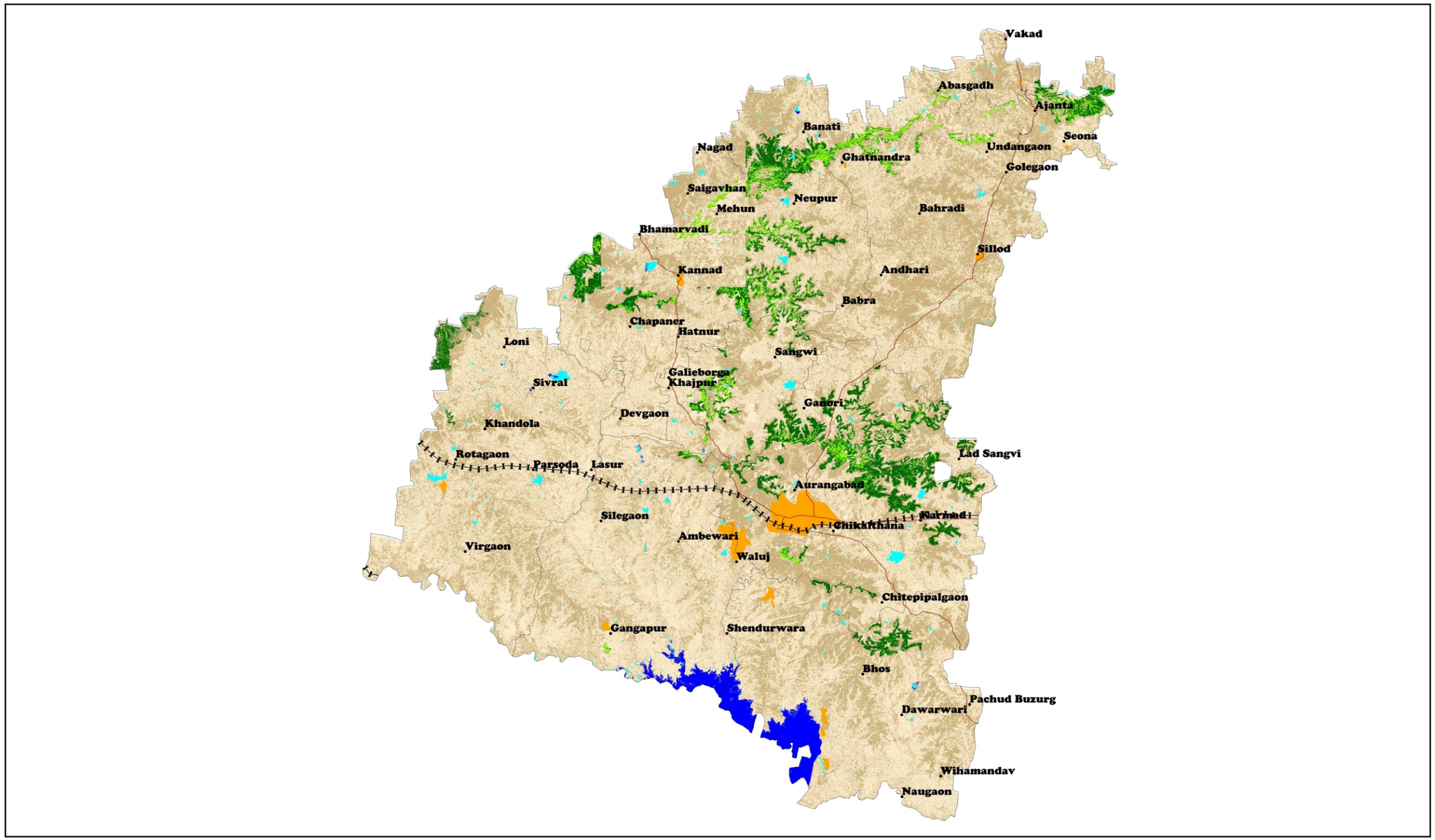
Integrated wetland and land use map

District Aurangabad, Maharashtra



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Roads	NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary	
Arable Land	Township	NP Water-logged	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary	

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS-1C & 1D LISS III (1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
Pond/Tank				
Reservoir				
Water-logged		NP	NP	NP
Oxbow		NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank			NP	
Reservoir			NP	
Water-logged		NP	NP	NP
Oxbow/Cut-off		NP	NP	NP

Maps not to scale

Maharashtra state Remote Sensing Application Centre and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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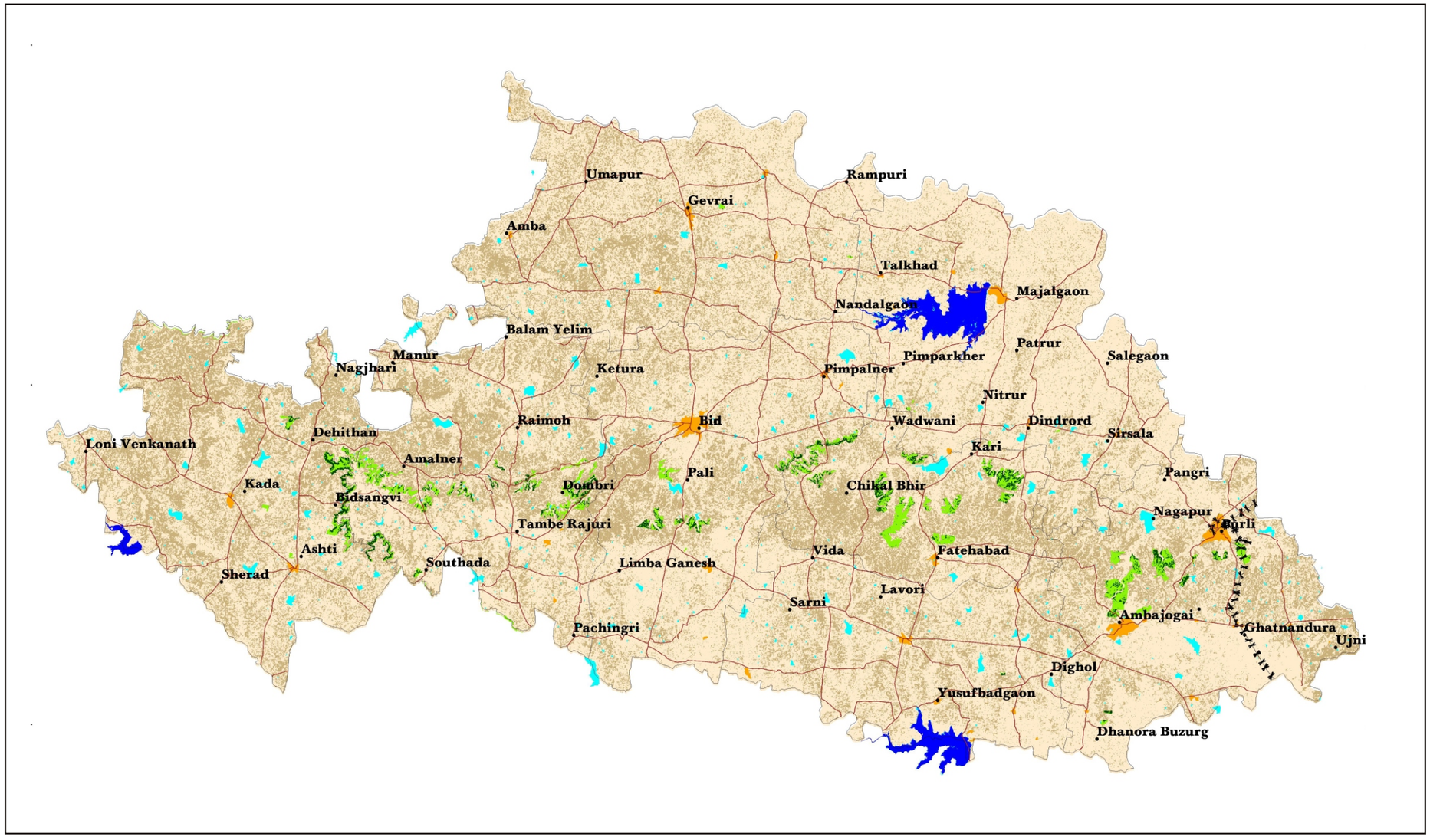
Integrated wetland and land use map



Integrated wetland type and land use

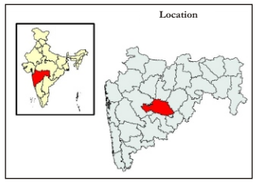
Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways	NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary	
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary	

Maps not to scale

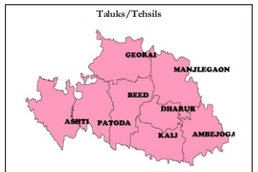
©SACON 2004

District Beed, Maharashtra

Location



Taluks/Tehsils



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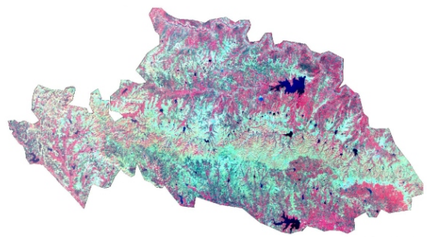


Band Combination: 3, 2, 1
IRS 1C & 1D LISS III (1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation

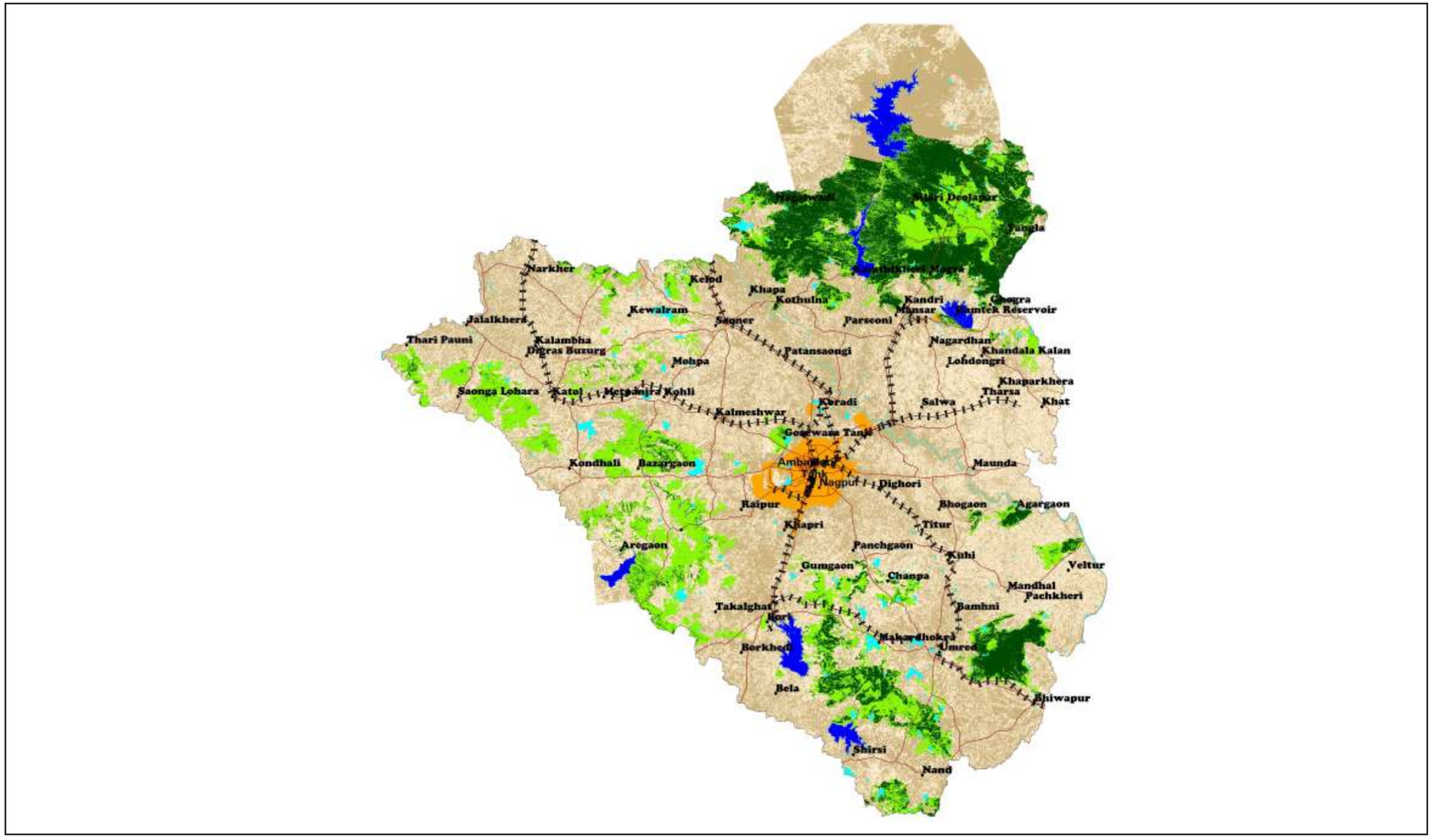


Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir			
	Water logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Maharashtra state Remote Sensing Application Centre and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map

District Nagpur, Maharashtra

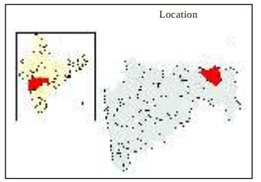


Integrated wetland type and land use

Dense Forest	Waste Land	Pond / Tank	NP Oxbow Lake / Cut-off	NP Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	NP Water-logged	NP Marsh / Mud	Roads	Taluks / Tehsil Boundary

NP * Not Present

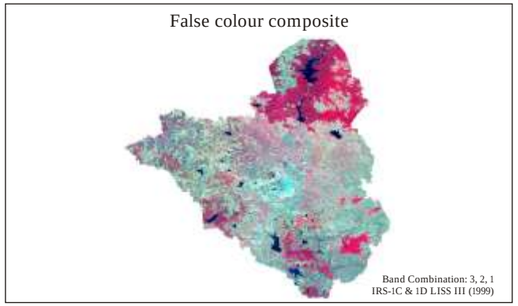
Location



Taluks / Tehsils



False colour composite



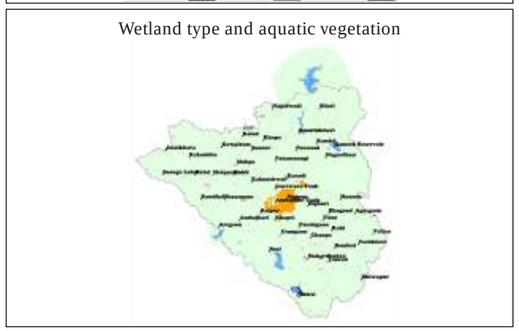
Band Combination: 3, 2, 1
IRS-1C & 1D LISS III (1999)

Wetland type and turbidity



Legend Wetland Turbidity

Wetland type and aquatic vegetation



Legend Wetland Aquatic Vegetation

Maps not to scale

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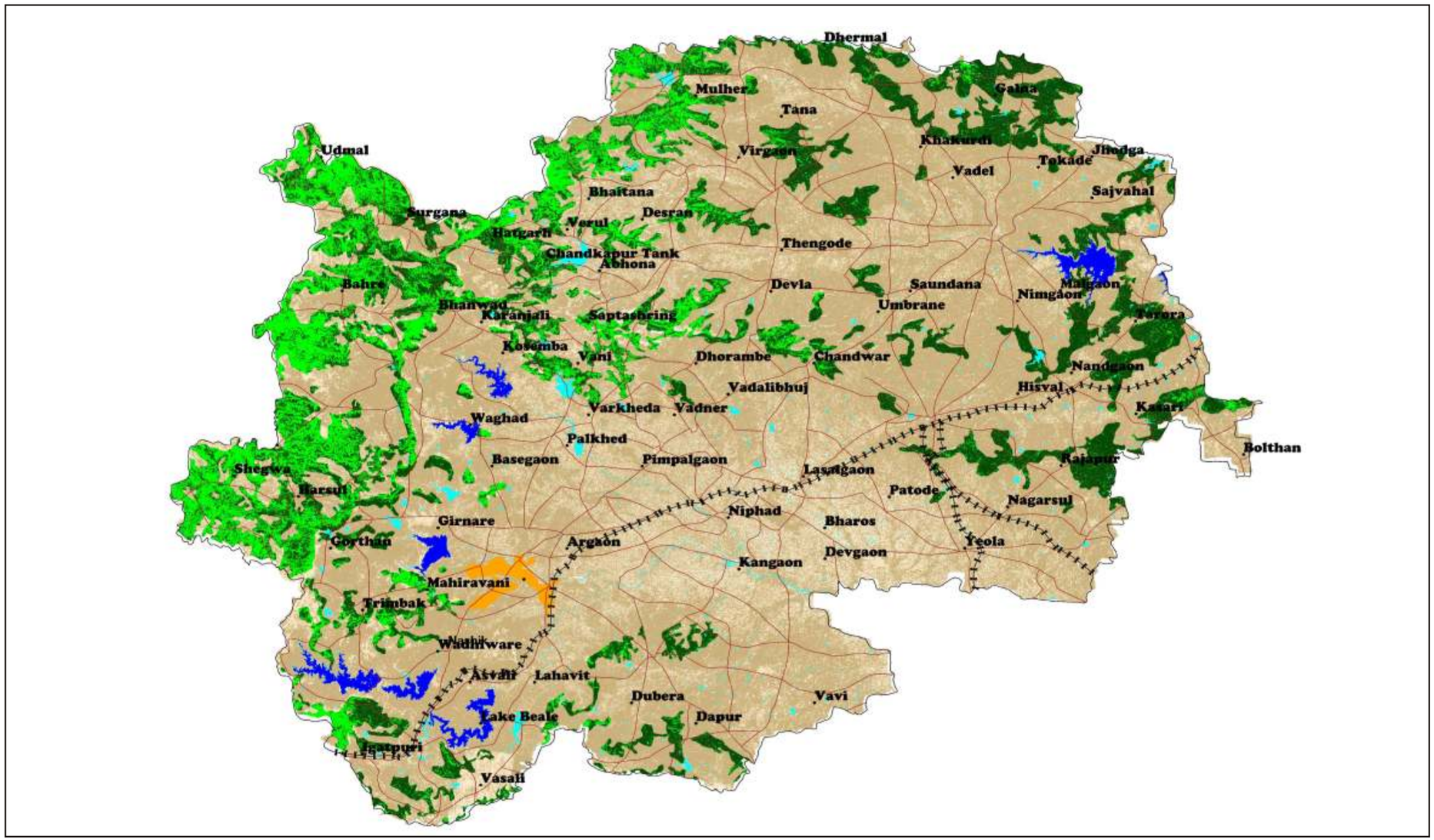
Integrated wetland and land use map

District Nashik, Maharashtra

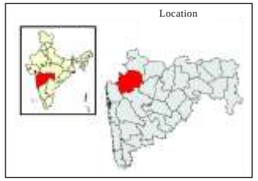


Integrated wetland type and land use

Dense Forest	Waste Land	Pond / Tank	NP Water-logged	NP Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	NP Oxbow Lake / Cut-off	NP Marsh / Mud	Roads	Taluks / Tehsil Boundary

NP * Not Present

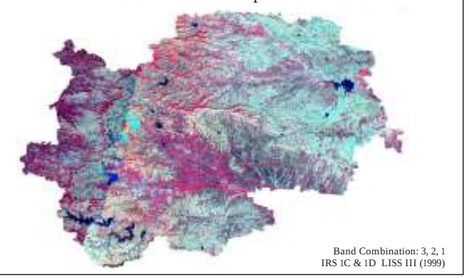
Location



Taluks / Tehsils



False colour composite

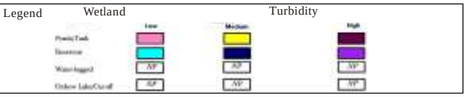


Band Combination: 3, 2, 1
IRS IC & 1D LISS III (1999)

Wetland type and turbidity



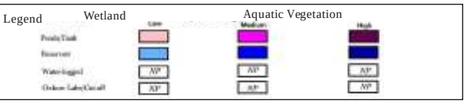
Legend Wetland Turbidity



Wetland type and aquatic vegetation



Legend Wetland Aquatic Vegetation



Maps not to scale

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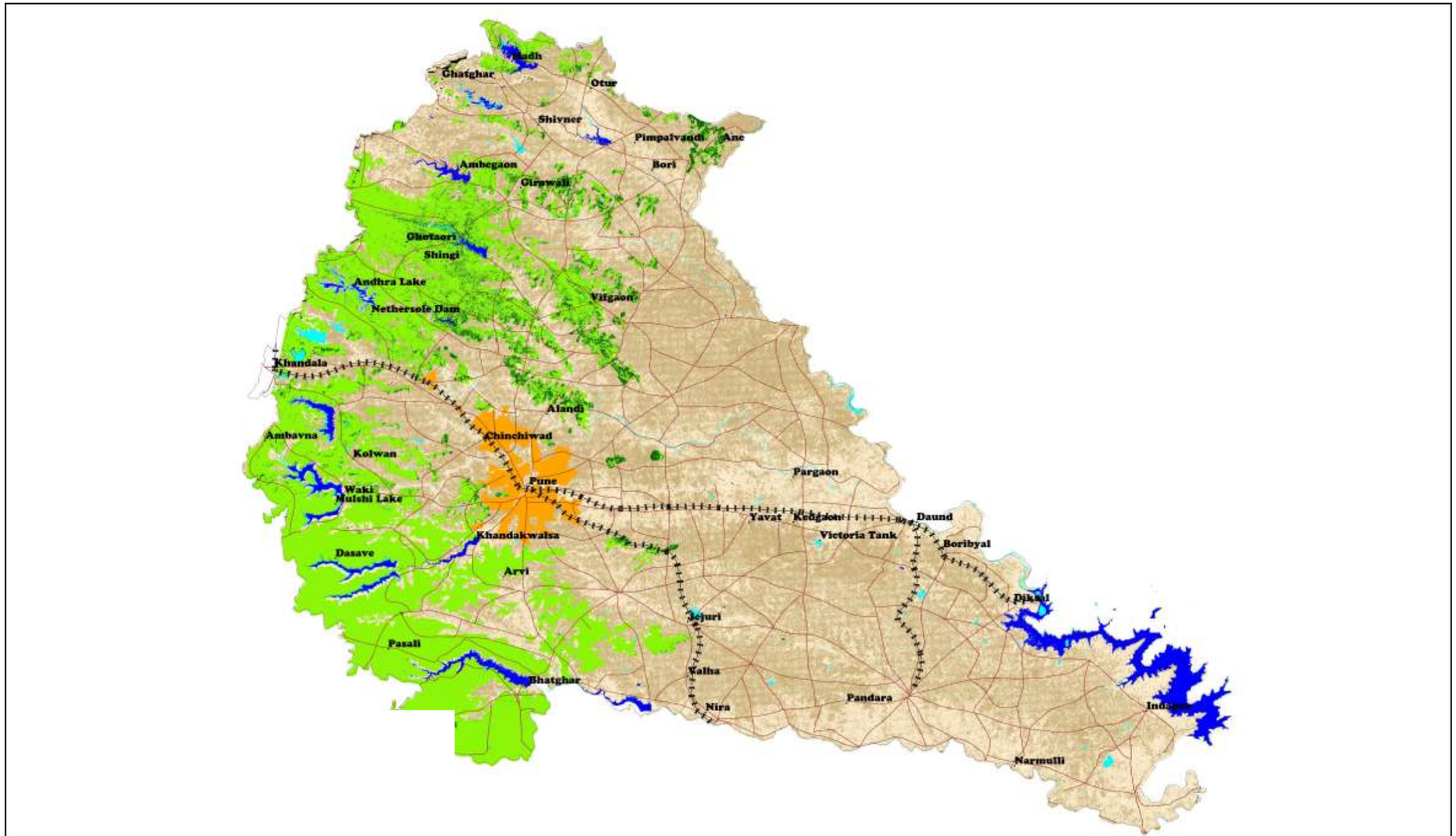
Integrated wetland and land use map

District Pune, Maharashtra



Integrated wetland type and land use

Dense Forest	Waste Land	Pond / Tank	Water-logged	Sand	Railways
Open Forest	River	Reservoir	Coastal-water	Others	District Boundary
Arable Land	Township	Oxbow Lake / Cut-off	Marsh / Mud	Roads	Taluks / Tehsil Boundary

NP = Not Present

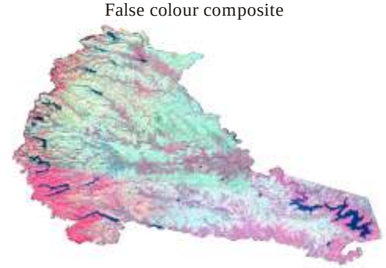
Location



Taluks / Tehsils



False colour composite

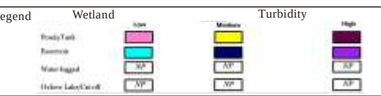


Band Combination: 3, 2, 1
IRS-1C & 1D LISS III (1999)

Wetland type and turbidity



Legend — Wetland — Turbidity



Wetland type and aquatic vegetation



Legend — Wetland — Aquatic Vegetation



Maps not to scale

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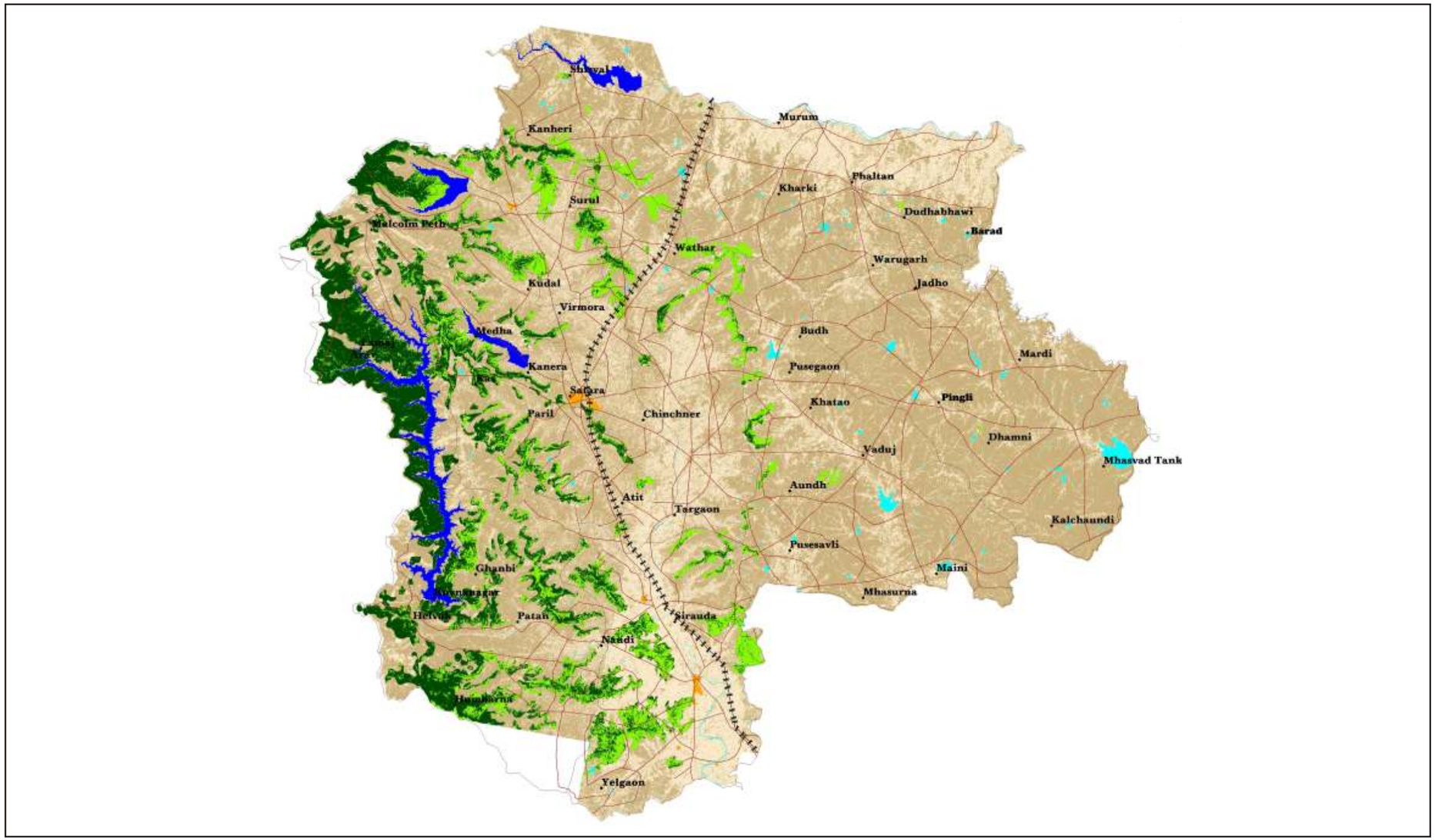
Integrated wetland and land use map

District Satara, Maharashtra

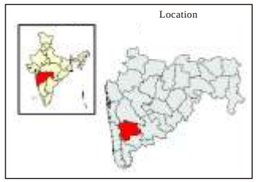


Integrated wetland type and land use

Dense Forest	Waste Land	Pond / Tank	Water-logged	Sand	Railways
Open Forest	River	Reservoir	Coastal-water	Others	District Boundary
Arable Land	Township	Oxbow Lake / Cut-off	Marsh / Mud	Roads	Taluks / Tehsil Boundary

NP = Not Present

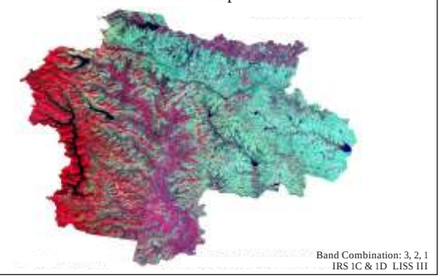
Location



Taluks / Tehsils



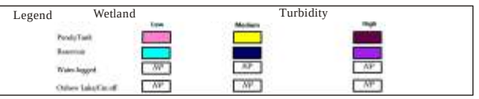
False colour composite



Band Combination: 3, 2, 1
IRS 1C & 1D LISS III

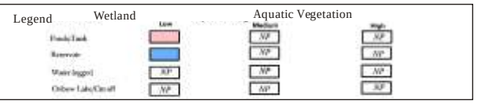
Wetland type and turbidity





Wetland type and aquatic vegetation





Maps not to scale

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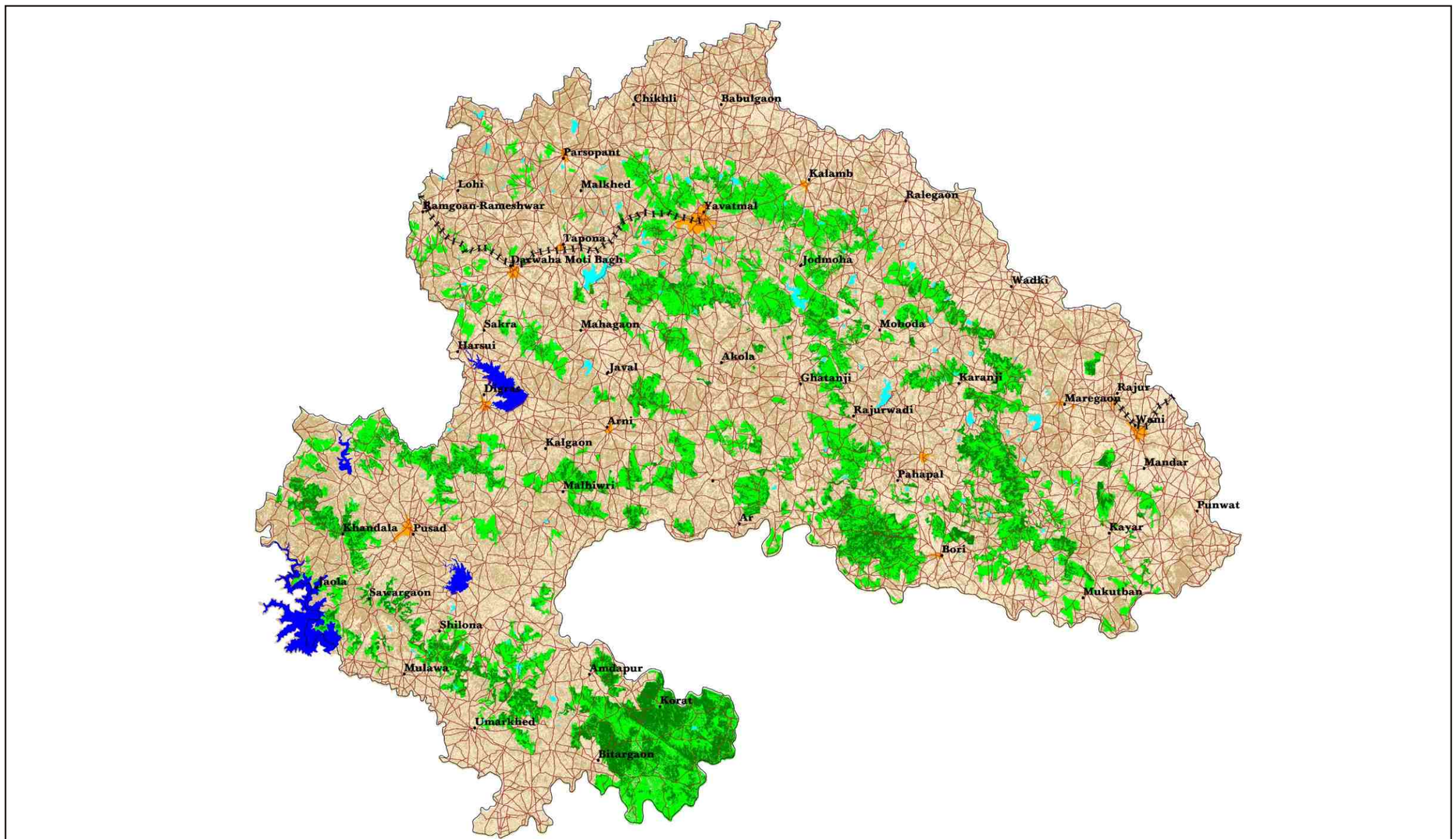
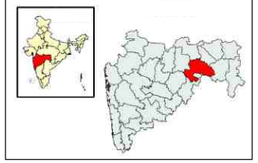
Integrated wetland and land use map

District Yavatmal, Maharashtra



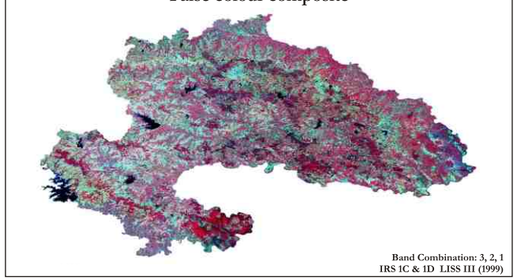
Location



Taluks/Tehsils

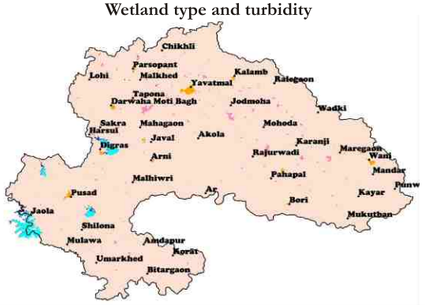


False colour composite



Band Combination: 3, 2, 1
IRS 1C & 1D LISS III (1999)

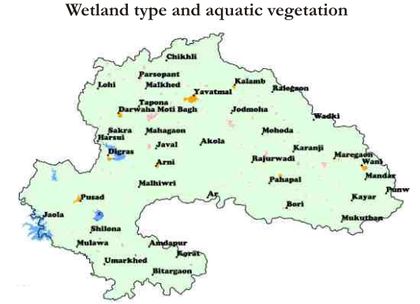
Wetland type and turbidity



Legend

Wetland	Low	Medium	High
Ponds/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend

Wetland	Low	Medium	High
Ponds/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Water-logged	NP Sand	Railways	NP * Not Present	
Open Forest	River	Reservoir	NP Coastal-water	NP Others	Taluks/Tehsil Boundary		
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	District Boundary		

Maps not to scale

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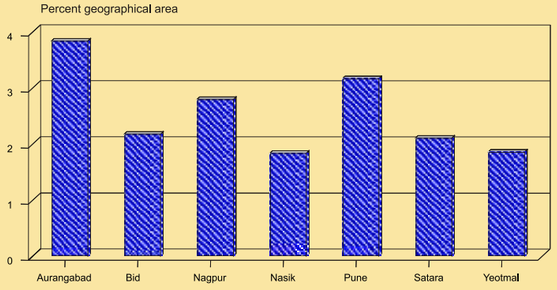
Maharashtra state Remote Sensing Application Centre and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

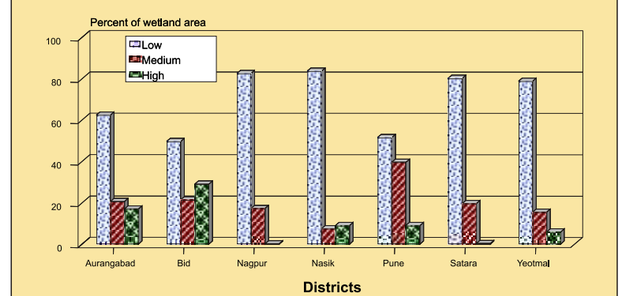


Area under wetland in select districts

Attributes of wetlands and environmental contamination

Wetlands

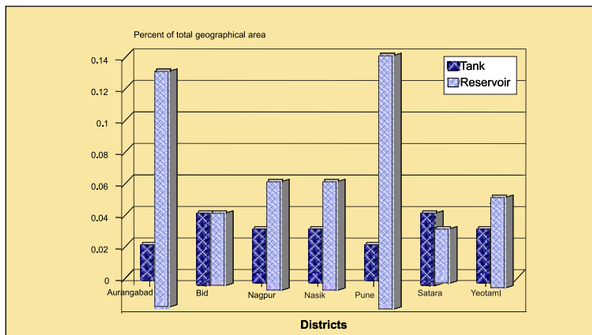
The area under wetlands in the districts vary from 1.82% (Nasik) to 3.82% (Aurangabad). Two major categories of wetlands, namely reservoirs and ponds/lakes occur in these districts. The latter is more in area and many times more in numbers. It is very instructive to learn that wetlands smaller than 56.25 ha are several folds higher in all the districts studied.



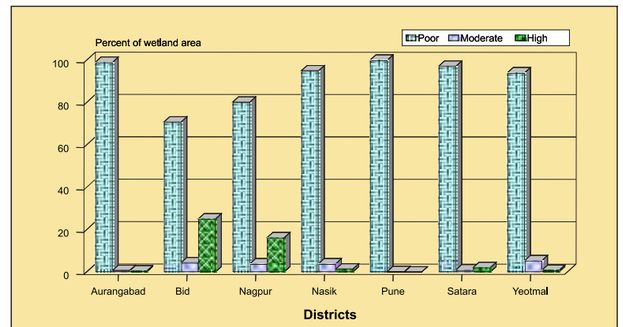
Turbidity pattern in select districts

Turbidity

Reservoir of four districts (Beed,Nagpur,Nasik and Satara) have low turbidity while those in three districts (Aurangabad,Pune and Yavatmal) have moderate, moderate/high and low/moderate levels of turbidity. The ponds/tanks also had low turbidity except in Aurangabad and Beed where it was high.



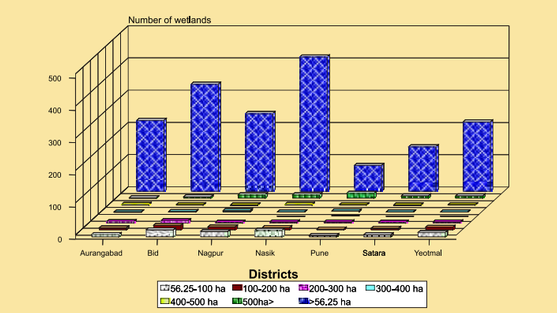
Area under different wetland classes in select districts



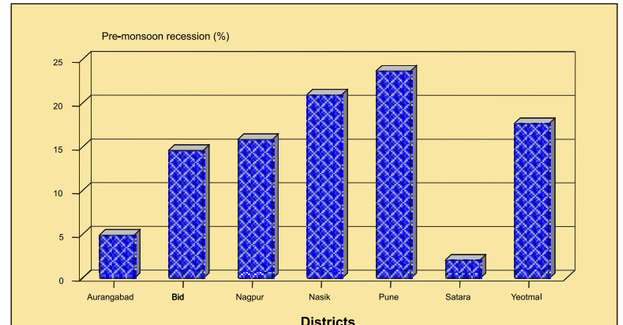
Aquatic vegetation in wetlands in select districts

Summer recession of water

The summer recession among the wetlands varied from 2.1% (Satara) to 23.7% (Pune). It appears that the degree of recession is smaller in tanks than in reservoirs. One exception is in the district Aurangabad that has higher percent of wetlands under the reservoir category. Actual use of water in the reservoir may be a better indicator of extent of recession. Thus, the reservoirs in Pune substantially cater to the generation of power, whereas the reservoirs in Aurangabad are used for irrigation.



Size class distribution of wetlands in select districts



Average summer recession in select districts

E. Bharucha

Maps not to scale

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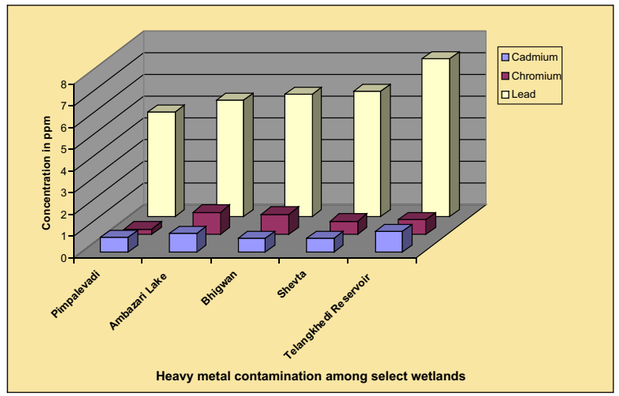


Heavy metal contamination among select wetlands

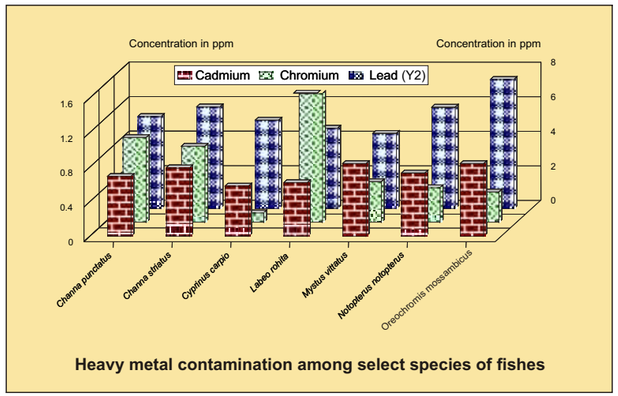
Attributes of wetlands and environmental contamination

Heavy metals

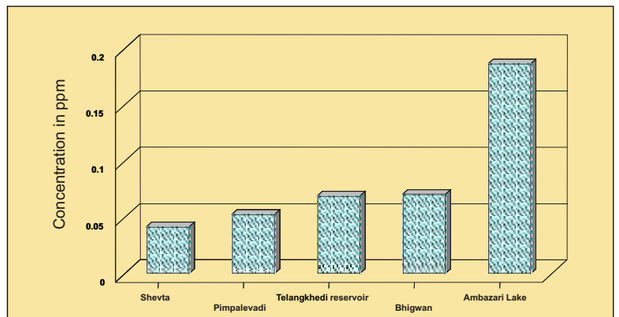
Among the wetlands examined, Telangkhedi Reservoir of Nagpur district has maximum concentrations of lead and cadmium, while Ambazari lake of the same district has high levels of chromium. Although other metals, namely copper, zinc and chromium are in quantifiable levels, they are not expected to pose any harmful effects. Variation in the contamination levels of all the metals except chromium is significant among wetlands. Among the species studied, *Oreochromis mossambicus,* an omnivorous feeder has maximum levels of lead and cadmium. *Labeo rohita* has the highest concentrations of chromium, while the levels of other metals are not high. However, the fishes have significantly varying levels of copper, lead and zinc.

Pesticides

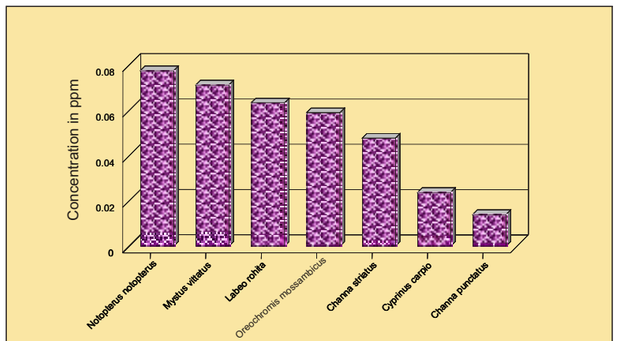
Among the five wetlands studied, Ambazare lake of Nagpur district has the maximum load of total organochlorine residues followed by Bhigwan of Pune. The least concentration was recorded in Shevta of Aurangabad district. Of the seven species of fishes analyzed, *Notoptenus notopterus* is the most contaminated fish in terms of organochlorine residues followed by *Mystus vittatus* and *Labeo rohita*. Least concentrations are detected in *Cyprinus carpio* and *Channa punctatus*. Among all the fishes analyzed, 93, 91 and 78% are contaminated with HCH, heptachlor epoxide and DDT respectively. Of the various organochlorine residues detected, HCH concentrations in *Ompok bimaculatus* of Ambazare lake of Nagpur district exceed the Maximum Residue Levels (MRL), which is recommended for fish products (FAO/WHO). Organochlorine residues are less than the threshold concentration of ecological risk to fish and avian wildlife.



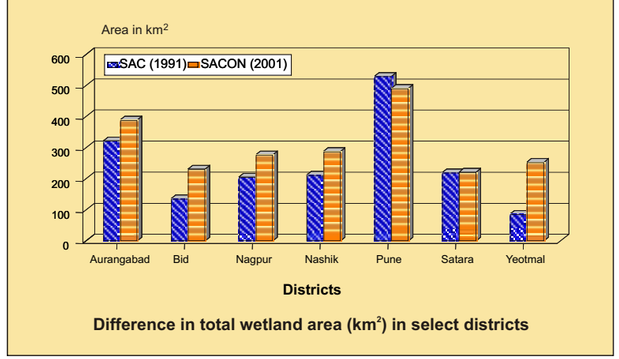
Heavy metal contamination among select species of fishes



Total organochlorine residues among select wetlands



Total organochlorine residues among various species of fishes



Difference in total wetland area (km²) in select districts



E. Bharucha

E. Bharucha

Maps not to scale

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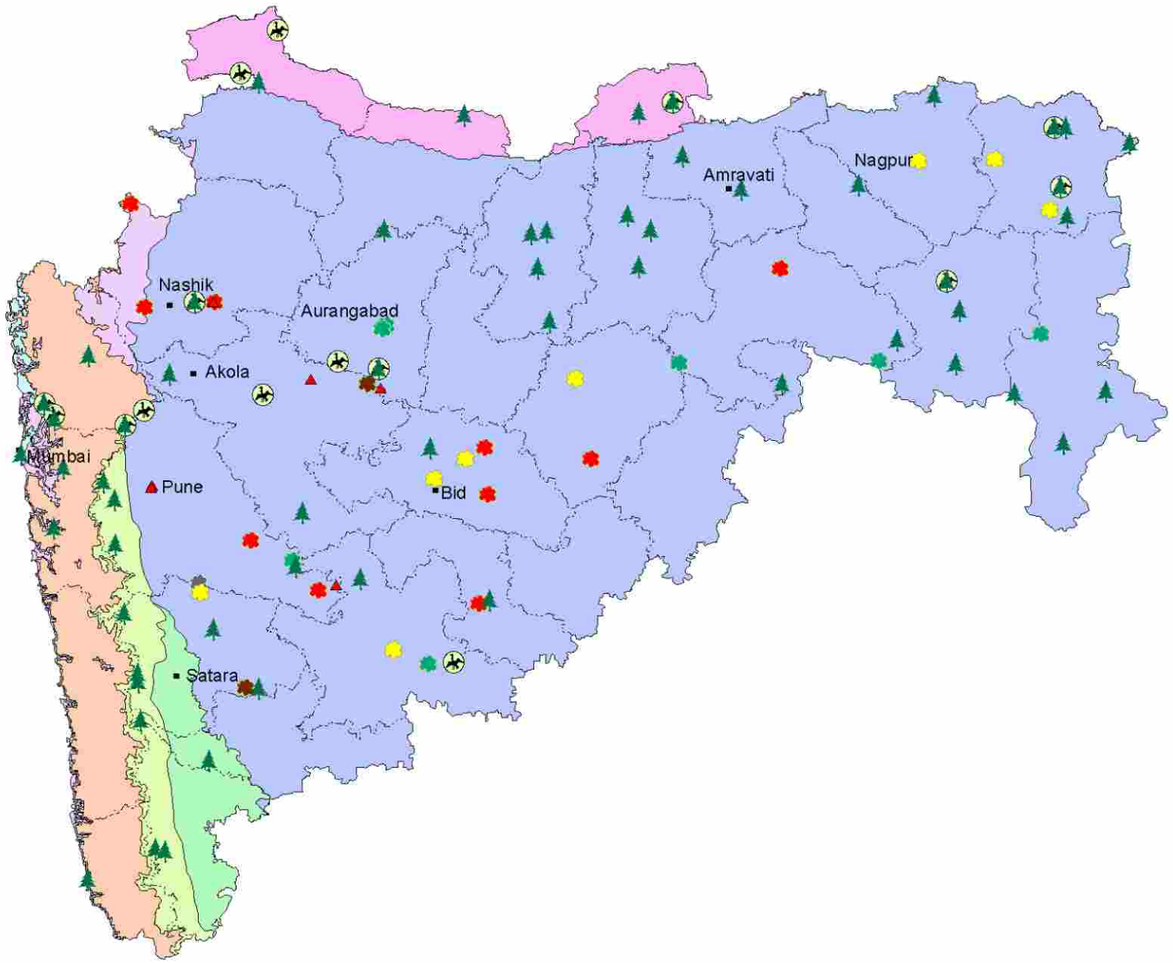
Prioritized inland wetlands of Maharashtra



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *4B, Semi Arid Gujarat Rajputana*
- *5A, Western Ghats-Malabar Plains*
- *5B, Western Ghats-Western Ghats Mountain*
- *6A, Deccan Peninsula-Central Highlands*
- *6D, Deccan Peninsula-Central Plateau*
- *6E, Deccan Peninsula-Deccan South*
- *8A, Coasts-West Coast*
- *District Boundaries*

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Maharashtra

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
BHIGWAN	PUNE	181900	744600	BHIGWAN	1	H	6D
BINDUSAR	BID	185430	754400	BID	1	H	6D
ERAI DAM	CHANDRAPUR	200000	800000	CHANDRAPUR	2	N.A.	6D
GANGAPUR TANK	NASHIK	203830	733000	NASHIK	1	M	6D
HIPPERGA TANK	SOLAPUR	174000	754500	SHOLAPUR	1	H	6D
ISAPUR DAM	PARBHANI	194500	772600	HINGALI	3	H	6D
ITIADOH	BHANDRA	211000	793900	BHANDRA	3	N.A.	6D
JAYAKWADI	AURANGABAD	193130	751350	PAITHAN	1	H	6D
JEJURI DAM	PUNE	180800	740700	JEJURI	2	M	6D
KAMBAL TALAV	SHOLAPUR	174500	753000	SHOLAPUR	3	H	6D
KHAMBALA TANK	NASHIK	195730	733730	NASHIK	1	M	6D
KUNDALIKA DAM	BID	184900	760700	DHARUR	1	H	6D
MAJALGAON DAM	BID	190800	760500	N.A.	2	H	6D
MAYNI	SATARA	172700	742900	LITA	2	M	6D
MUKUTBAN	YAVATMAL	194800	785100	PANDKAR	1	N.A.	4B
NAGAPUR DAM	NAGPUR	210900	790600	PASALI	4	L	6D
NANDUR-MEDHMESHWAR	NASHIK	200100	740700	NIPHAD	1	H	6D
NAVEGAON	BHANDRA	205000	800300	BHANDRA	3	N.A.	6D
NILONA	YAVATMAL	202400	780800	YAVATMAL	2	N.A.	6D
NIVALI	PARBHANI	193700	764200	JINTUR	1	H	6D
PATAS	PUNE	182600	742800	PATAS CITY	4	H	6D
PIMPALWADI	BID	190300	755700	N.A.	2	N.A.	6D
SALIM ALI LAKE	AURANGABAD	195400	751900	GAR	2	H	6D
SIDDHESHWAR DAM	PARBHANI	190500	765000	JINTUR	3	H	6D
SUKHANA	AURANGABAD	195530	752030	AURANGABAD	2	M	6D
TARANGWADI	PUNE	180730	745730	N.A.	3	H	6D
TEESGAON	AURANGABAD	195500	752000	AURANGABAD	3	M	6D
VEER	PUNE	180400	740800	SASUAD	1	L	6D
YERALEWADI DAM	SATARA	172700	742900	KHATAV	2	H	6D
YELDARI DAM	OSAMANBAD	180500	760500	JINTUR	3	M	6D

Ameen Ahmed

Note:- In Ambazare, Malharsagar and Dahegaon lake information is not available; N.A.-Not Available/Data Deficient; L-Low,M-Medium,H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



B. Sinha

MANIPUR MANIPUR

Habitat features

Manipur has 155 wetlands of 2.25 ha in size, covering a total area of 529.58 km^2 (SAC, 1998 & MRSAC, 1997),constituting 2.37% of the total geographic area of the state. Wetland distribution in three districts is given in page 116.

Manipur has four categories of lakes, namely valley lakes, oxbow lakes or cut-off meanders, tectonic/landslide lakes, and artificial reservoirs. All these lakes together constitute about 82% of the wetlands of the state.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	7	16	23	N.A.	N.A.
Turtles	N.A.	N.A.	1	2	N.A.	3	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	3	2	N.A.

Prioritized Sites

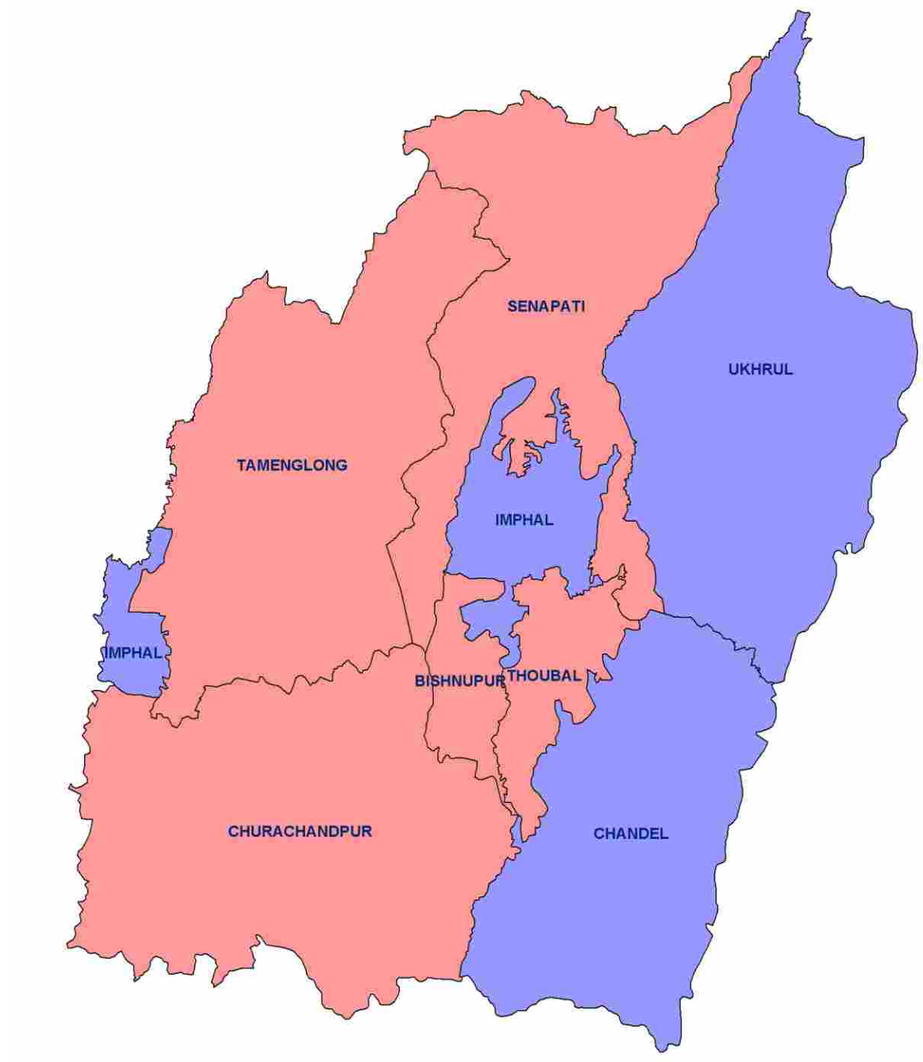
Number of Prioritized Wetlands	Rank 1	Rank 2
6	5	1

Loktak has already been declared as a Ramsar site. The next four in the prioritized list are also eligible for declaration as Ramsar sites (page 215).

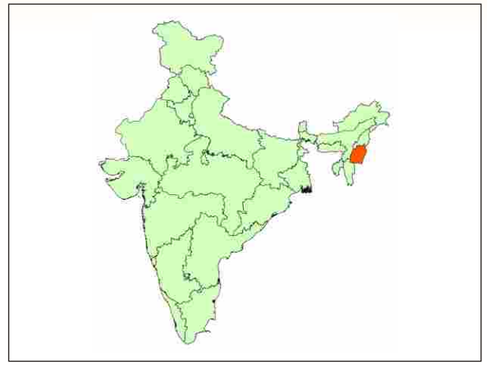


Anwaruddin Chaudhary

A profile of wetlands in Manipur



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BISHNUPUR	496.00	199.05	40.13
CHANDEL	3313.00	N.A.	0.00
CHURACHANDPUR	4570.00	N.A.	0.00
IMPHAL	1228.00	132.65	10.80
SENAPATI	3271.00	0.20	0.01
TAMENGLONG	4391.00	0.80	0.02
THOUBAL	514.00	196.88	38.30
UKHRUL	4544.00	N.A.	0.00

Maps not to scale

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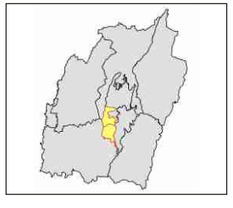
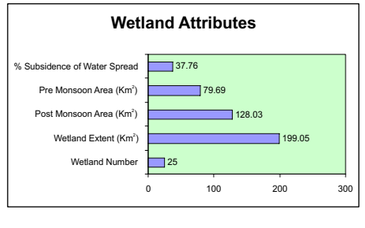
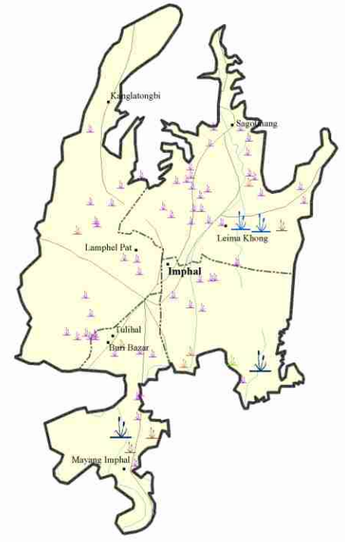
District - wise spatial distribution of wetlands



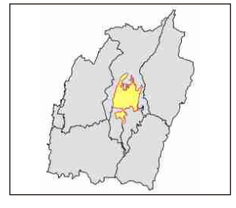
District Bishnupur

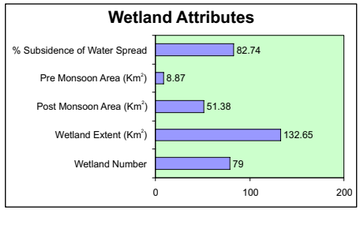


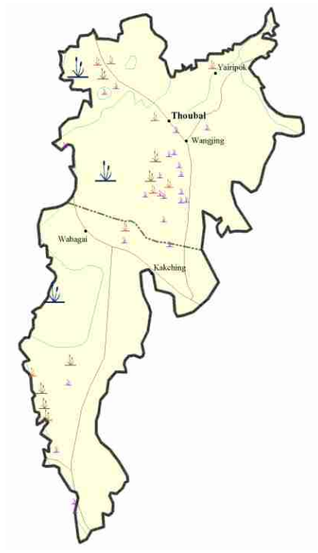




District Imphal

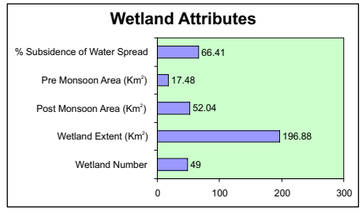


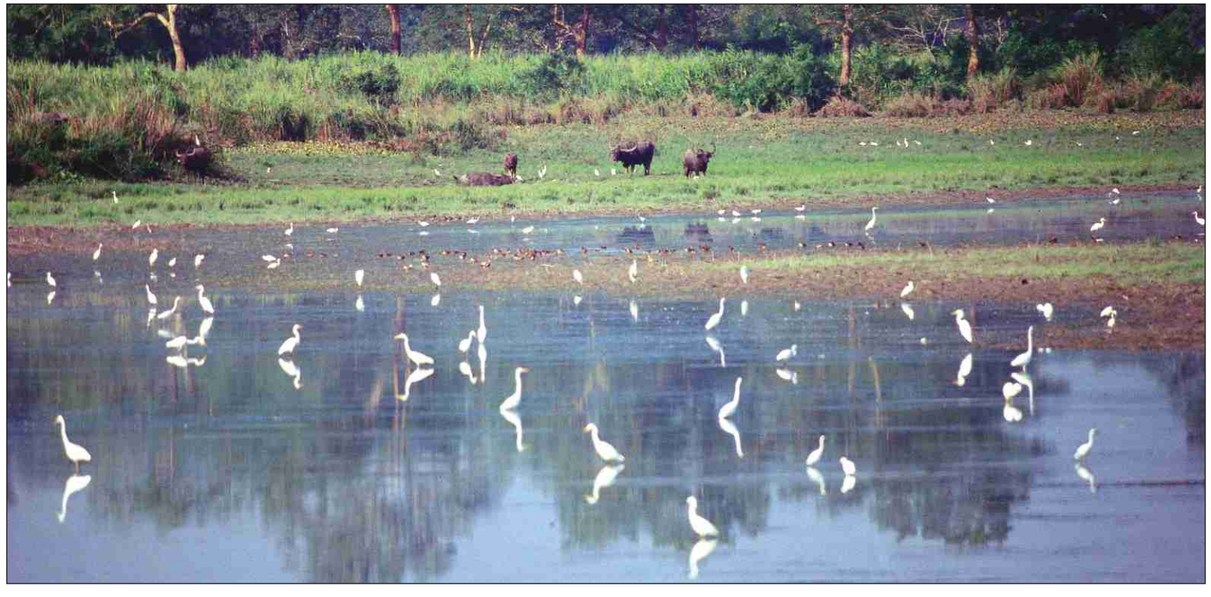




District Thoubal







Anwaruddin Chaudhary

Source: Wetland point data; Manipur Remote Sensing Applications Centre, Imphal

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha | Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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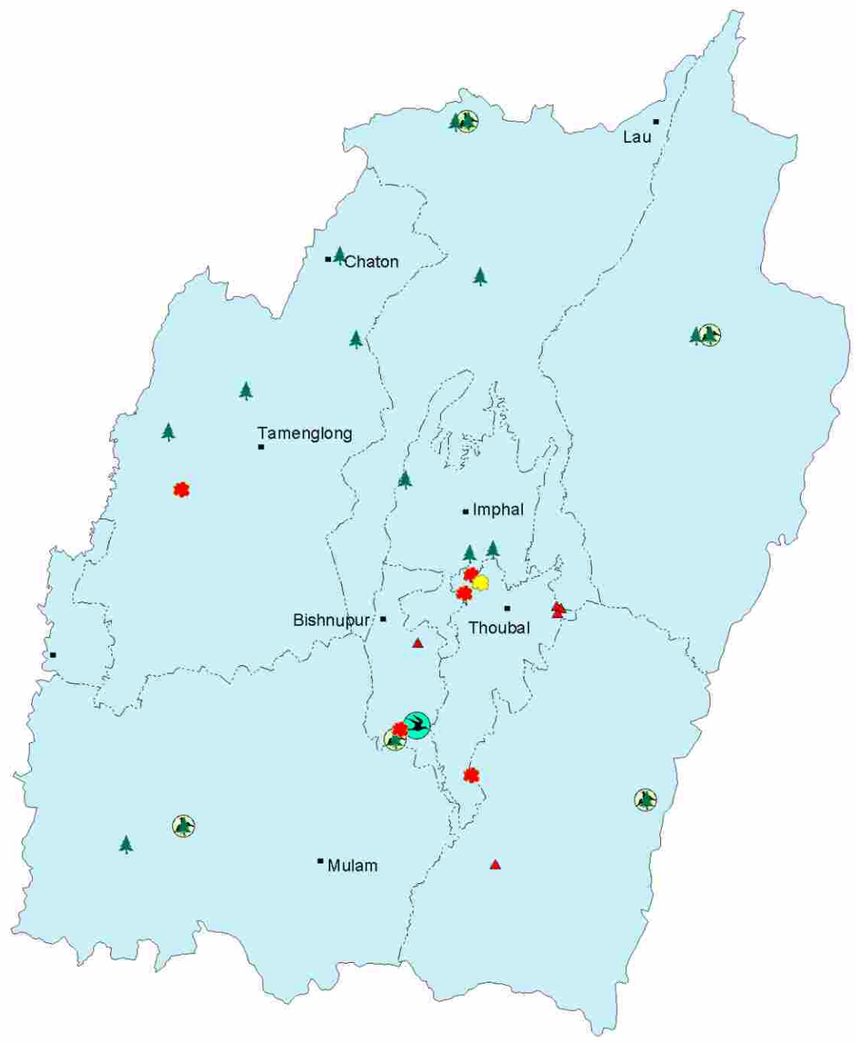
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Prioritized inland wetlands of Manipur



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *9B, North East-North East Hills*
- *District Boundaries*
- *Ramser site*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Manipur

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
IKOP PAT	THOUBAL	24 42 00	93 57 00	THOUBAL	1	H	9B
KHARUNG PAT	THOUBAL	24 40 00	93 56 00	KAKCHING	1	H	9B
LOKTAK LAKE	BISHNUPUR	24 25 42	93 46 55	MOIRANG	1	H	9B
PUMLEN PAT	THOUBAL	24 20 00	93 55 00	KUMKI	1	H	9B
WAITHOU LAKE	IMPHAL	24 41 00	93 58 00	THOUBAL	2	H	9B
ZEILAD LAKE COMPLEX	TAMENGLONG	24 54 00	93 23 00	TAMENGLONG	1	H	9B



S.A. Hussain

Note:-L-Low,M-Medium,H-High.

Maps not to scale

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B. Sinha

MEGHALAYA MEGHALAYA

Habitat features

Meghalaya has 98 wetlands of 2.25 ha and above in size. However, the total area covered by the wetlands is only 12.57 km^2, about 0.06% of the total area of the state (SAC, 1998). Wetland distribution in four districts is given in page 119.

There are four categories of lakes, namely valley lakes, oxbow lakes or cut - off meanders, tectonic / landslide lakes, and artificial reservoirs.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	14	18	N.A.	N.A.
Turtles	N.A.	N.A.	2	2	N.A.	3	1
Birds	N.A.	N.A.	N.A.	N.A.	N.A.	2	N.A.

Prioritized Sites

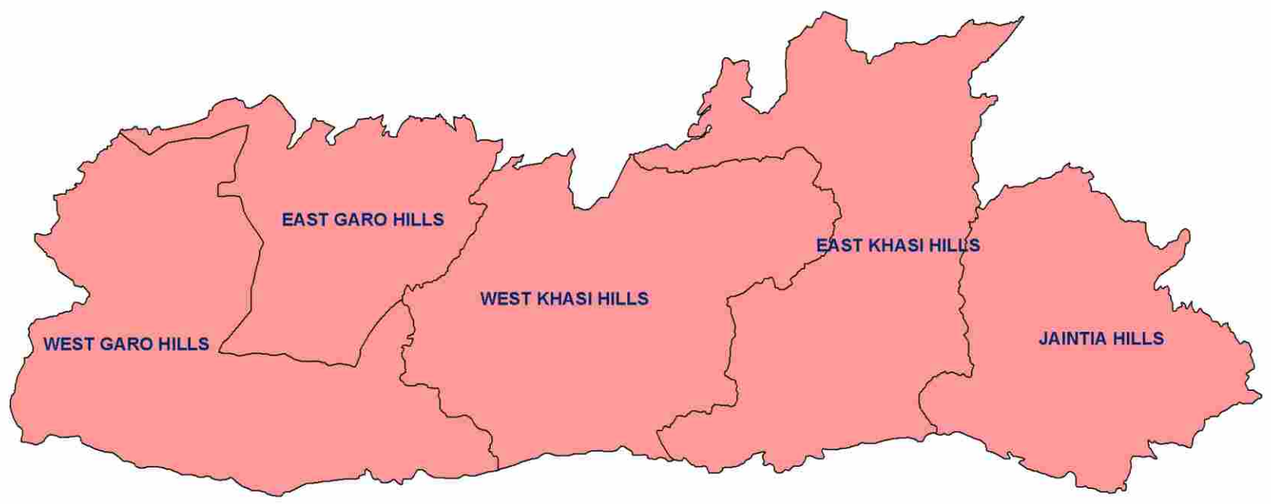
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3
7	3	2	2

Birbah lake, Umiam lake and Tasek lake are qualified to be declared as Ramsar sites (page 215).

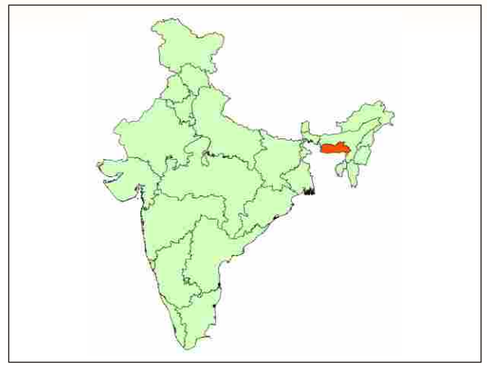


Anwaruddin Chaudhary

A profile of wetlands in Meghalaya



Aerial extent of wetland cover



Per cent geographic area under wetlands

- *0.0-0.5*
- *0.5-1.0*
- *1.0-1.5*
- *1.5-2.0*
- *>2.0*

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
EAST KHASI HILLS	5196	3.64	0.07
EAST GARO HILLS	2603	0.78	0.03
JAINTIA HILLS	3819	2.82	0.07
WEST GARO HILLS	5564	1.66	0.03
WEST KHASI HILLS	5247	3.67	0.07

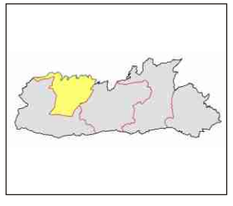
Maps not to scale

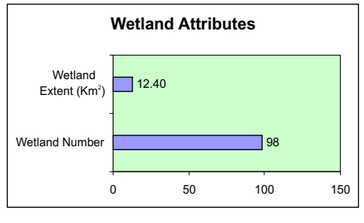
©SACON 2004

District - wise spatial distribution of wetlands



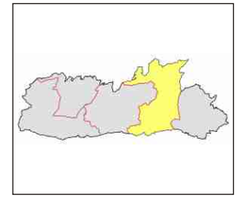
District East Garo Hills

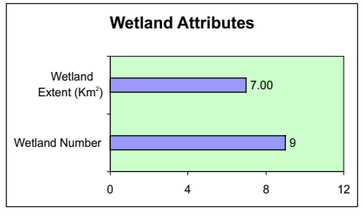


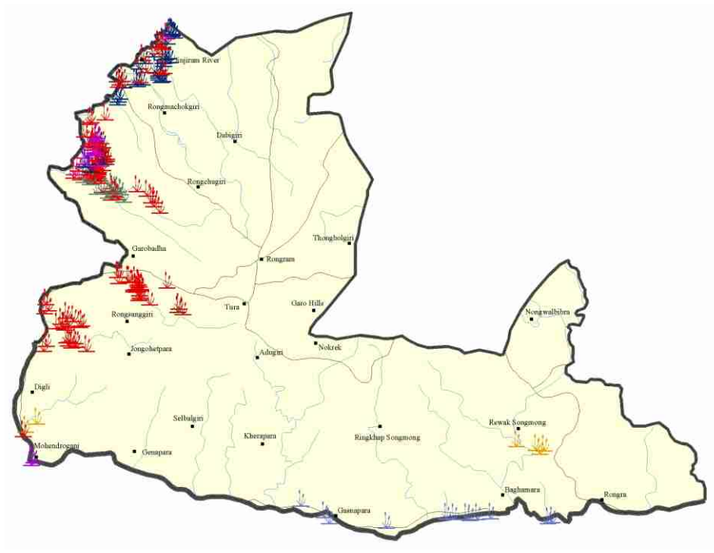




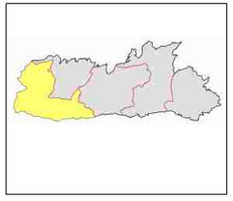
District East Khasi Hills

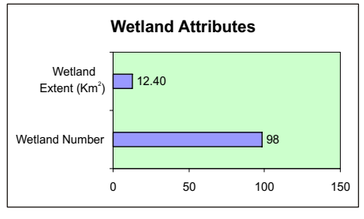


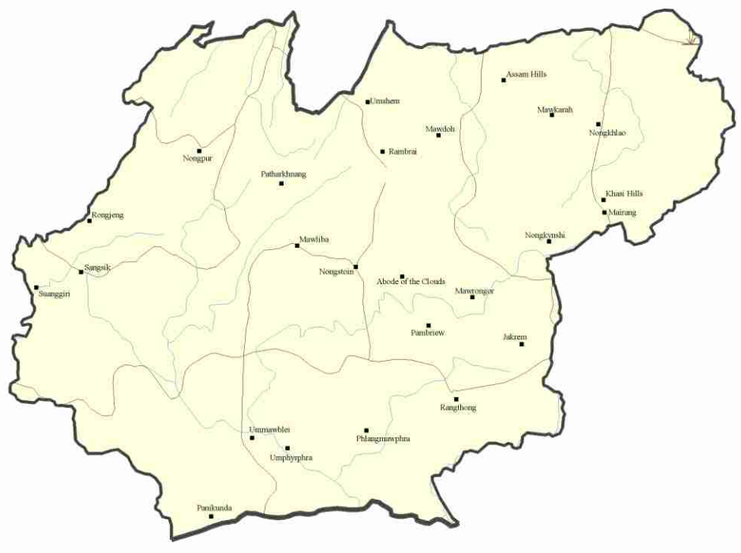




District West Garo Hills

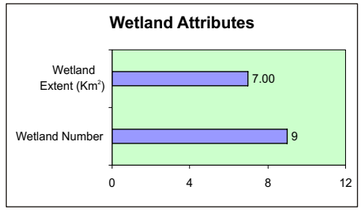






District West Khasi Hills





Source: Wetland point data; Space Applications Centre, Ahmedabad

Wetlands

Waterlogged (Seasonal, Low Turbidity) | Waterlogged (Seasonal, Moderate Turbidity) | Tanks (Low Turbidity) | Tanks (Moderate Turbidity)

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary

Maps not to scale

©SACON 2004

Prioritized inland wetlands of Meghalaya



Prioritized Wetland
- *Rank 1*
- *Rank 2*
- *Rank 3*

- *Important Bird Areas*
- *Wildlife Sanctuaries & National Parks*

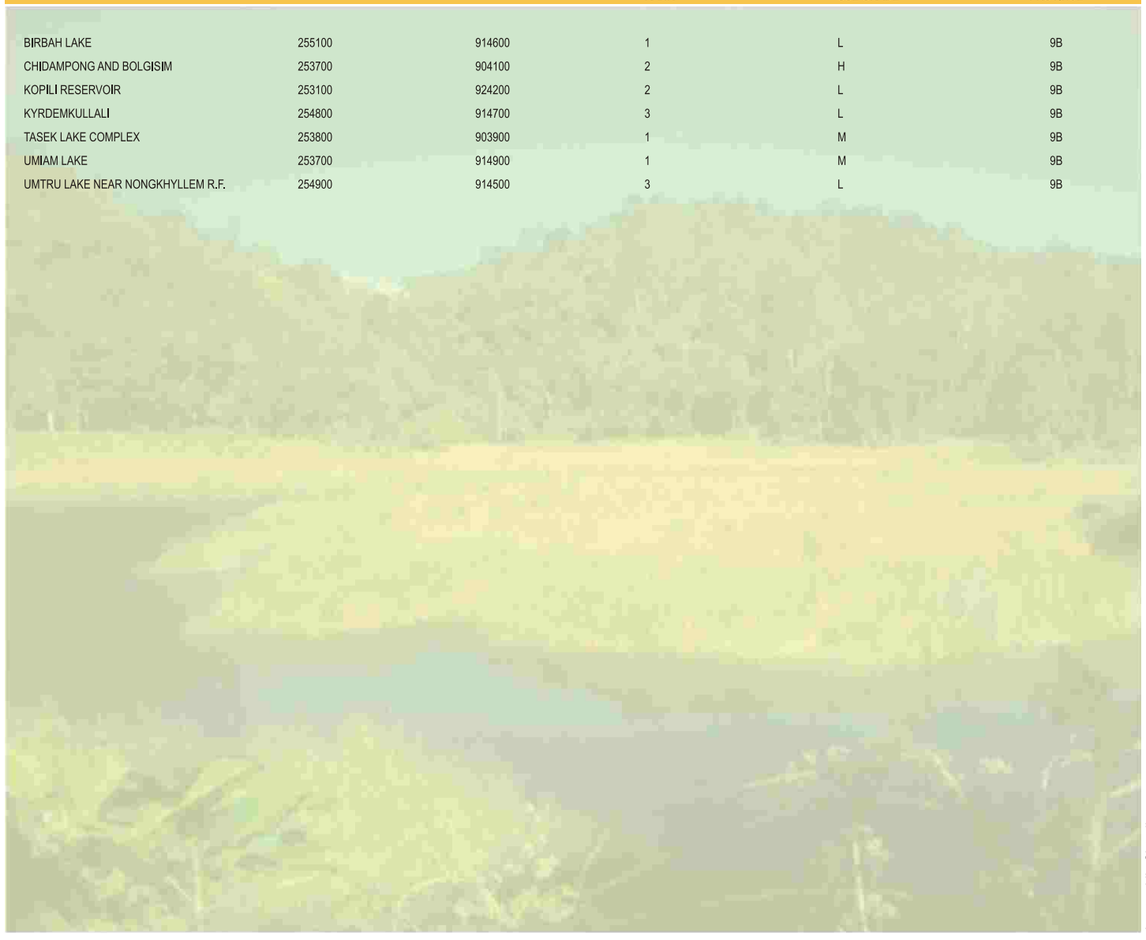
Biogeographic Provinces
- *9B, North East-North East Hills*
- *District Boundaries*

Maps not to scale

©SACON 2004

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Meghalaya

PRIORITIZED SITE	LATITUDE	LONGITUDE	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
BIRBAH LAKE	255100	914600	1	L	9B
CHIDAMPONG AND BOLGISIM	253700	904100	2	H	9B
KOPILI RESERVOIR	253100	924200	2	L	9B
KYRDEMKULLALI	254800	914700	3	L	9B
TASEK LAKE COMPLEX	253800	903900	1	M	9B
UMIAM LAKE	253700	914900	1	M	9B
UMTRU LAKE NEAR NONGKHYLLEM R.F.	254900	914500	3	L	9B



Anwaruddin Chaudhary

Note:-District name and nearest town is not available; L-Low,M-Medium,H-High.



B. Sinha

MIZORAM

MIZORAM

Habitat features

Mizoram does not have larger wetlands; the total area of wetlands of the size 2.25 ha and above is only 1.47 km^2 (SAC, 1998). The wetlands constitute 0.01% of the total geographic area of the state. Wetland distribution in three districts is given in page 122.

The state has three categories of lakes, namely valley lakes, tectonic/landslide lakes, and artificial reservoirs but except for one lake, all are insignificant.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	11	15	N.A.	N.A.
Turtles	N.A.	N.A.	2	1	N.A.	3	1
Birds	N.A.	N.A.	N.A.	N.A.	1	1	N.A.

Prioritized Sites

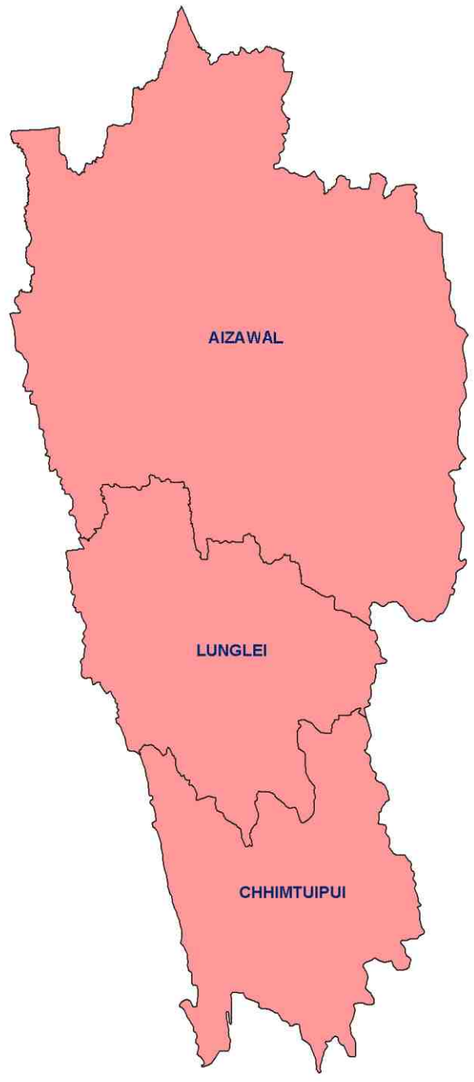
Number of Prioritized Wetlands	Rank 1	Rank 2
3	1	2

Palak dil qualifies to be declared as Ramsar site (page 215).

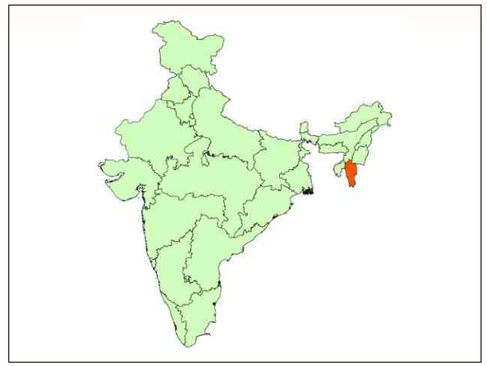


Anwaruddin Chaudhary

A profile of wetlands in Mizoram



Aerial extent of wetland cover



Per cent geographic area under wetlands

- 0.0-0.5
- 0.5-1.0
- 1.0-1.5
- 1.5-2.0
- >2.0

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AIZAWAL	3576	1.27	0.0355
CHHIMTUIPUI	3957	0.18	0.0045
LUNGLEI	4538	0.02	0.0004

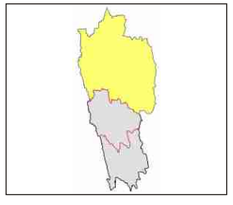
Maps not to scale

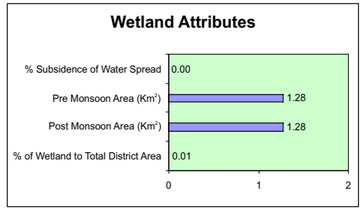
©SACON 2004

District - wise spatial distribution of wetlands



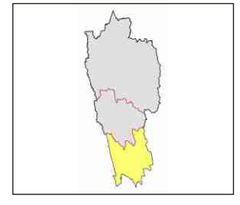
District Aizawal

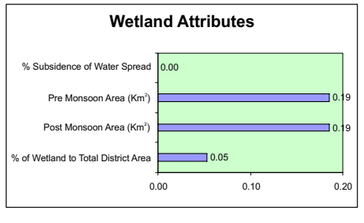






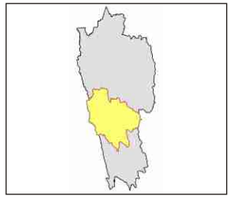
District Chhimtuipui

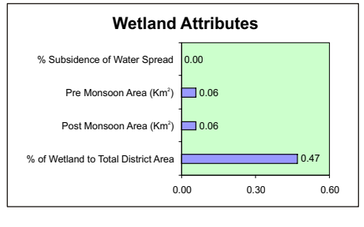






District Lunglei







Anwaruddin Chaudhary

Source: Wetland point data; Space Applications Centre, Ahmedabad

Wetlands

Lakes/Ponds
Lakes/Ponds (Low Turbidity, Aquatic Vegetation)
Waterlogged (Seasonal, Low Turbidity)
Waterlogged (Seasonal, Low Turbidity,)
Waterlogged (Seasonal, Low Turbidity,)
Tanks (Low Turbidity, Aquatic Vegetation)
Lakes/Ponds
Lakes/Ponds (Low Turbidity, Aquatic Vegetation)
Waterlogged (Seasonal)
Waterlogged (Seasonal, Low Turbidity, Aquatic Vegetation)
Tanks (Low Turbidity, Aquatic Vegetation)
Rivers/Streams
Cities/Towns/Villages
Railways
Roads
International Boundary
State Boundary
District Boundary
Taluk Boundaries

Maps not to scale

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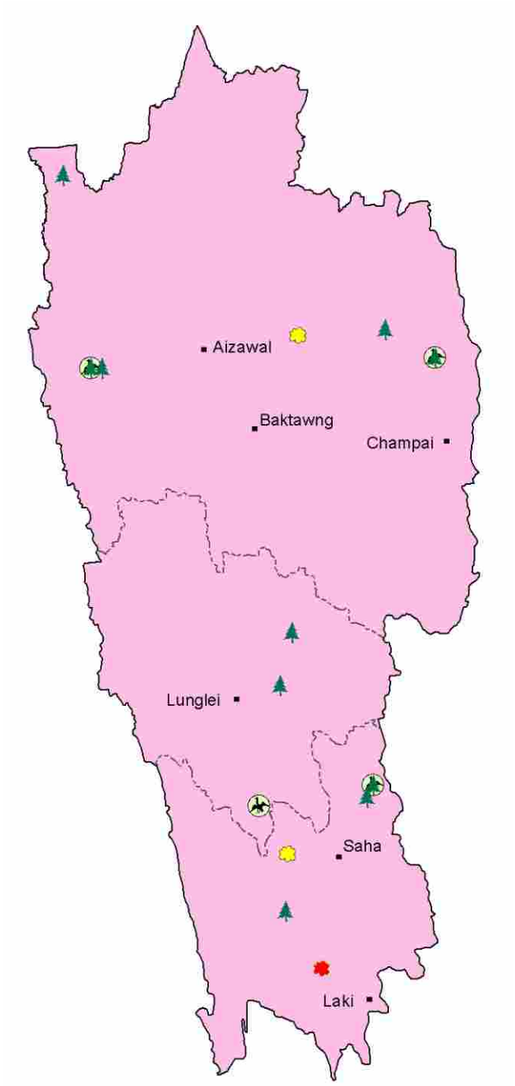
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Prioritized inland wetlands of Mizoram



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Important Bird Areas*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *9B, North East-North East Hills*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Mizoram

PRIORITIZED SITE	LATITUDE	LONGITUDE	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
MAMPUI DIL	223000	925000	2	M	9B
PALAK DIL	221300	925400	1	M	9B
TAM DIL	234500	925800	2	M	9B

Anwaruddin Chaudhary

Note:-District name and nearest town is not available; M-Medium.

Maps not to scale

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B. Sinha

NAGALAND

NAGALAND

Habitat features

In Nagaland only a small portion of the geographic area is covered by wetland; those in the size of 2.25 ha and above cover about 9.18 km^2. Thus, 0.01 % of the total area of the state is under wetland (SAC, 1998). Wetland distribution in three districts is given in page 125.

Apart from waterlogged wetlands, swamps and tanks, the state has three categories of lakes, oxbow lakes or cut-off meanders, tectonic/ landslide lakes, and artificial reservoirs.The largest natural lake is Shilloi in Phek district.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	18	22	N.A.	N.A.
Turtles	N.A.	N.A.	1	N.A.	N.A.	1	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	1	N.A.	N.A.

Prioritized Sites

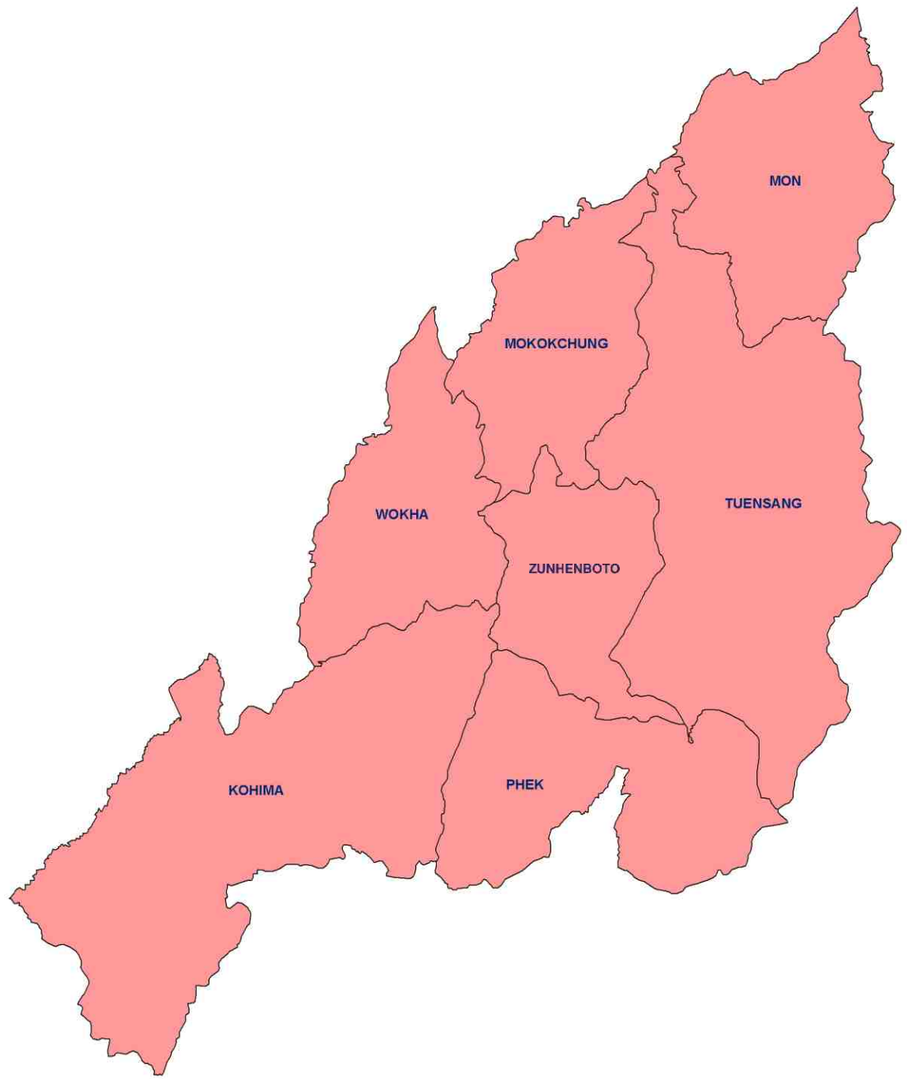
Number of Prioritized Wetlands	Rank 1	Rank 2
3	2	1

All the three wetlands are qualified to be declared as Ramsar sites (page 215).

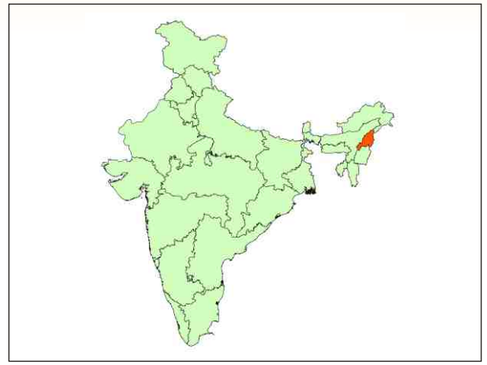


Anwaruddin Chaudhary

A profile of wetlands in Nagaland



Aerial extent of wetland cover



Per cent geographic area under wetlands

- 0.0-0.5
- 0.5-1.0
- 1.0-1.5
- 1.5-2.0
- >2.0

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT AREA (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
KOHIMA	3114	7.57	0.24
MOKOKCHUNG	1615	0.78	0.05
MON	1786	N.A	0.00
PHEK	2026	N.A	0.00
TUENSANG	4228	N.A	0.00
WOKHA	1628	0.83	0.05
ZUNHENBOTO	1255	N.A	0.00

Maps not to scale

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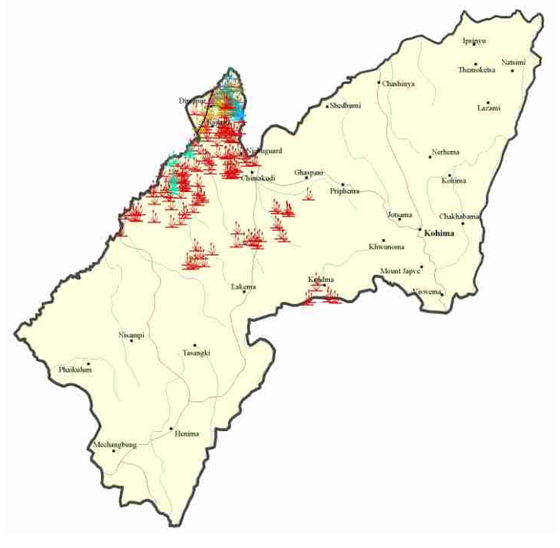
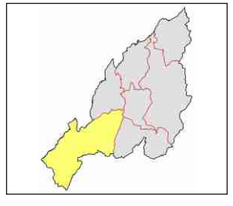
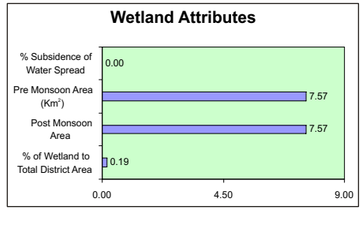
District - wise spatial distribution of wetlands



District Kohima

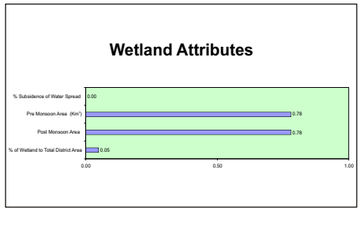






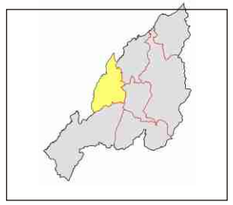
District Mokokchung

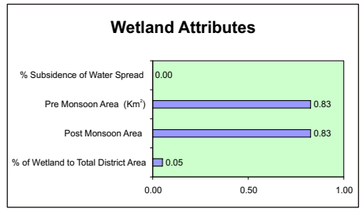






District Wokha







B. Pandav

Wetlands

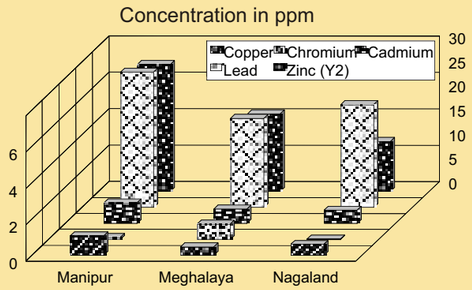
Ox-Bow Lakes (Aquatic Vegetation) | Ox-Bow Lakes (Moderate Turbidity) | Waterlogged (Seasonal) | Waterlogged (Seasonal, Other Vegetation) | Playas (Low Turbidity) | Swamp/Marsh | Tanks (Low Turbidity) | Waterlogged (Aquatic Vegetation)

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary

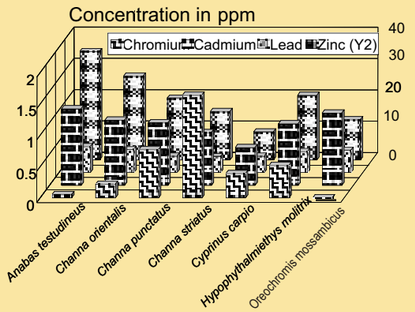
Source: Wetland point data; Space Applications Centre, Ahmedabad

Maps not to scale

©SACON 2004



Heavy metal contamination among select wetlands



Heavy metal contamination in select species of fishes



E. Barucha

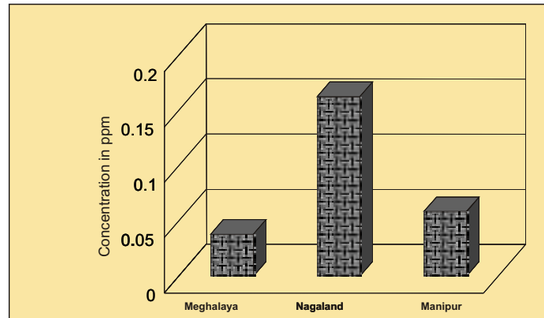
Attributes of wetlands and environmental contamination in three North - Eastern States

Heavy Metals

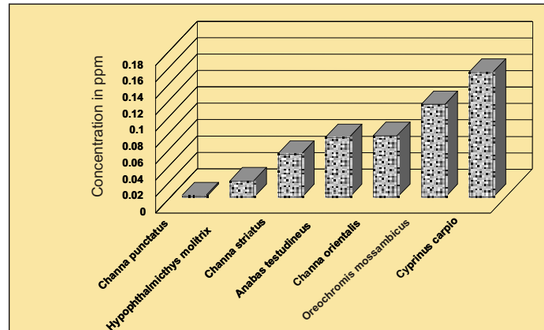
Among the three wetlands examined, Loktak lake of Manipur has the highest concentrations of all metals. Among the seven species studied, *Anabas testudineus* has the maximum concentrations of lead, zinc and cadmium. The levels of copper appear to fall within the tolerable limits. Significant variation in contamination is observed for lead and zinc among wetlands. However, among species variation is discernible only in *Hypothalmicthys molitrix* and *Channa punctatus*. Loktak Lake of Manipur and Umiam Lake of Meghalaya receive domestic sewage and industrial effluents from the small-scale industries located nearby. Further, they also receive agricultural leachate containing pesticides and fertilizers.

Pesticides

Fishes from the wetlands of the North Eastern states have a lower load of organochlorine residues than those from the other states, particularly Assam, Gujarat and Bihar. Pesticide consumption is found to be 29, 11 and 9 mt/Yr in Manipur, Meghalaya and Nagaland respectively. HCH is quite prevalent followed by heptachlor epoxide and DDT. Among the three states, fishes from Nagaland have a higher load. Of the seven species of fishes analyzed, *Cyprinus carpio* is the most contaminated in terms of total organochlorine residues followed by *Oreochromis mossambicus*. Less contaminated fishes are *Hypophthalmicthys molitrix* and *Channa punctatus*.



Total organochlorine residues among select wetlands



Total organochlorine residues among various species of fishes



Anwaruddin Chaudhary Sinha

Maps not to scale

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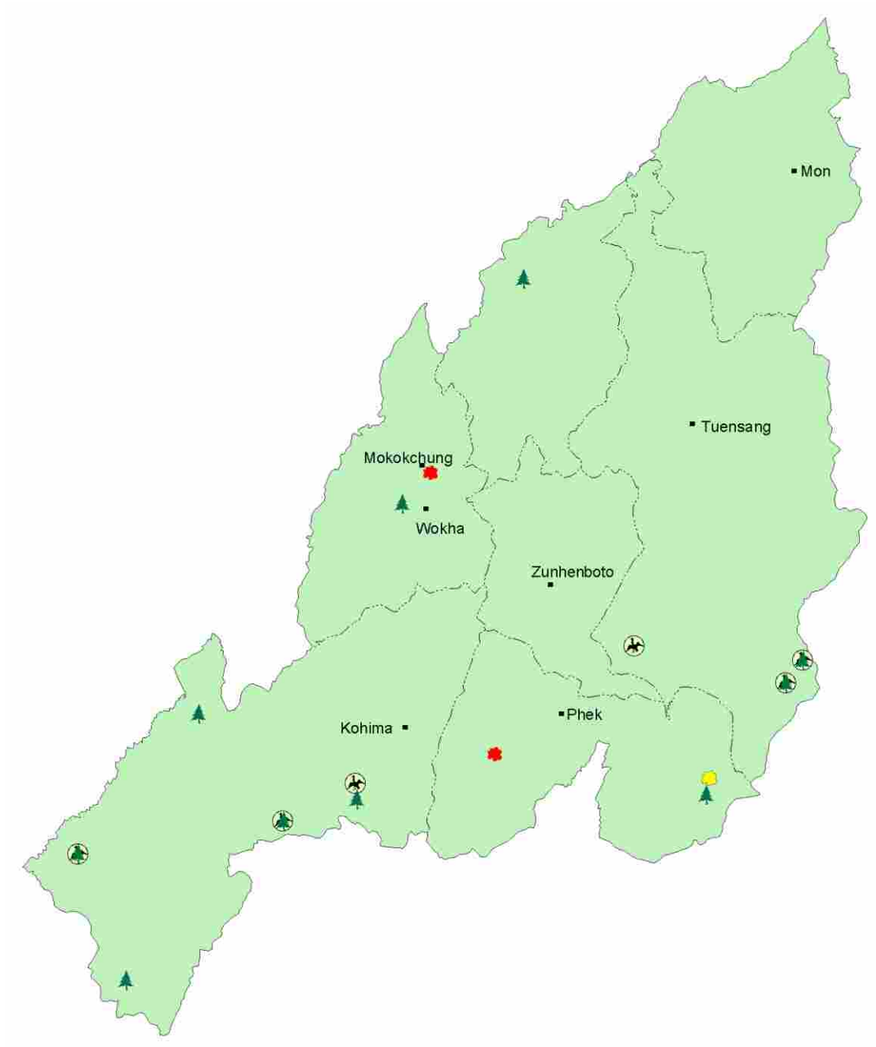
Prioritized inland wetlands of Nagaland



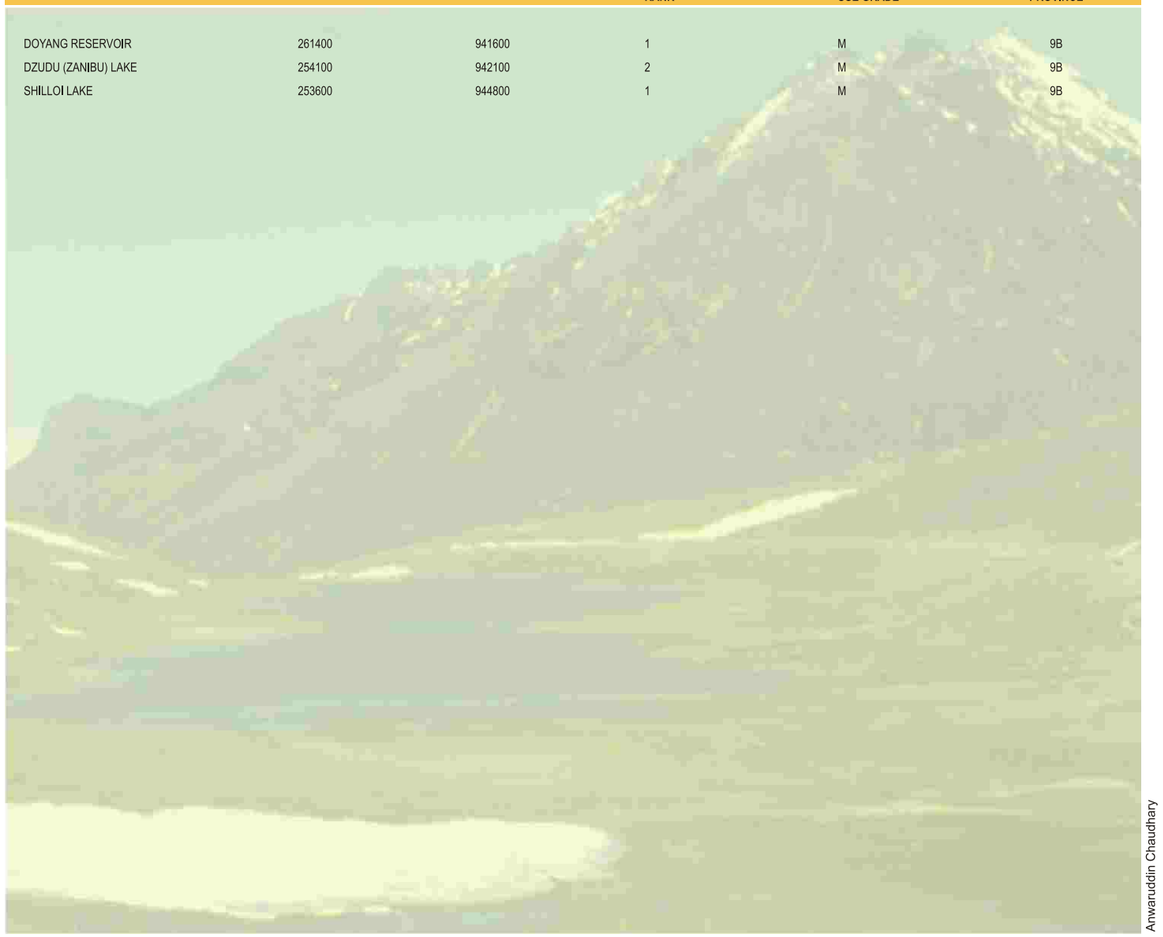
Prioritized Wetland
- *Rank 1*
- *Rank 2*

- *Important Bird Areas*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces
- *9B, North East-North East Hills*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Nagaland

PRIORITIZED SITE	LATITUDE	LONGITUDE	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
DOYANG RESERVOIR	261400	941600	1	M	9B
DZUDU (ZANIBU) LAKE	254100	942100	2	M	9B
SHILLOI LAKE	253600	944800	1	M	9B



Anwaruddin Chaudhary

Note:-District name and nearest town is not available; M-Medium.

Maps not to scale

©SACON 2004



B.C. Chaudhary

ORISSA

Habitat features

Orissa has 234 inland wetlands of the size 56.25 ha and above, covering a total area of 1627.75 km^2 (ORSAC,1996 & SAC,1998).Thus, the wetlands constitute 1.05% of the total geographic area of the state.

88.8% of the total area is covered by 86 reservoirs. There are 148 lakes/ponds, waterlogged, marsh areas and tanks covering only 181.7 km^2.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	6	N.A.	N.A.	N.A.	N.A.	N.A.	
Fishes	N.A.	1	6	15	22	N.A.	
Turtles	N.A.	N.A.	2	3	N.A.	3	
Birds	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	

Prioritized Sites

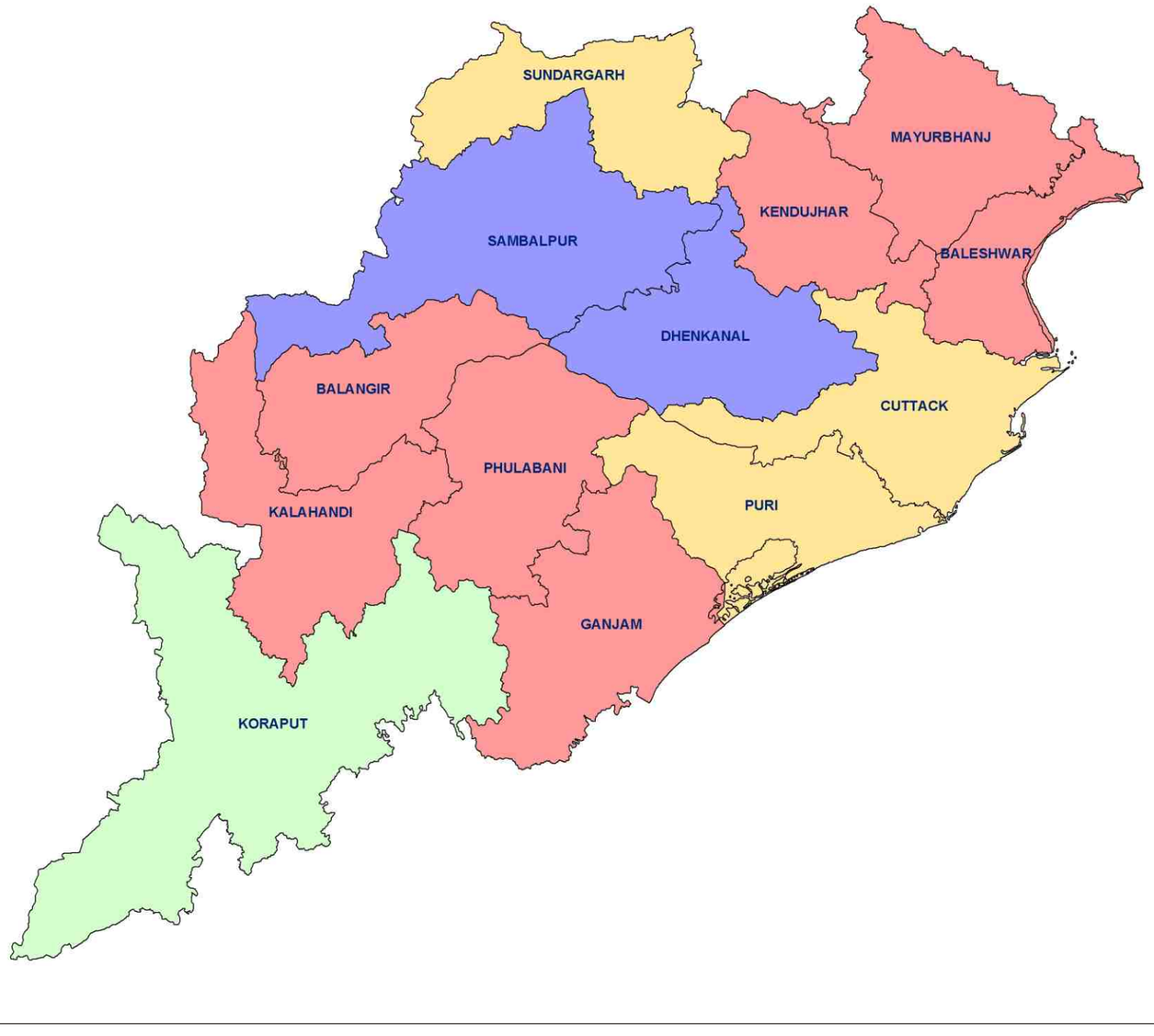
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3
7	4	1	2

Four wetlands in Orissa are qualified to be declared as Ramsar sites (page 215).

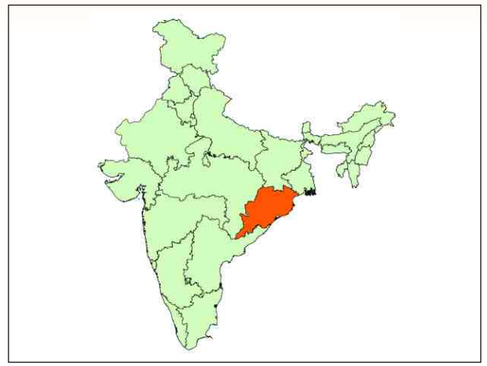


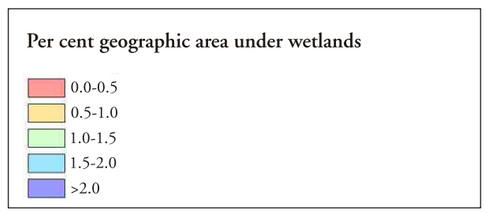
V.S. Vijayan

A profile of wetlands in Orissa



Aerial extent of wetland cover





DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BOLANGIR	6575.00	8.26	0.13
BALESHWAR	8955.00	38.77	0.43
CUTTACK	8499.00	48.82	0.57
DHENKANAL	10872	256.81	2.36
GANJAM	12531.00	52.20	0.42
KALAHANDI	11772.00	18.20	0.15
KENDUJHAR	8303.00	37.77	0.45
KORAPUT	26962.00	356.25	1.32
MAYURBHANJ	10418.00	26.71	0.26
PHULBANI	11119.00	4.91	0.04
PURI	10182.00	69.61	0.68
SAMBALPUR	15434.00	646.50	4.19
SUNDARGARH	9712.00	62.65	0.65

Maps not to scale

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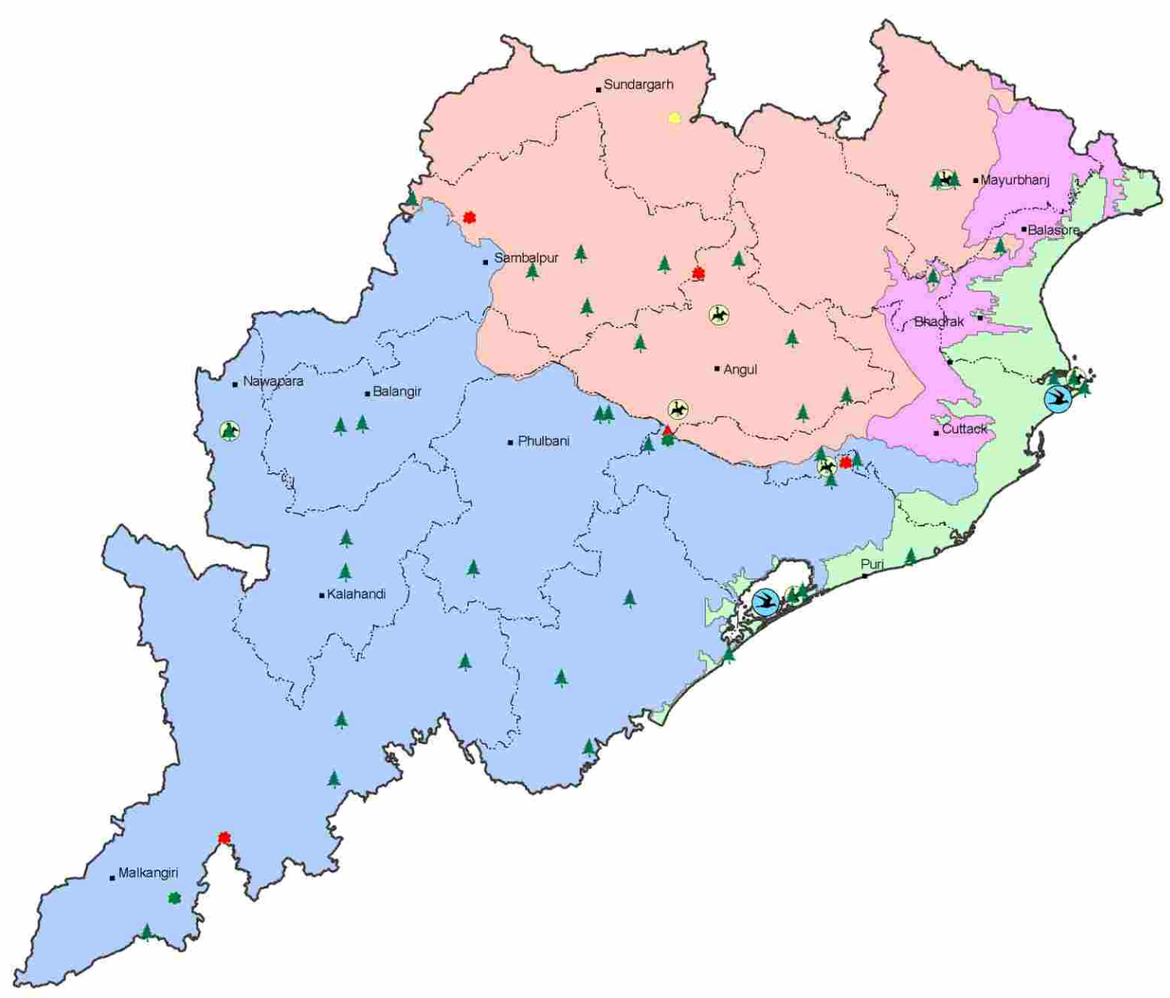
Prioritized inland wetlands of Orissa



Prioritized Wetland
- *Rank 1*
- *Rank 2*
- *Rank 3*

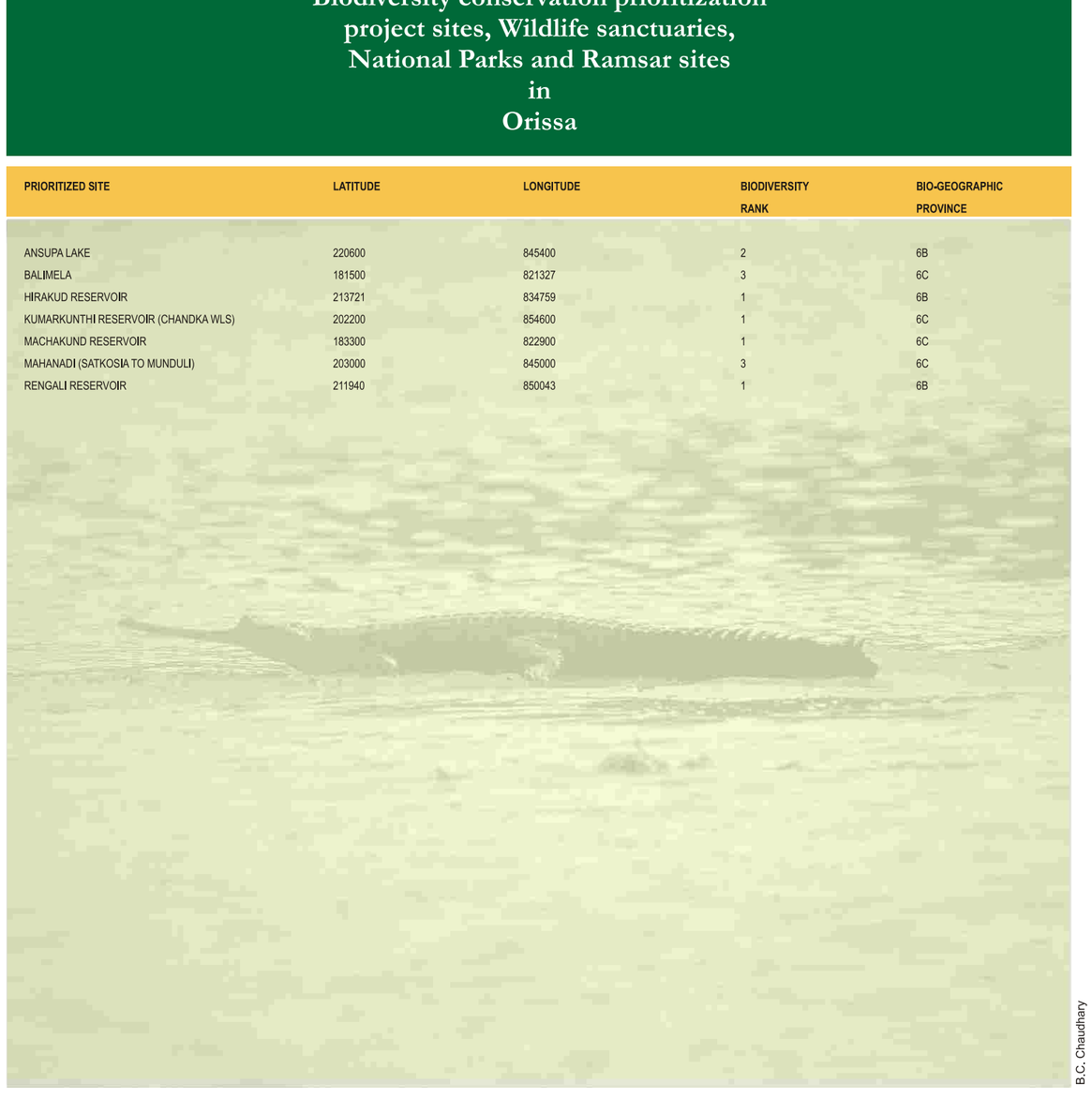
- *BCPP Sites*
- *Important Bird Areas*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces
- *6B, Deccan Peninsula-Chota Nagpur*
- *6C, Deccan Peninsula-Eastern Highlands*
- *7B, Gangetic Plain-Lower Gangetic Plain*
- *8B, Coasts-East Coast*

- *District Boundaries*
- *Ramsar site*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Orissa

PRIORITIZED SITE	LATITUDE	LONGITUDE	BIODIVERSITY RANK	BIO-GEOGRAPHIC PROVINCE
ANSUPA LAKE	220600	845400	2	6B
BALIMELA	181500	821327	3	6C
HIRAKUD RESERVOIR	213721	834759	1	6B
KUMARKUNTHI RESERVOIR (CHANDKA WLS)	202200	854600	1	6C
MACHAKUND RESERVOIR	183300	822900	1	6C
MAHANADI (SATKOSIA TO MUNDULI)	203000	845000	3	6C
RENGALI RESERVOIR	211940	850043	1	6B



B.C. Chaudhary

Note:-District name, nearest town and socio-economic use grade is not available/Data Deficient.

Maps not to scale

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V.S. Vijayan

Habitat features

The total number of wetlands above 2.25 ha. is estimated at 1821, covering 718.75 km^2 (PRSC,1997& SAC,1998). The wetlands constitute 1.34% of the total geographic area of the state. Wetland distribution in twelve districts is given in pages 131 to 133.

The state has seven different types of wetlands ranging from oxbow lakes to lakes/ponds and reservoirs.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	7	8	15	N.A.	N.A.
Turtles	N.A.	1	1	3	N.A.	2	1
Birds	N.A.	N.A.	N.A.	N.A.	4	2	N.A.

Prioritized Sites

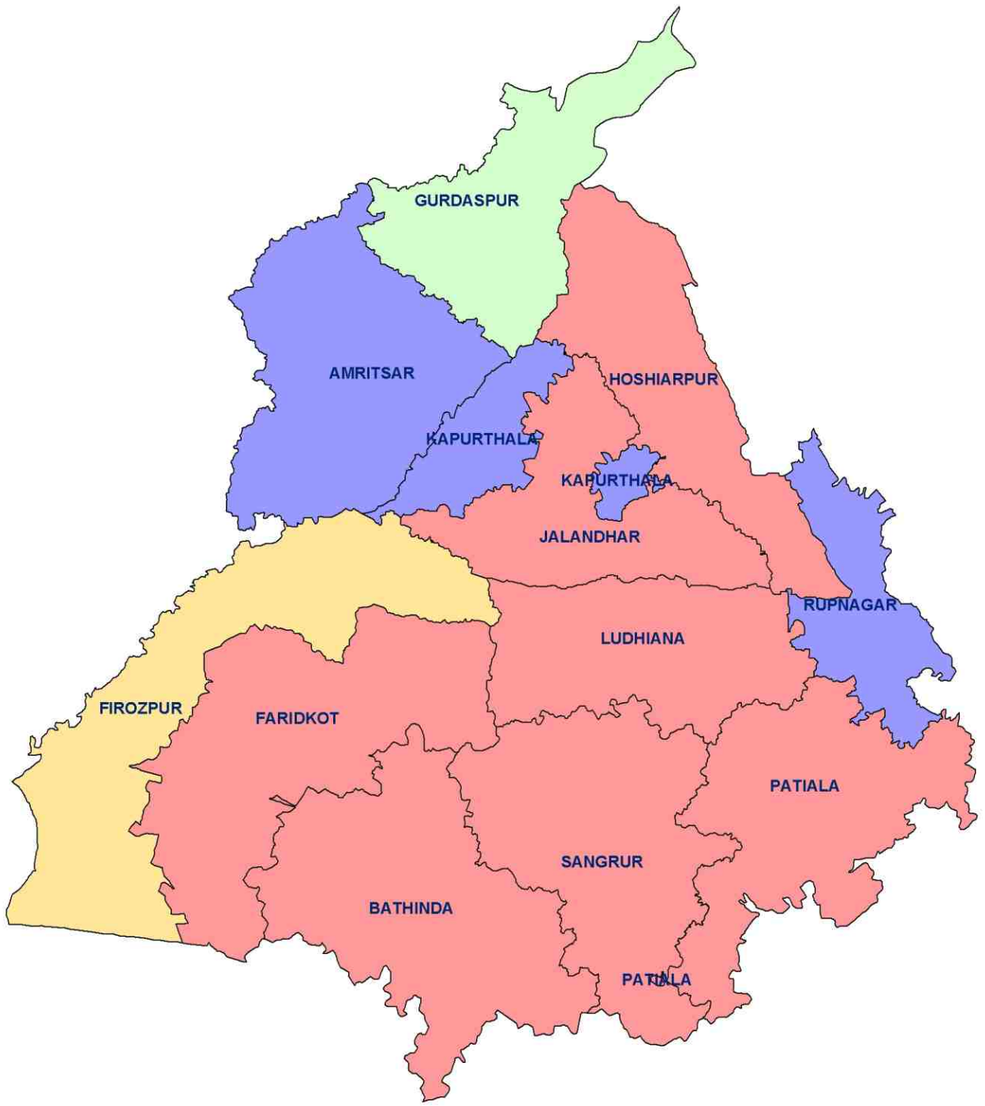
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3
13	3	5	5

Maru Buchia, Tajpur Khoje and Shikar Machia are qualified to be declared as Ramsar sites (page 215).

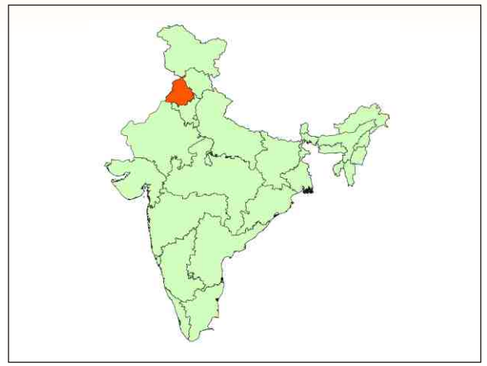


Parasarya

A profile of wetlands in Punjab



Aerial extent of wetland cover



Per cent geographic area under wetlands

- 0.0-0.5
- 0.5-1.0
- 1.0-1.5
- 1.5-2.0
- >2.0

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AMRITSAR	5094.00	335.07	6.58
BHATINDA	5551.00	14.64	0.26
FARIDKOT	6300.00	8.28	0.13
FEROZPUR	5300.00	40.66	0.77
GURDASPUR	3569.00	49.78	1.39
HOSHIARPUR	3364.00	7.81	0.23
JALANDHAR	3900.00	8.94	0.23
KAPURTHALA	1633.00	60.74	3.72
LUDHIANA	3767.00	5.48	0.15
PATIALA	3627.00	4.84	0.13
RUPNAGAR	3236.00	127.43	3.94
SANGRUR	5021.00	11.30	0.23

Maps not to scale

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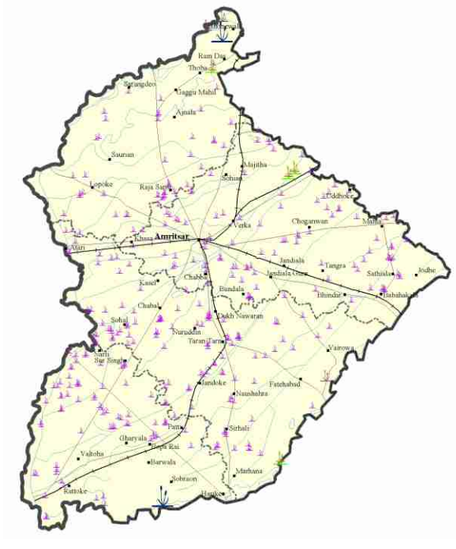
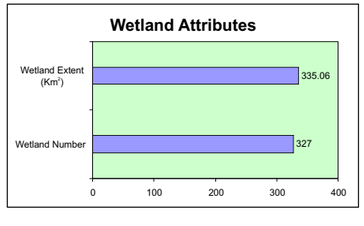
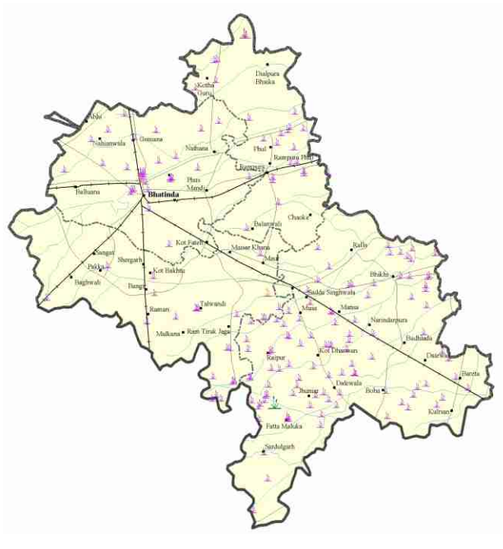
District - wise spatial distribution of wetlands



District Amritsar

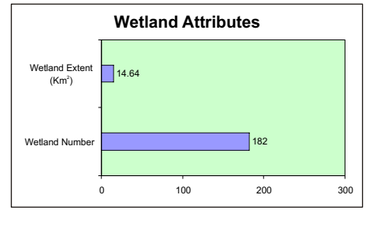






District Bhatinda






Faridkot
Bhalur
Bhagha Purana
Bhagta Bhai Ka
Bhuchchon Kalan
Bilaspur
Chanarwala
Chandi Wala
Chandi Wala Jattan
Chandi Wala Jattan Bhagta Bhai Ka
Chandi Wala Jattan Bhagta Bhai Ka Bhuchchon Kalan
Chandi Wala Jattan Bhagta Bhai Ka Bhuchchon Kalan Bilaspur
Chandi Wala Jattan Bhagta Bhai Ka Bhuchchon Kalan Bilaspur Chak Mahun
Chandi Wala Jattan Bhagta Bhai Ka Bhuchchon Kalan Bilaspur Chak Mahun Dhilwan
Chandi Wala Jattan Bhagta Bhai Ka Bhuchchon Kalan Bilaspur Chak Mahun Dhilwan Dhuddi
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Chandi Wala Jattan Bhagta Bhai Ka Bhuchchon Kalan Bilaspur Chak Mahun Dhilwan Dhuddi Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd Dhuddi Kalan Dhuddi Khurd
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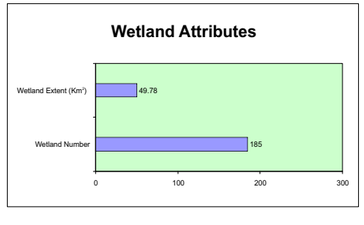
District - wise spatial distribution of wetlands



District Gurdaspur

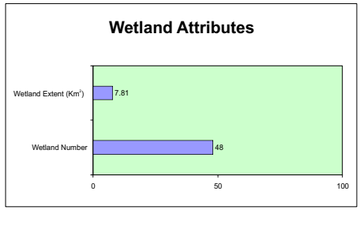


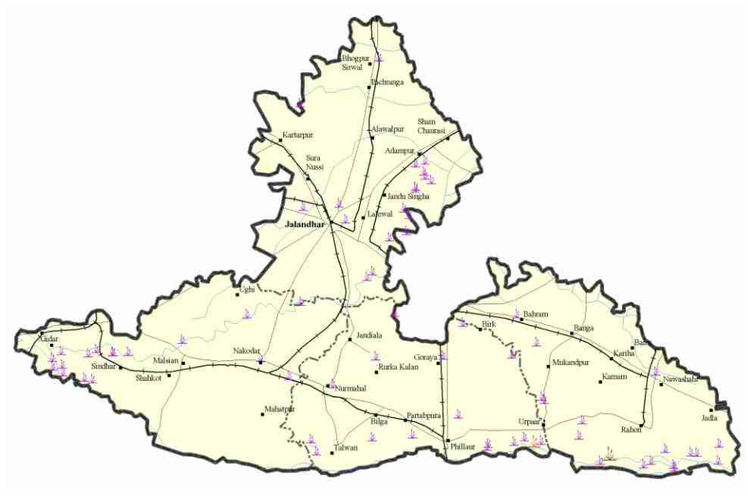




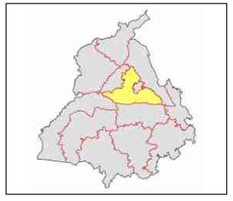
District Hoshiarpur

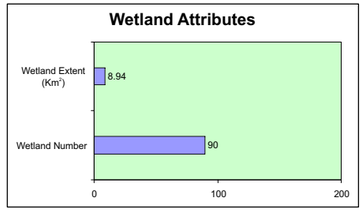


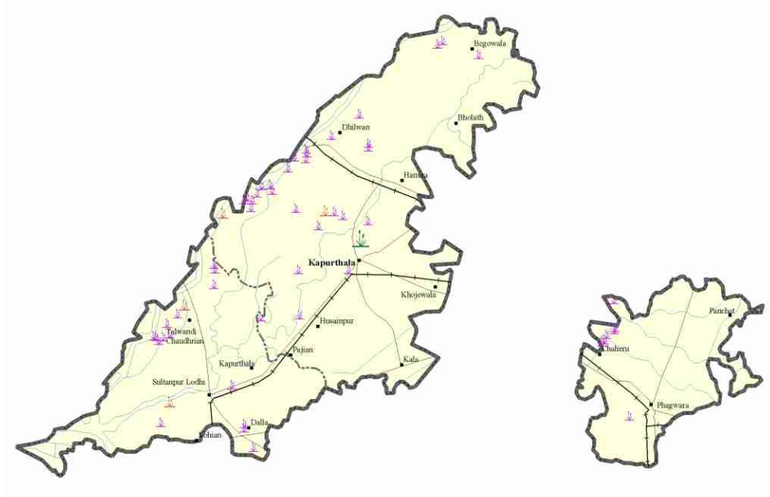




District Jalandhar

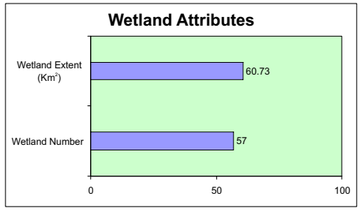






District Kapurthala





Wetlands

- Area >= 500 ha
- Area >= 400 ha and <500 ha
- Area >= 300 ha and < 400 ha
- Area >= 200 ha and < 300 ha
- Area >= 100 ha and < 200 ha
- Area >= 56 ha and < 100 ha
- Area <= 56 ha
- Rivers/Streams
- Cities/Towns/Villages
- Railways
- Roads
- International Boundary
- State Boundary
- District Boundary
- Taluk Boundaries

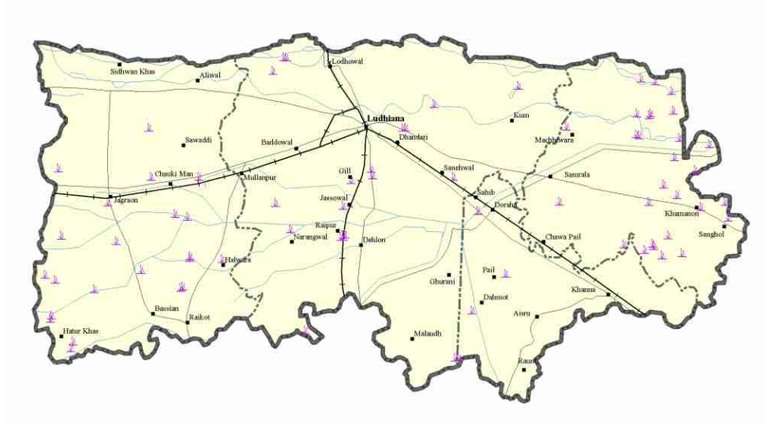
Source: Wetland point data; Punjab Remote Sensing Applications Centre, Ludhiana

Maps not to scale

©SACON 2004

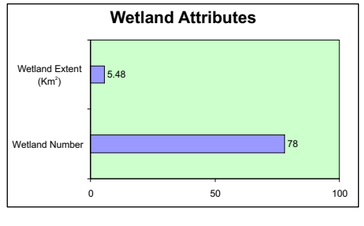
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

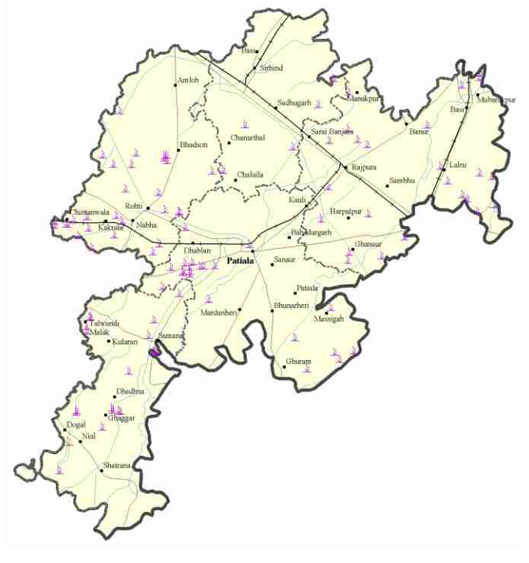
District - wise spatial distribution of wetlands





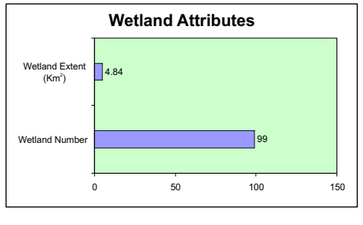
District Ludhiana

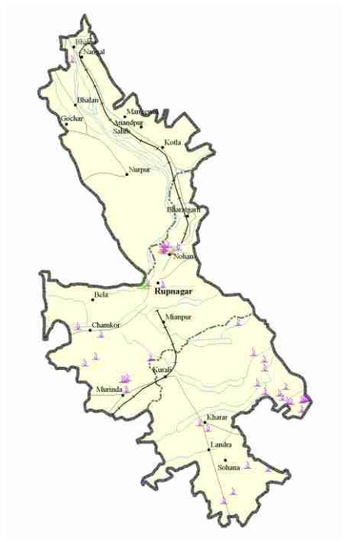




District Patiala

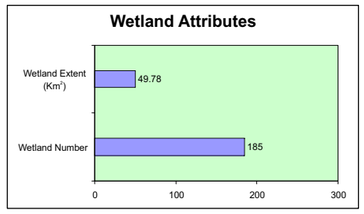


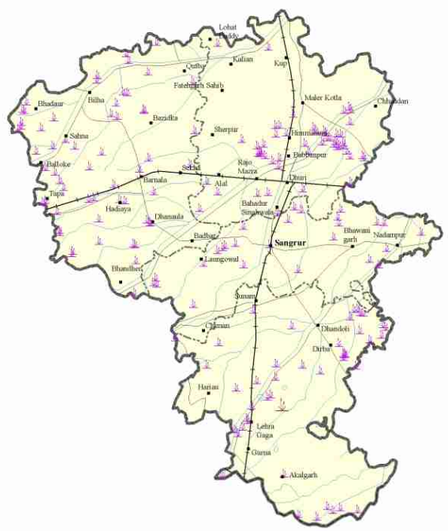






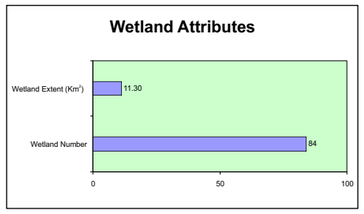
District Rupnagar





District Sangrur





Wetlands

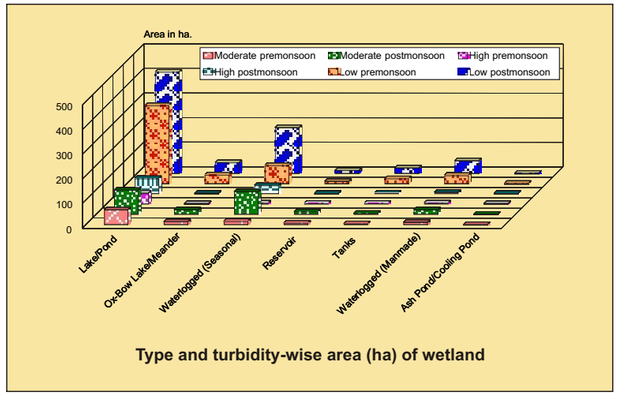
Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

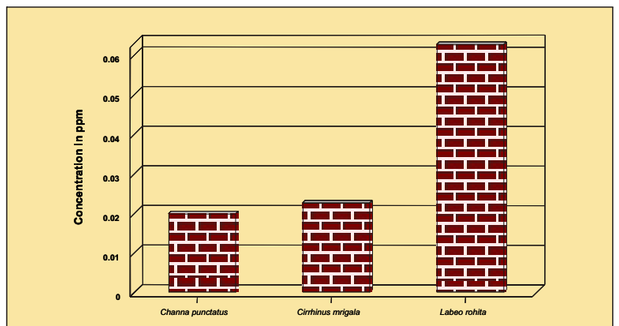
Source: Wetland point data; Punjab Remote Sensing Applications Centre, Ludhiana

Maps not to scale

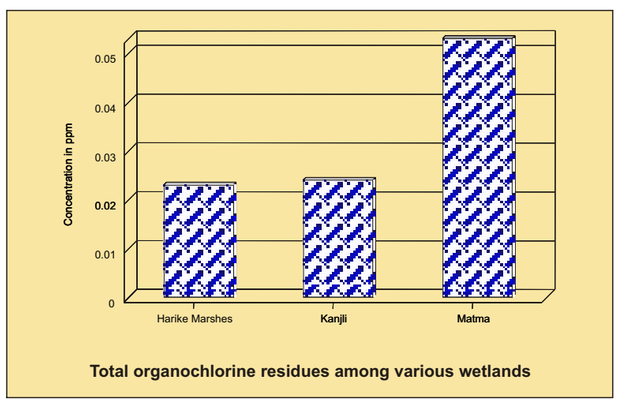
©SACON 2004



Type and turbidity-wise area (ha) of wetland



Total organochlorine residues among various species of fishes



Total organochlorine residues among various wetlands

Attributes of wetlands and environmental contamination

Heavy metals

Among the three wetlands studied, namley Harike, Kanjili and Matma, the fishes collected from Kanjili have the maximum concentrations of all metals. Moreover, level of lead and zinc are also comparatively high.The contamination level among wetlands is significant for all the metals except for chromium and cadmium. Between the two species examined, *Cirrhinus mrigala* has higher concentrations of lead, cadmium and chromium, than those in *Labeo rohita*.

Pesticides

Among the three wetlands, Matma of Gurdaspur district has the maximum load of total organochlorine residues followed by Kanjili of Kapurthala district and Harike marshes of Ferozepur district. Among the three species of fishes analyzed, *Labeo rohita* has the maximum concentration of pesticide residues followed by *Cirrhinus mrigala* and *Channa punctatus*. Almost all the fishes are contaminated with endosulfan and HCH.The annual pesticide consumption in Punjab (7076 mt) is comparatively higher than in other states, which might be responsible for the decline (40%) in fish harvest, reported over the last 5-6 years.

B.C. Chaudhary



Acharya



Acharya

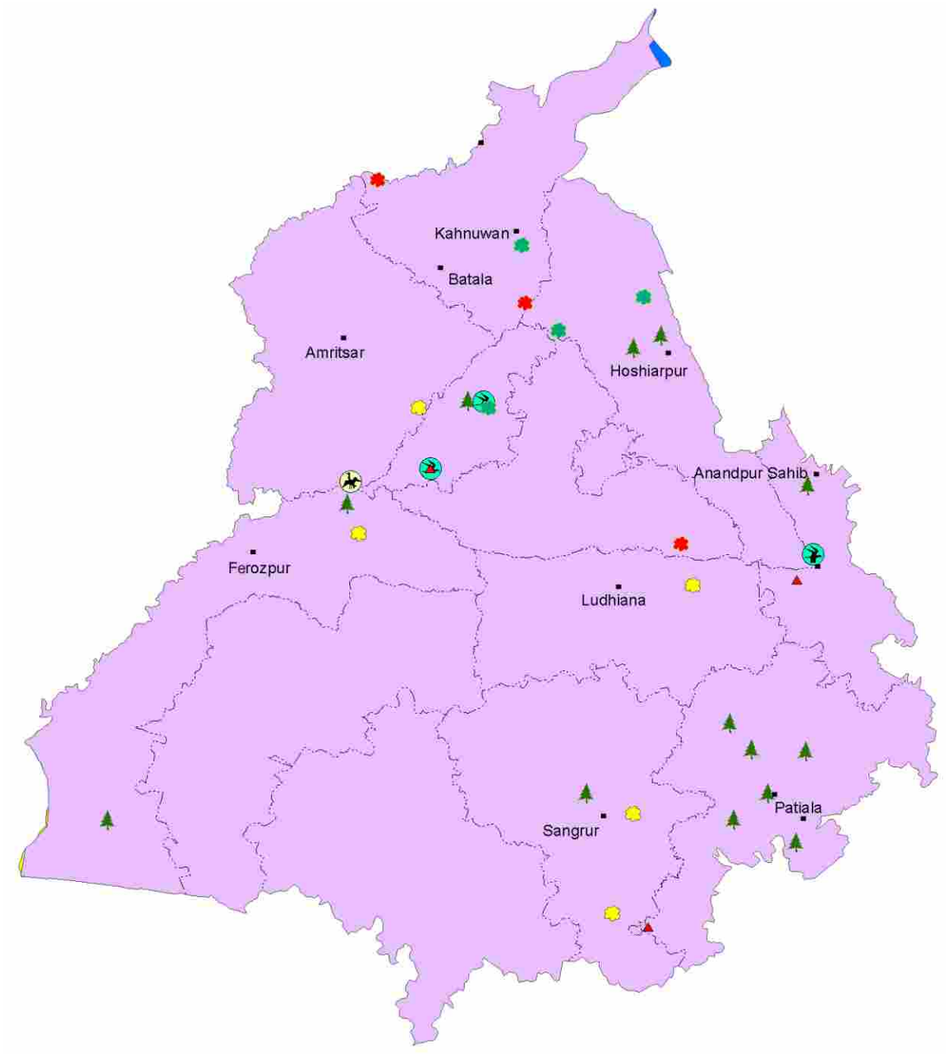


B. Sinha

Maps not to scale

©SACON 2004

Prioritized inland wetlands of Punjab



Prioritized Wetland
- *Rank 1*
- *Rank 2*
- *Rank 3*

- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*
- *Ramsar Site*

Biogeographic Provinces
- *2A, Himalaya-North West Himalaya*
- *3A, Desert Thar*
- *4A, Semi Arid Punjab Plains*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Punjab

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
MARU BUCHIA	GURDASPUR	314230	752930	HARGOBINDPUR	1	H	4A
SHIKAR MACHIA	GURDASPUR	320240	745820	BATALA	1	M	4A
MAKHU	FEROZPUR	310110	745500	HARIKE	2	H	4A
RAJGARH	LUDHIANA	305445	760850	MACHHIWARA	2	M	4A
RAMGARH SANDHUWAN	SANGRUR	295105	755230	SUNAN	2	L	4A
DHOLBAHA	HOSHIARPUR	314430	755330	HARIYANA	3	M	4A
ZAHURA JHEEL	HOSHIARPUR	313800	753630	TANDA	3	M	4A



B. Pandav

Note:- In Tajpur Khoje, Mundi morh, Thermal Power Plant, Kanjili, Kahnuwan Chhamb and Kehshopur information is not available; L-Low,M-Medium, H-High.

Maps not to scale

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RAJASTHAN

RAJASTHAN

Habitat features

Rajasthan has 1054 wetlands of the size 56.25 ha and above, covering a total area of 3449.64 km^2 (SRSAC & SAC, 1998). The wetlands constitute 1.01% of the total geographic area of the state. Wetland distribution in twenty-six districts is given in pages 137 to 143.

In the thirteen districts of the state, assessed by SACON, 2135 wetlands of the size two ha and above, covering 861.54 km^2 area have been reported. These are shown in pages 144 to156. Half of the wetlands have low turbidity while most of the wetlands have low vegetation according to satellite imageries.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	9	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	13	17	N.A.	N.A.
Turtles	N.A.	1	2	4	N.A.	3	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	6	7	N.A.

Prioritized Sites

Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
47	8	9	9	21

The first eight prioritized sites are potential Ramsar sites (page 215).

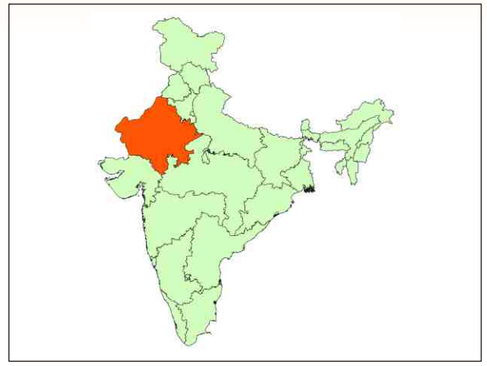


S.A. Hussain

A profile of wetlands in Rajasthan



Aerial extent of wetland cover



DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AJMER	8481.00	160.80	1.90
ALWAR	8380.00	48.75	0.58
BANSWARA	5037.00	123.24	2.45
BARMER	28387.00	210.24	0.74
BHARATPUR	5066.00	48.37	0.95
BHILWARA	10455.00	186.22	1.78
BIKANER	27284.00	17.26	0.06
BUNDI	5550.00	92.04	1.6
CHITTAURGARH	10856.00	287.47	2.65
CHURU	16830.00	16.58	0.10
DHAULPUR	3033.00	52.64	1.74
DUNGARPUR	3770.00	34.71	0.92
GANGANAGAR	20634.00	83.07	0.40
JAIPUR	14575.00	246.31	1.69
JAISALMER	38428.00	212.20	0.55
JALOR	10640.00	385.52	3.62
JHALAWAR	6219.00	35.88	0.58
JHUNJHUNUN	5928.00	3.90	0.07.
JODHPUR	22783.00	119.73	0.53
KOTA	11856.94	35.88	0.30
NAGAUR	17718.00	208.94	1.18
PALI	12387.00	189.93	1.53
SAWAI MADHOPUR	10022.00	162.01	1.62
SIKAR	7732.00	9.86	0.13
SIROHI	5136.00	45.24	0.88
TONK	7194.00	176.62	2.46
UDAIPUR	17279.00	108.81	0.6

Maps not to scale

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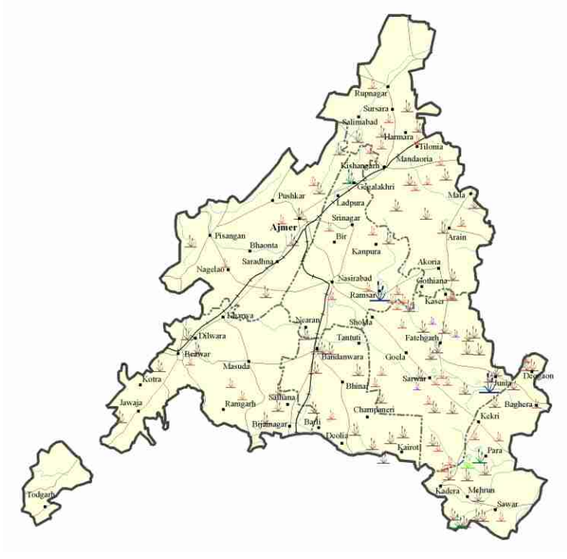
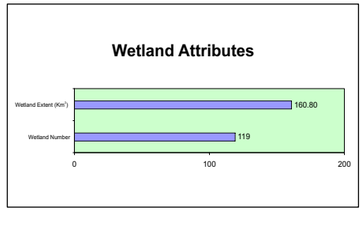
District - wise spatial distribution of wetlands



District Ajmer

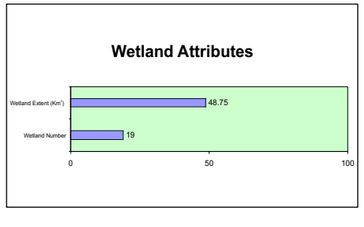


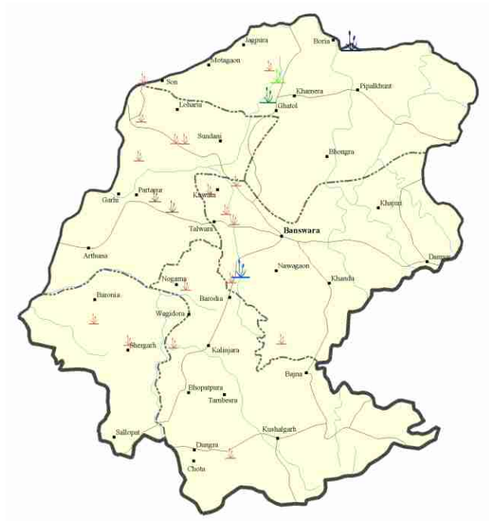




District Alwar

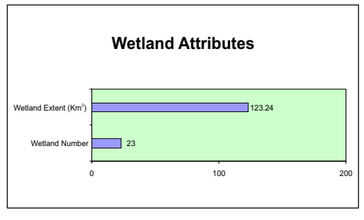






District Banswara

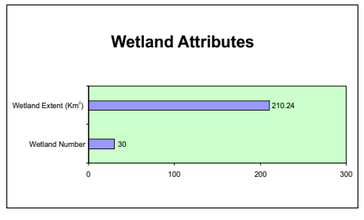






District Barmer





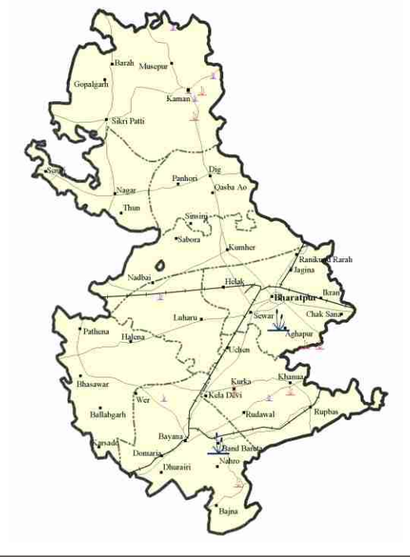
Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha | Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

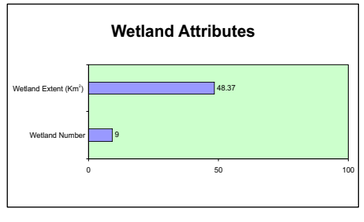
©SACON 2004

District - wise spatial distribution of wetlands



District Bharatpur

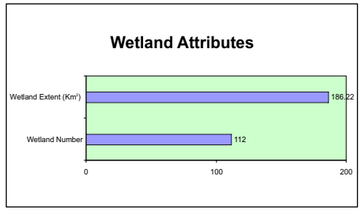






District Bhilwara

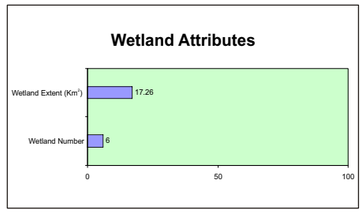


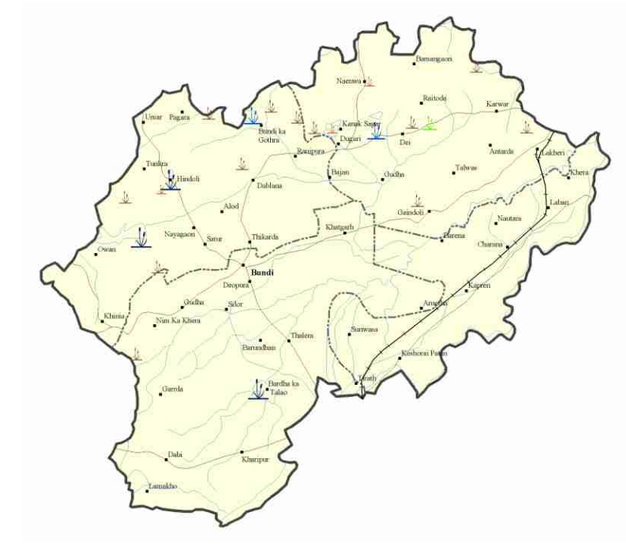




District Bikaner

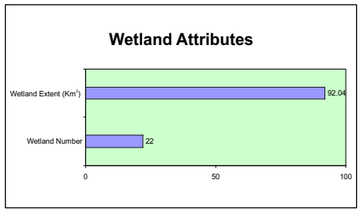






District Bundi





Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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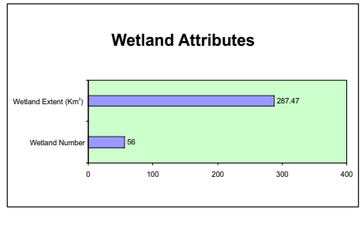
District - wise spatial distribution of wetlands



District Chitoorgarh

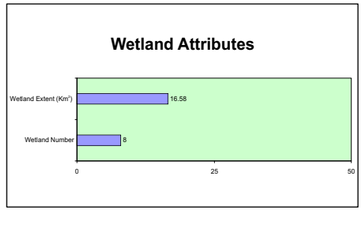


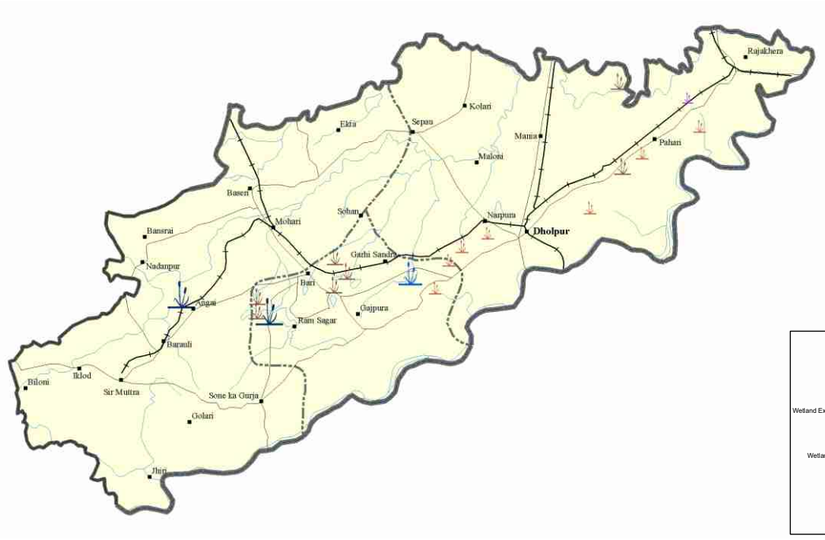




District Churu

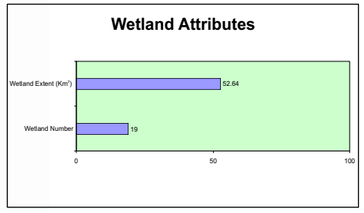


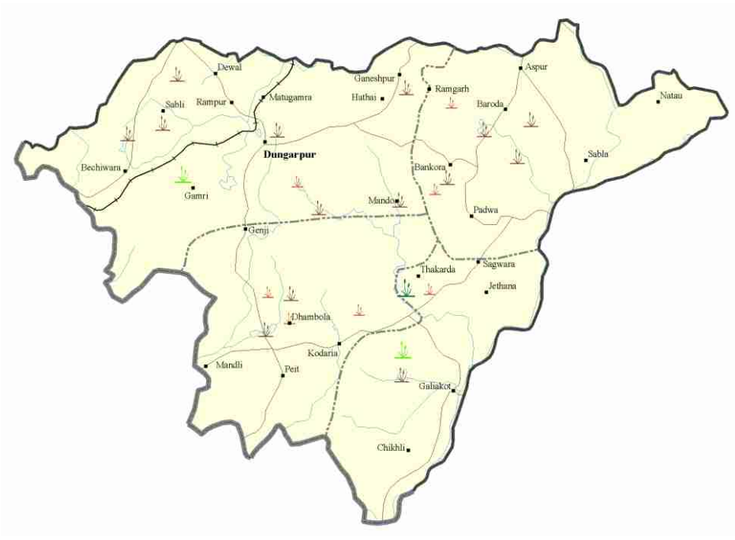




District Dholpur

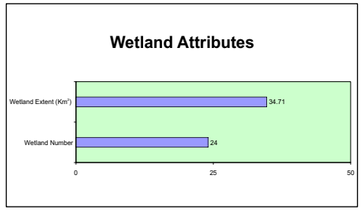






District Dungarpur





Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

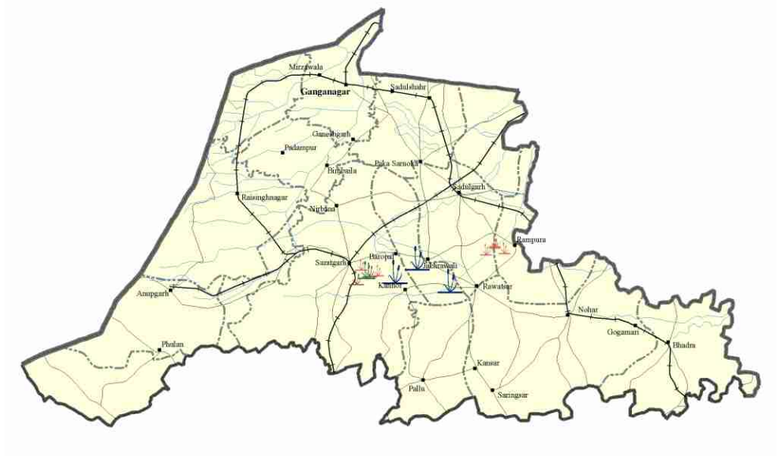
Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha | Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

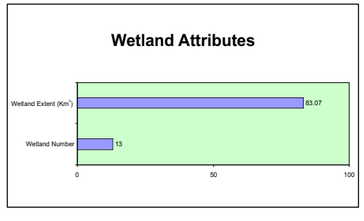
©SACON 2004

District - wise spatial distribution of wetlands



District Ganganagar

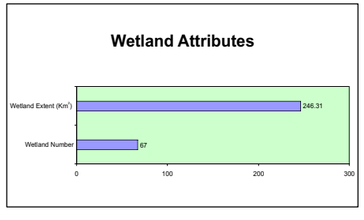






District Jaipur

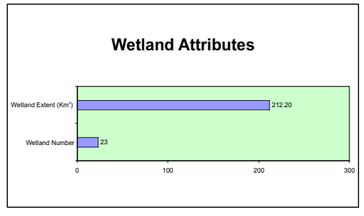






District Jaisalmer

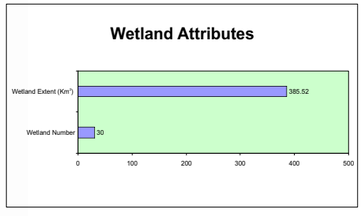






District Jalore





Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha | Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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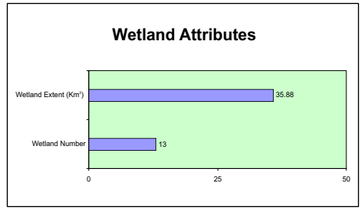
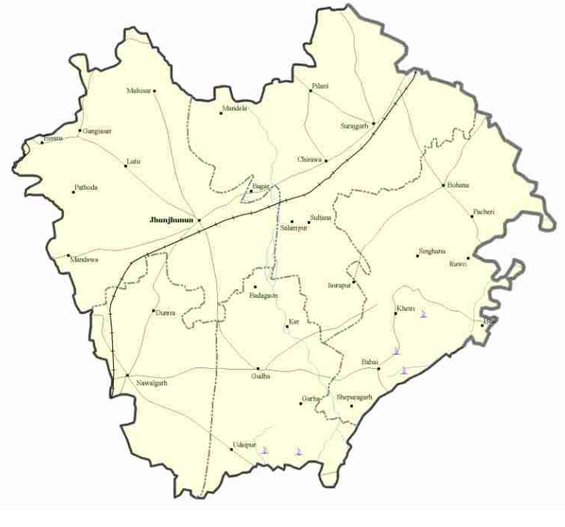
District - wise spatial distribution of wetlands



District Jhalawar

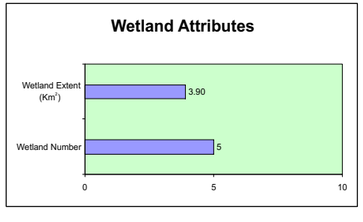






District Jhunjhunun

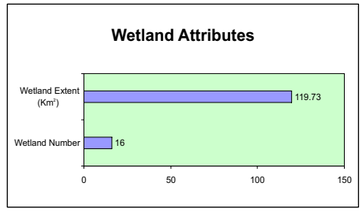


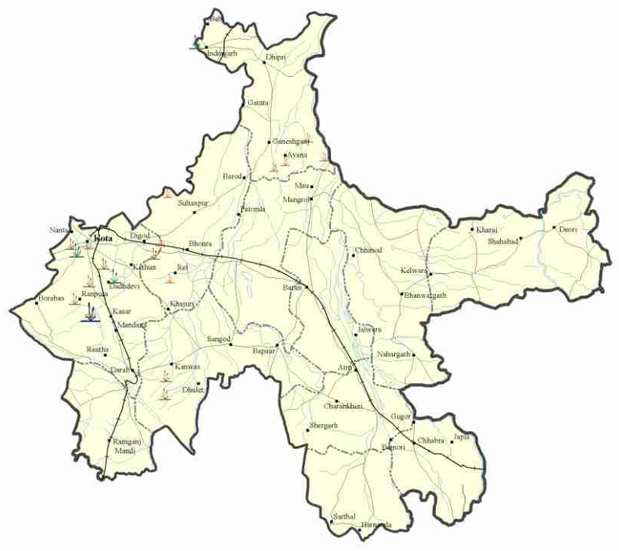




District Jodhpur

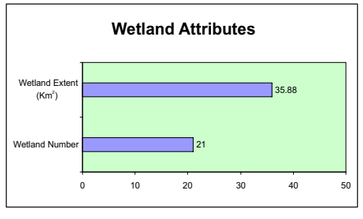






District Kota





Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

Wetlands

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Maps not to scale

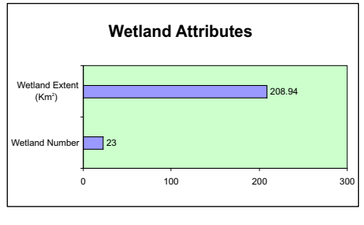
©SACON 2004

District - wise spatial distribution of wetlands



District Nagaur

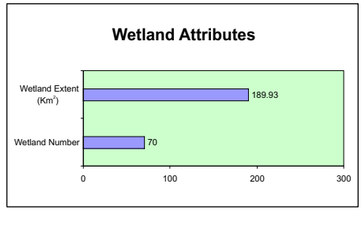


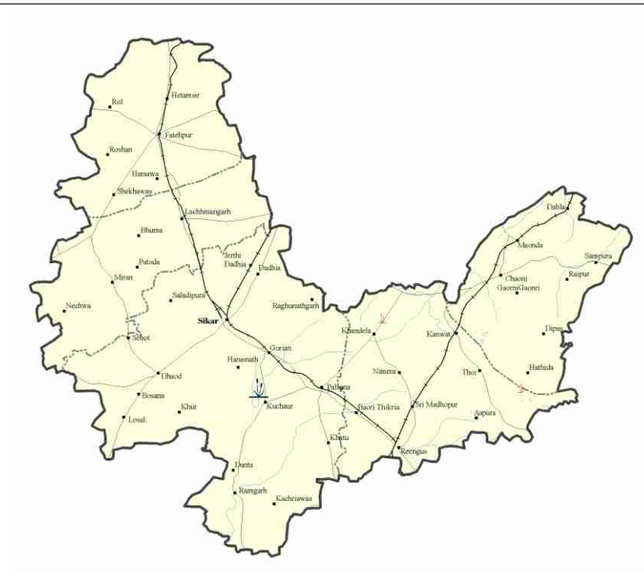




District Pali

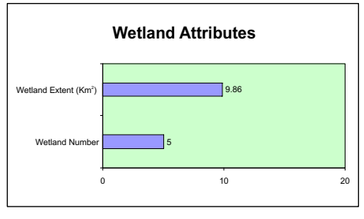


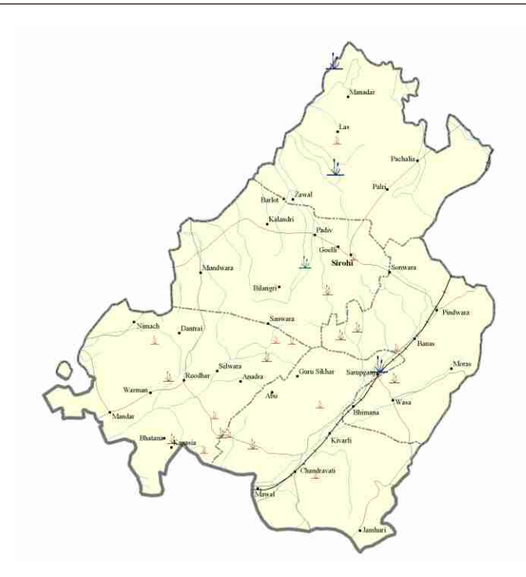




District Sikar

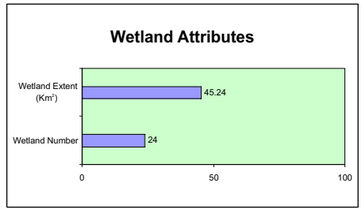






District Sirohi





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

Maps not to scale

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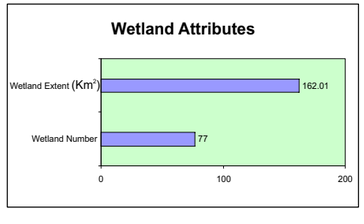
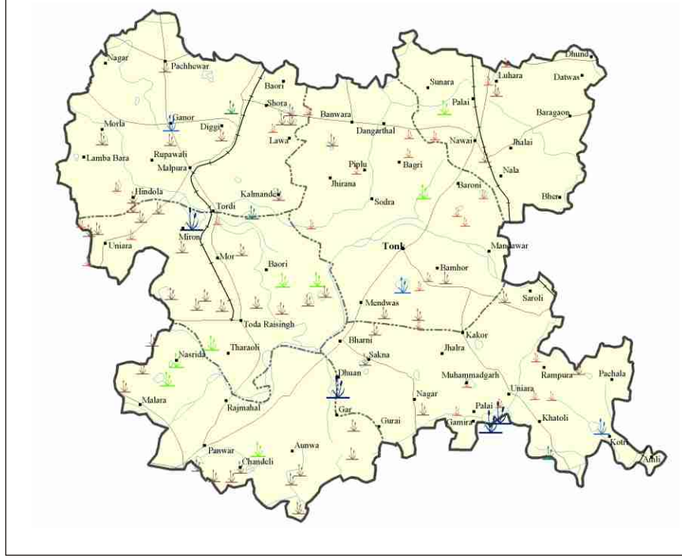
District - wise spatial distribution of wetlands



District Swai Madhupur

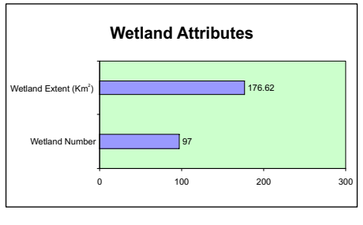






District Tonk

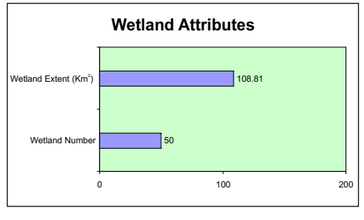






District Udaipur







Ramachandran

Source: Wetland point data; State Remote Sensing Applications Centre, Jodhpur

Wetlands

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Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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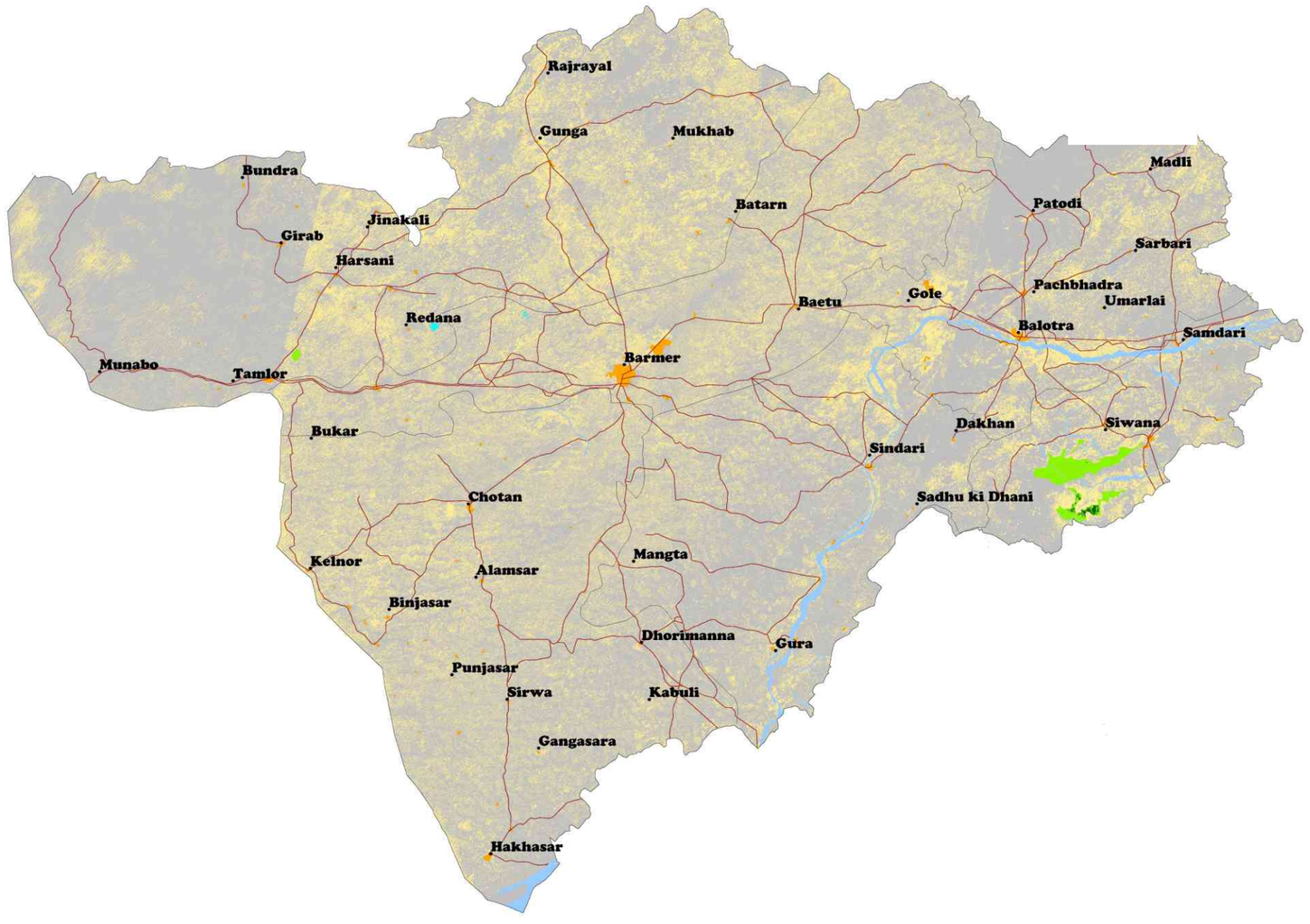
Integrated wetland and land use map



Integrated wetland type and land use

- Dense Forest
- Open Forest
- Arable Land
- Waste Land/Sand
- River
- Township
- Pond/Tank
- NP Reservoir
- NP Oxbow Lake/Cut-off
- NP Water-logged
- NP Coastal-water
- NP Marsh/Mud
- NP Others/Salt
- Roads
- Taluks/Tehsil Boundary
- District Boundary
- NP * Not Present

Maps not to scale

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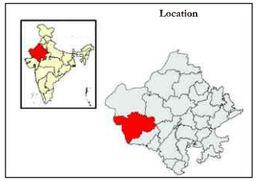
District Barmer, Rajasthan

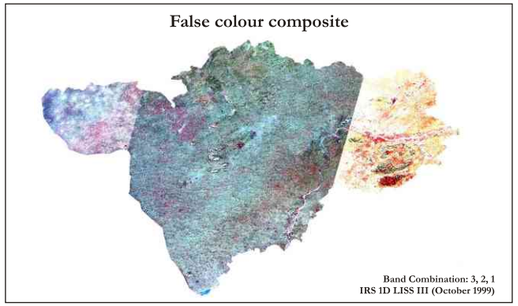
Location



Taluks/Tehsils

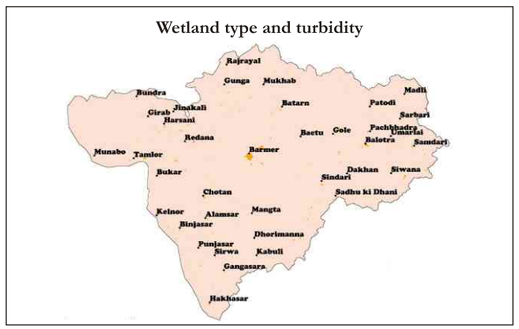


False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (October 1999)

Wetland type and turbidity



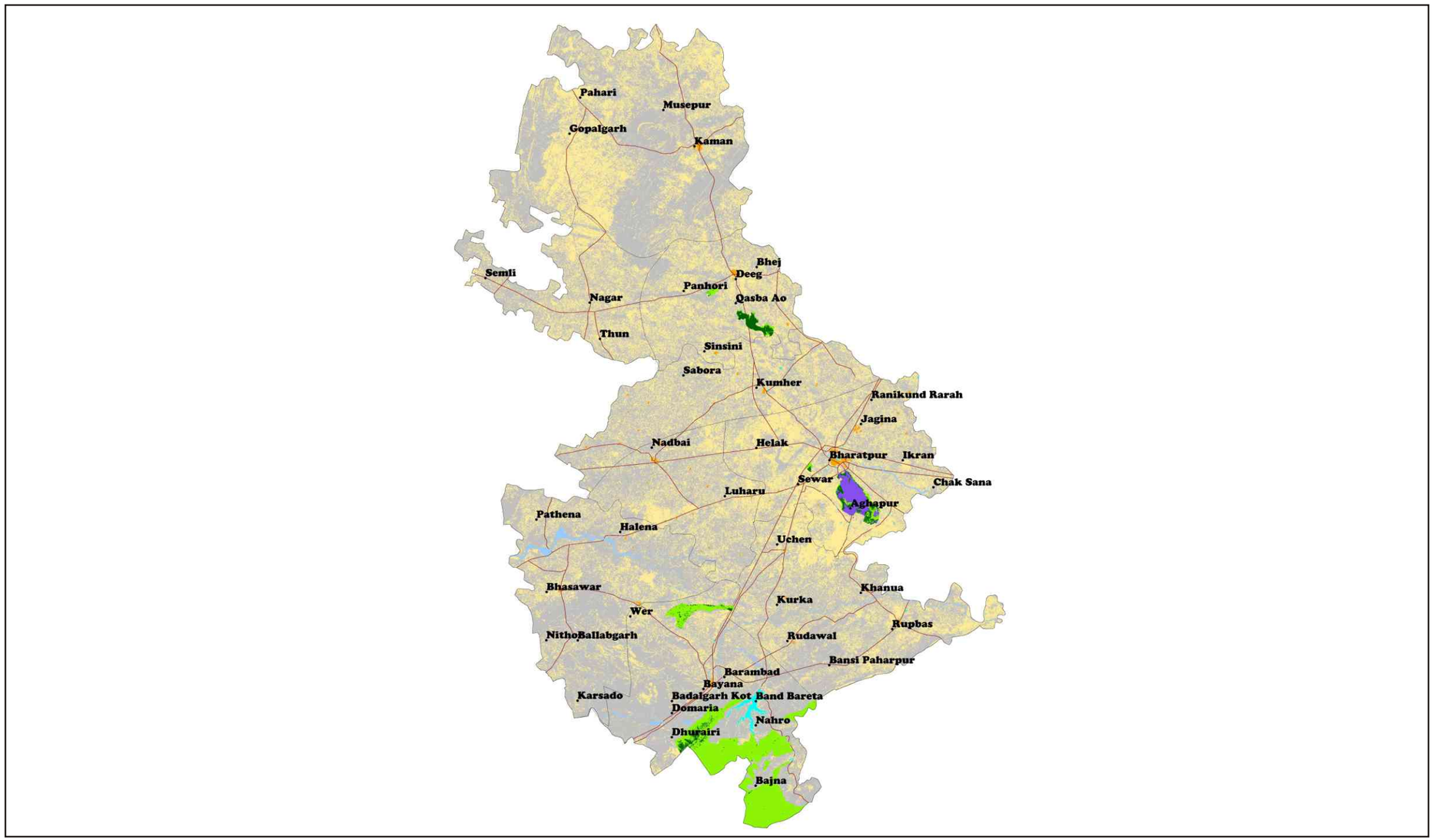
Legend	Wetland	Turbidity		
		Low	*Medium*	*High*
Pond/Tank			NP	NP
Reservoir		NP	NP	NP
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

Wetland type and aquatic vegetation

Legend	Wetland	Aquatic Vegetation		
		Low	*Medium*	*High*
Pond/Tank			NP	NP
Reservoir		NP	NP	NP
Water-logged		NP	NP	NP
Oxbow Lake/Cut-off		NP	NP	NP

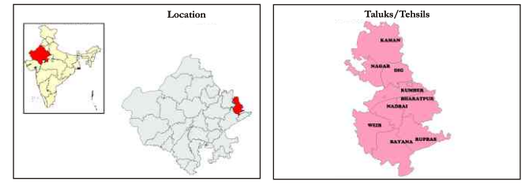
Integrated wetland and land use map

District Bharatpur, Rajasthan



Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Lake	NP Oxbow Lake/Cut-off	NP Others	District Boundary
Open Forest	Township	NP Reservoir	NP Coastal-water	Road	NP * Not Present
Arable Land	River	Water-logged	NP Marsh/Mud	Taluks/Tehsil Boundary	



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Band Combination: 3, 2, 1
IRS 1D LISS III (November 1999)

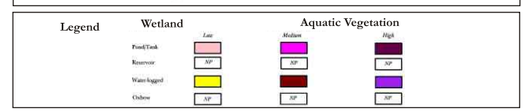
Wetland type and turbidity





Wetland type and aquatic vegetation





Maps not to scale

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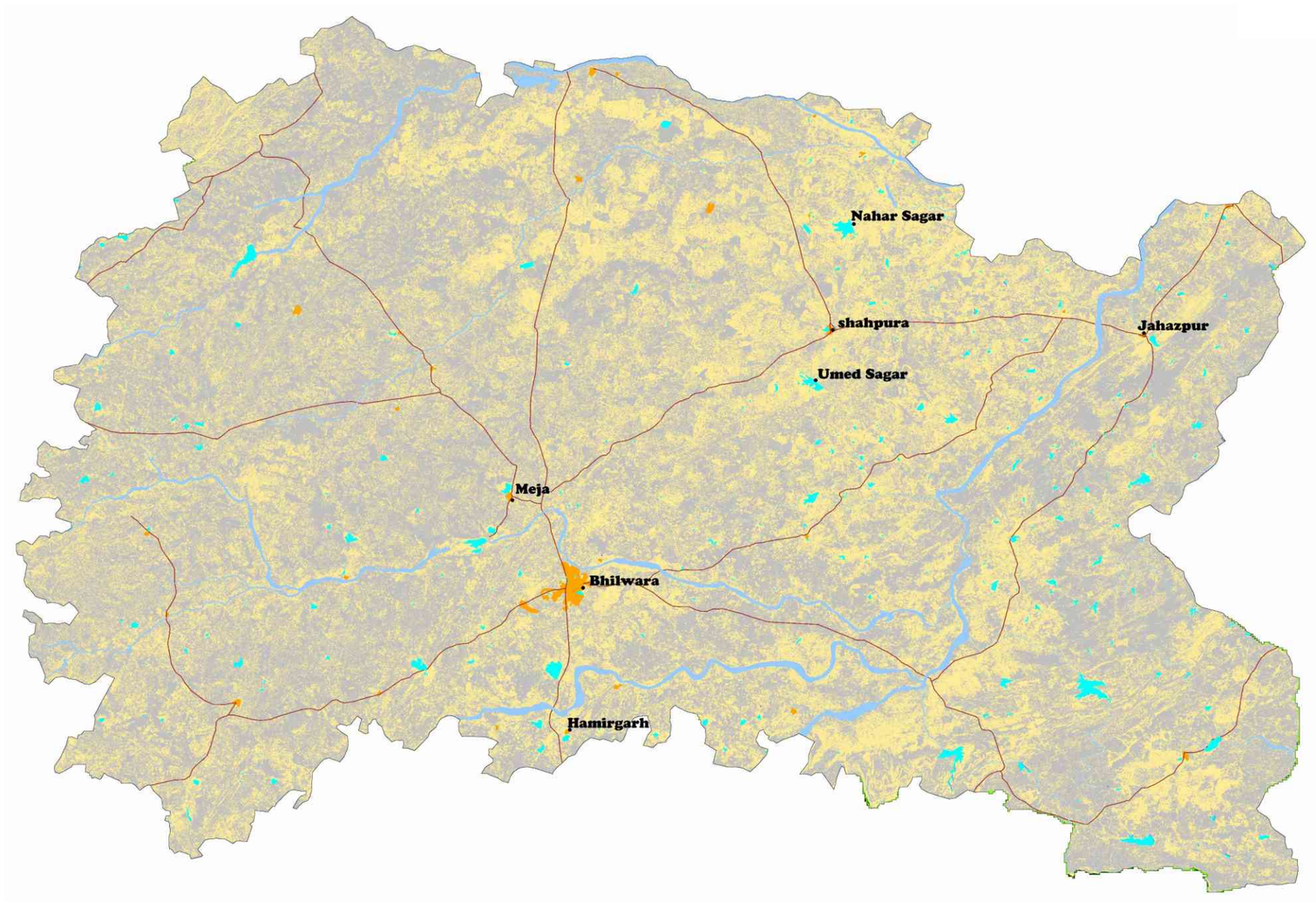
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Tank	Water-logged	NP Others/Salt	District Boundary
Open Forest	River	Reservoir	NP Coastal-water	Road	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Taluks/Tehsil Boundary	

District Bhilwara, Rajasthan

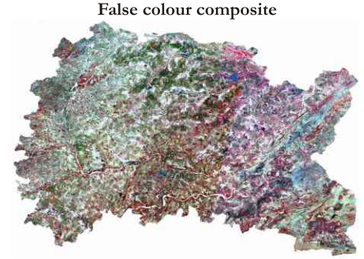
Location



Taluks/Tehsils

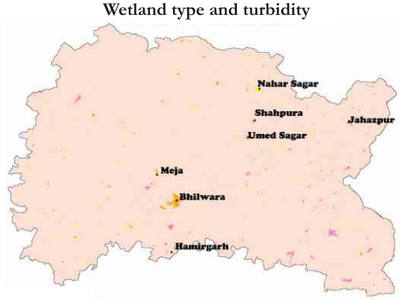


False colour composite



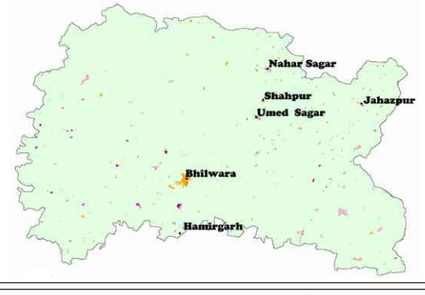
Band Combination: 3, 2, 1
IRS 1D LISS III (November 1999)

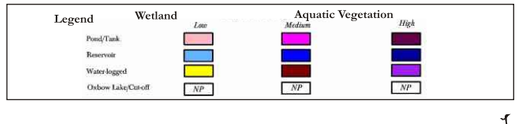
Wetland type and turbidity





Wetland type and aquatic vegetation





Maps not to scale

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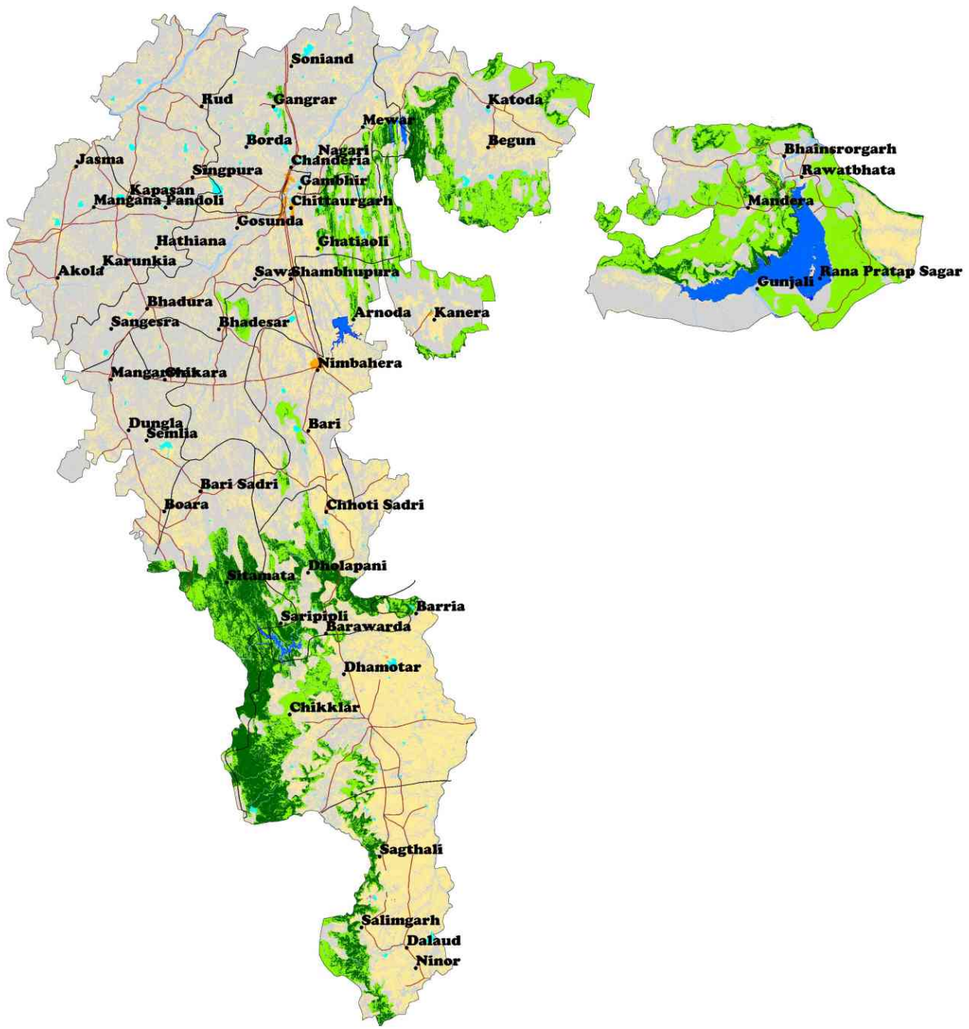
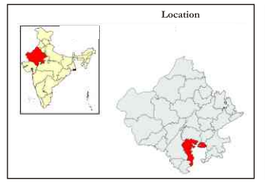
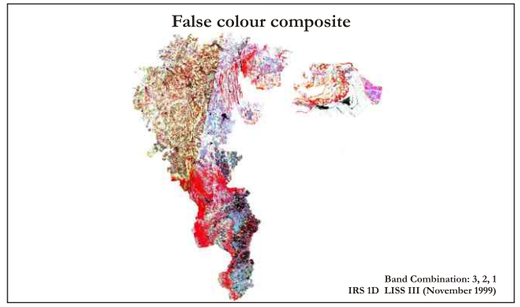
Integrated wetland and Land Use Map

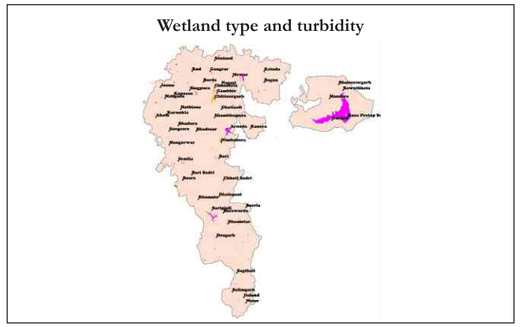
District Chittorgarh, Rajasthan

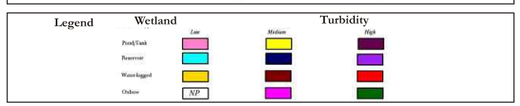


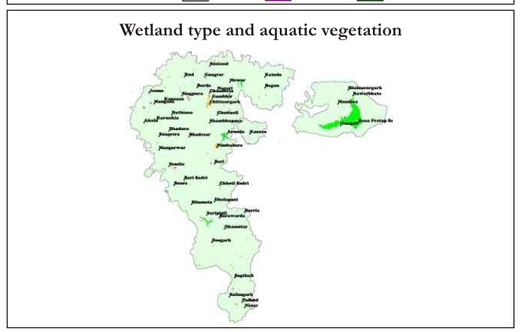


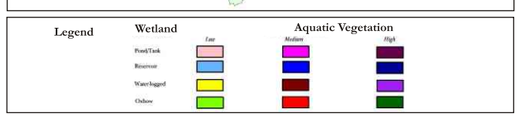












Integrated wetland type and land use

- Dense Forest
- Open Forest
- Arable Land
- Waste Land/Sand
- Township
- River
- Pond/Lake
- Reservoir
- Water-logged
- Oxbow Lake/Cut-off
- NP Coastal-water
- NP Marsh/Mud
- NP Others
- Road
- Taluks/Tehsil Boundary
- District Boundary
- NP * Not Present

Maps not to scale

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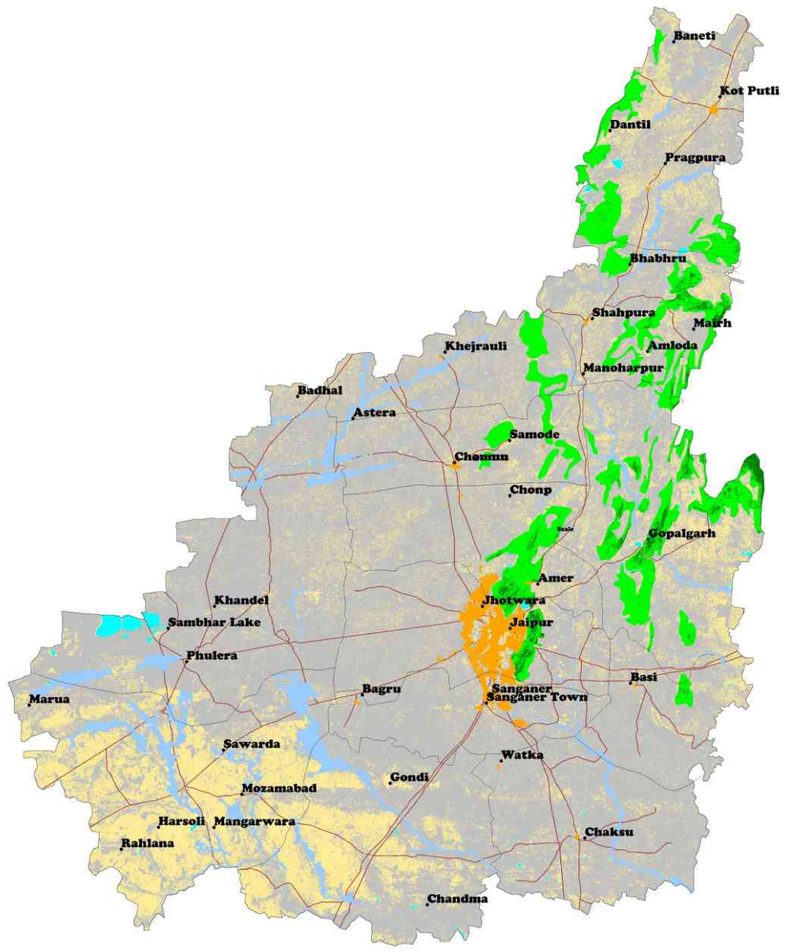
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Lake	Oxbow Lake/Cut-off	Others	District Boundary
Open Forest	Township	Reservoir	Coastal-water	Roads	* Not Present
Arable Land	River	Water-logged	Marsh/Mud	Taluks/Tehsil Boundary	

Maps not to scale

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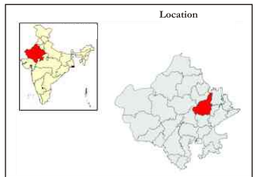
District Jaipur, Rajasthan

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS-1D LISS III (November 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
Pond/Tank			NP	
Reservoir		NP	NP	NP
Water-logged		NP	NP	NP
Oxbow		NP	NP	NP

Wetland type and aquatic vegetation

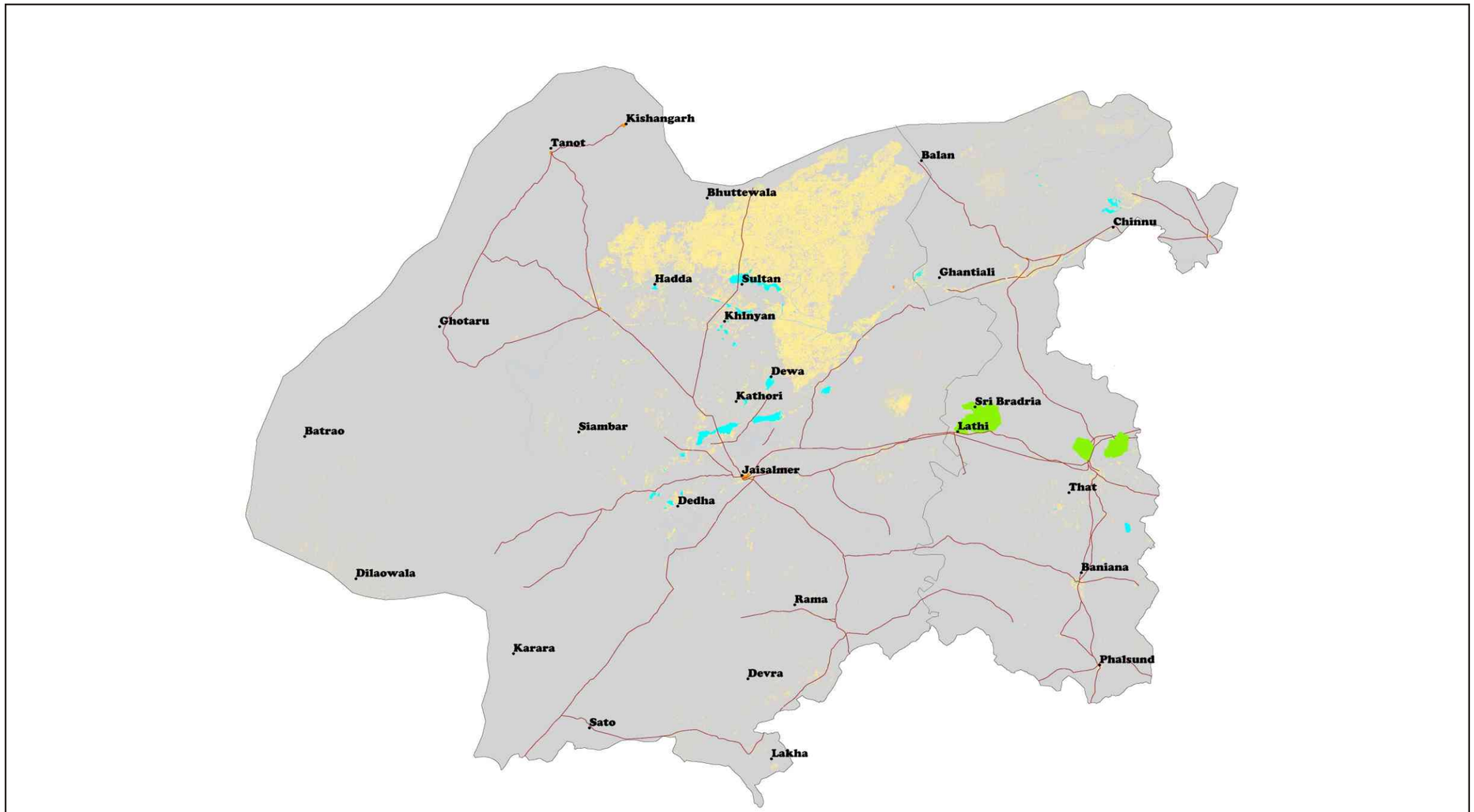


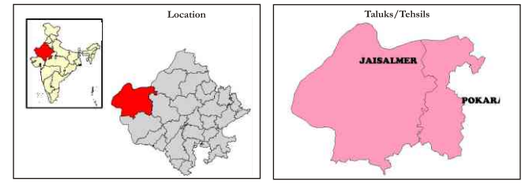
Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Pond/Tank			NP	
Reservoir		NP	NP	NP
Water-logged		NP	NP	NP
Oxbow		NP	NP	NP

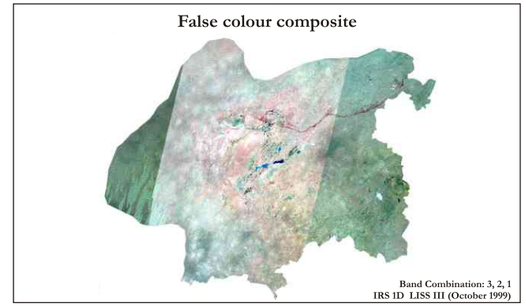
Regional Remote Sensing Service Centre, Jodhpur and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

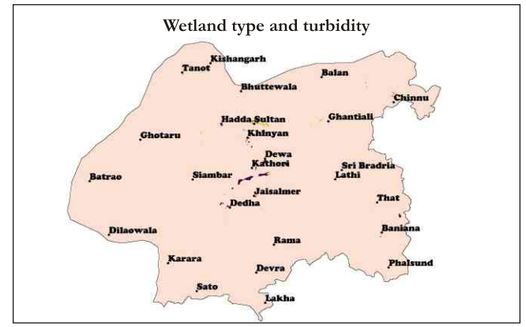
Integrated wetland and land use map

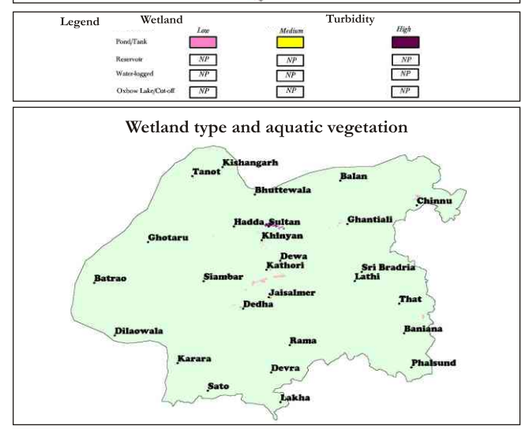
District Jaisalmer, Rajasthan











Integrated wetland type and land use

NP Dense Forest	Waste Land/Sand	Pond/Tank	NP Water-logged	NP Others/Salt	District Boundary
Open Forest	River	NP Reservoir	NP Coastal-water	Roads	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Taluks/Tehsil Boundary	

Maps not to scale

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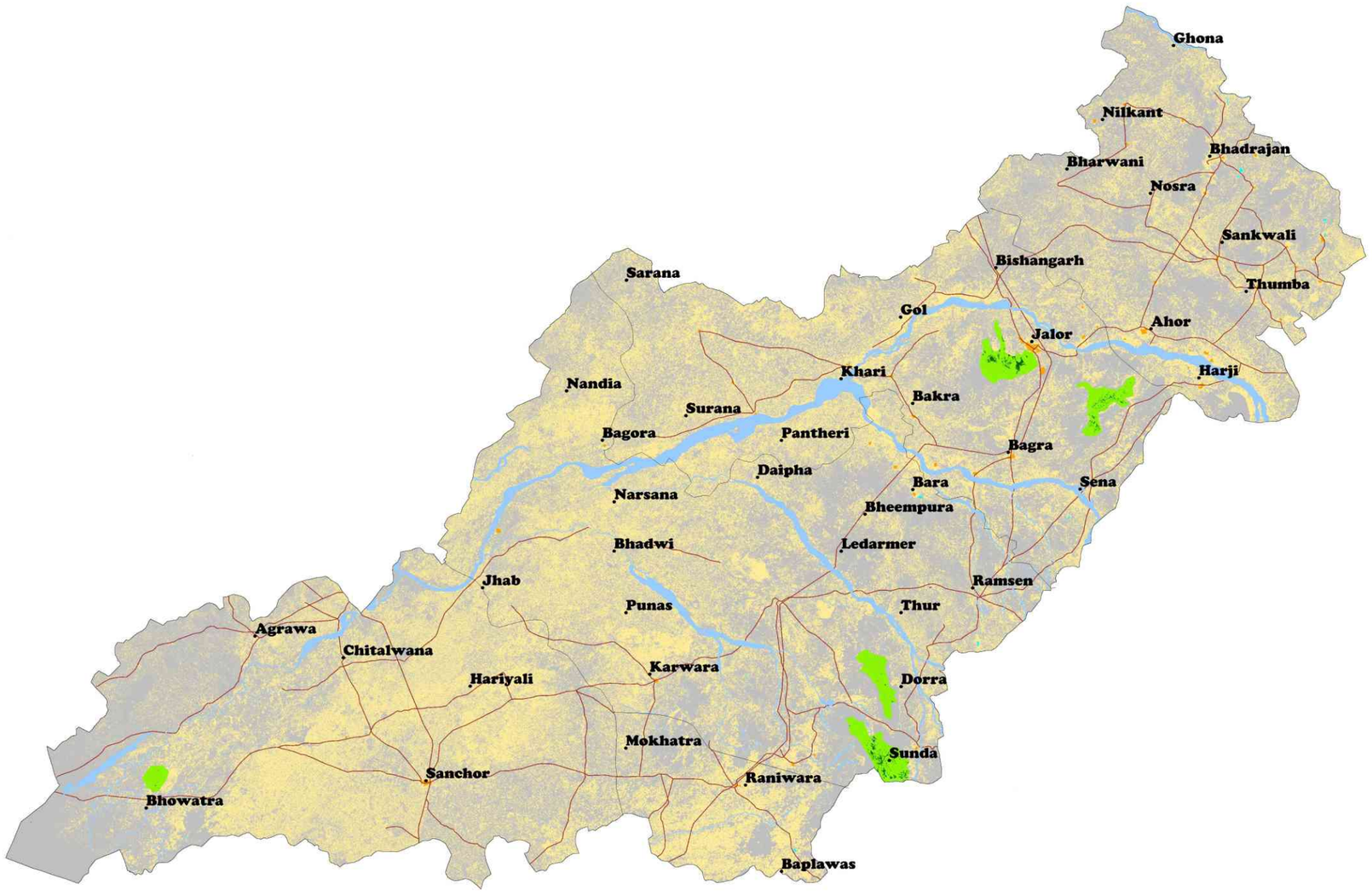
Integrated wetland and land use map

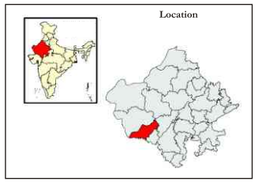


Integrated wetland type and land use

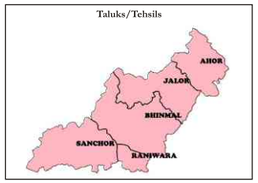
- Dense Forest
- Open Forest
- Arable Land
- Waste Land/Sand
- River
- Township
- Pond/Tank
- Reservoir
- NP Oxbow Lake/Cut-off
- NP Water-logged
- NP Coastal-water
- NP Marsh/Mud
- NP Others/Salt
- Roads
- Taluks/Tehsil Boundary
- District Boundary
- NP * Not Present

District Jalore, Rajasthan

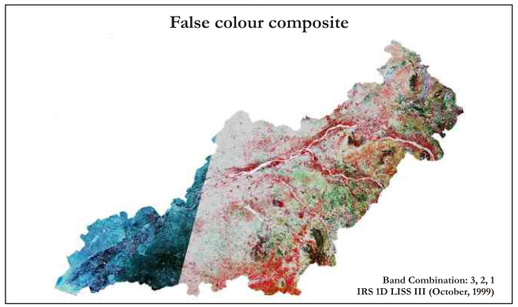
Location



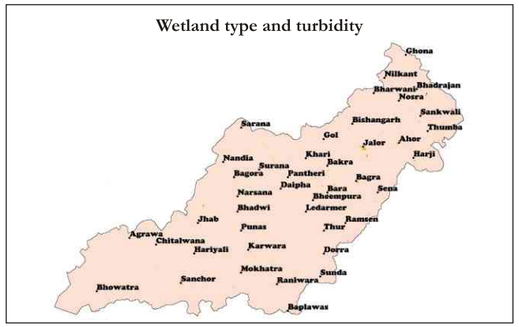
Taluks/Tehsils



False colour composite

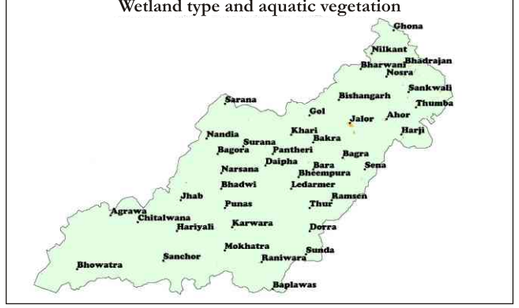


Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir	NP	NP	
	Water-logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir	NP	NP	
	Water-logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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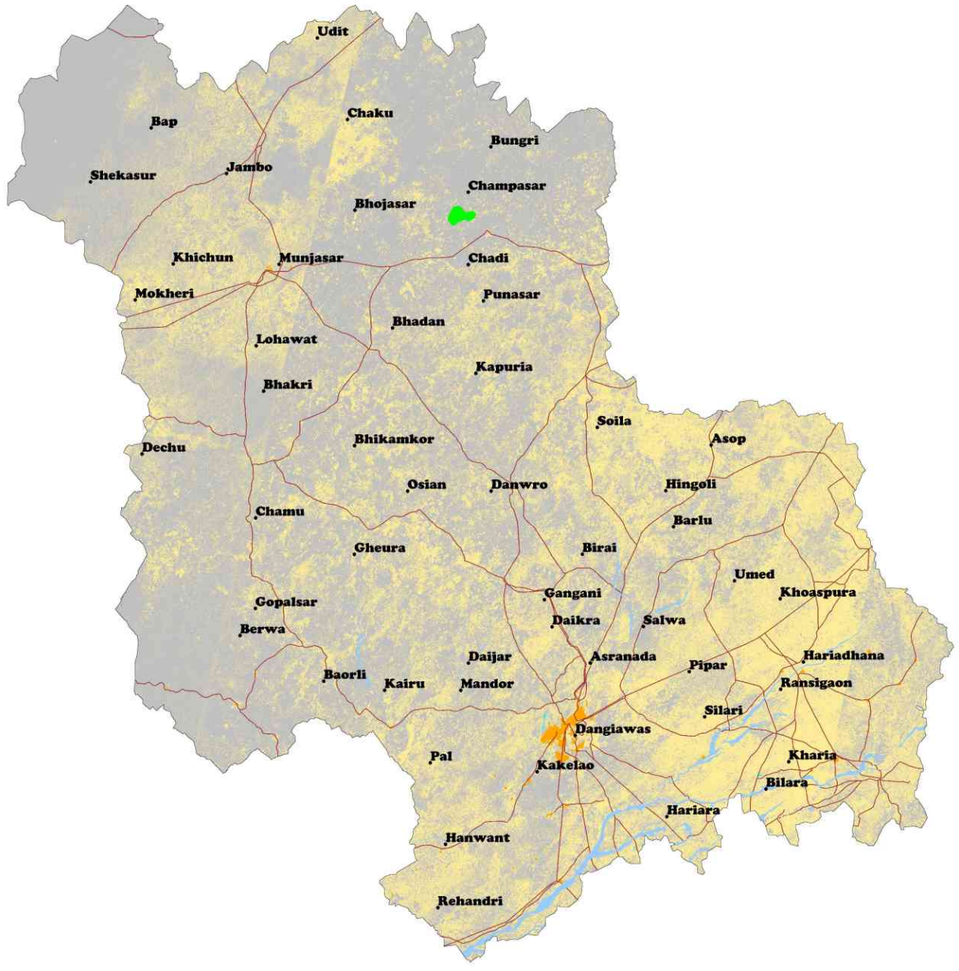
Integrated wetland and land use map

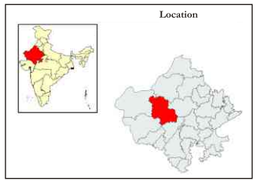
District Jodhpur, Rajasthan



Integrated wetland type and land use

NP Dense Forest	Waste Land/Sand	Pond/Lake	NP Oxbow Lake/Cut-off	NP Others/Salt	District Boundary
Open Forest	Township	NP Reservoir	NP Coastal-water	Roads	NP * Not Present
Arable Land	River	NP Water-logged	NP Marsh/Mud	Taluks/Tehsil Boundary	

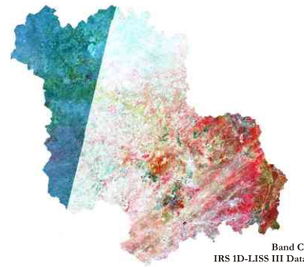
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D-LISS III Data(November, 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir	NP	NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir	NP	NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Maps not to scale

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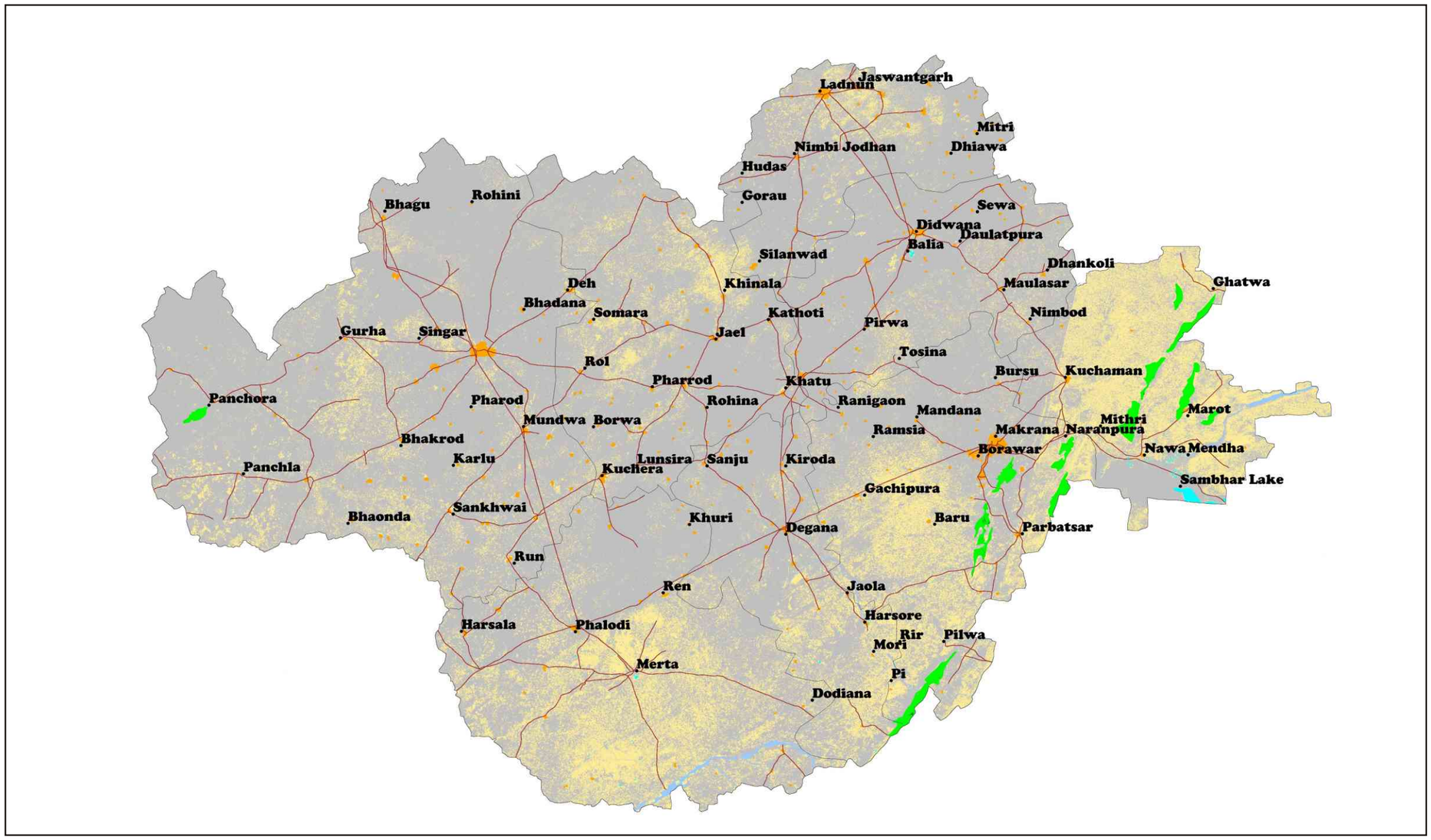
Integrated wetland and land use map

District Nagaur, Rajasthan



Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Tank	NP Water-logged	NP Others/Salt	District Boundary
Open Forest	River	NP Reservoir	NP Coastal-water	Roads	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Taluks/Tehsil Boundary	

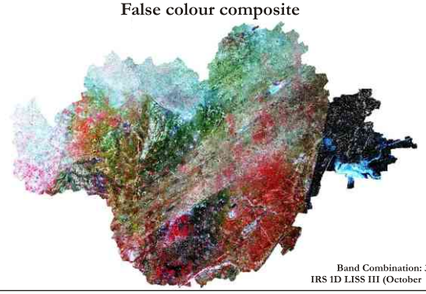
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (October 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir	NP	NP	NP
	Water-logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank		NP	NP
	Reservoir	NP	NP	NP
	Water-logged	NP	NP	NP
	Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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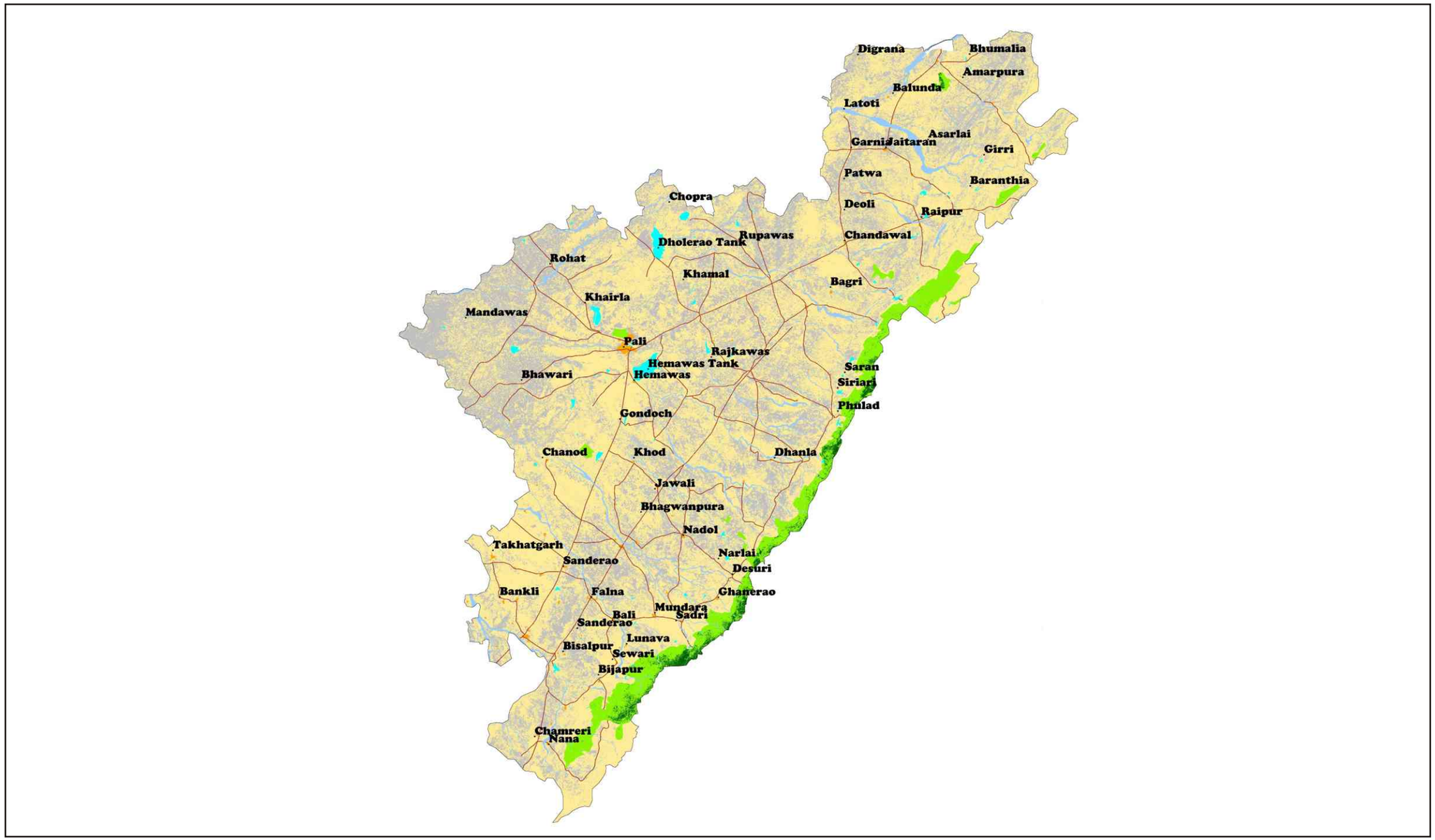
Integrated wetland and land use map

District Pali, Rajasthan



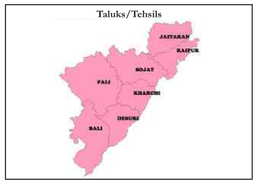
Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Lake	Oxbow Lake/Cut-off	Sand	District Boundary
Open Forest	Township	Reservoir	Coastal-water	Others	Taluks/Tehsil Boundary
Arable Land	River	Water-logged	Marsh/Mud	Roads	* Not Present

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D-LISS III Data (October-November 1999)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
	Pond/Tank			
	Reservoir	NP	NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Wetland type and aquatic vegetation



Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
	Pond/Tank			
	Reservoir	NP	NP	NP
	Water-logged	NP	NP	NP
	Oxbow	NP	NP	NP

Maps not to scale

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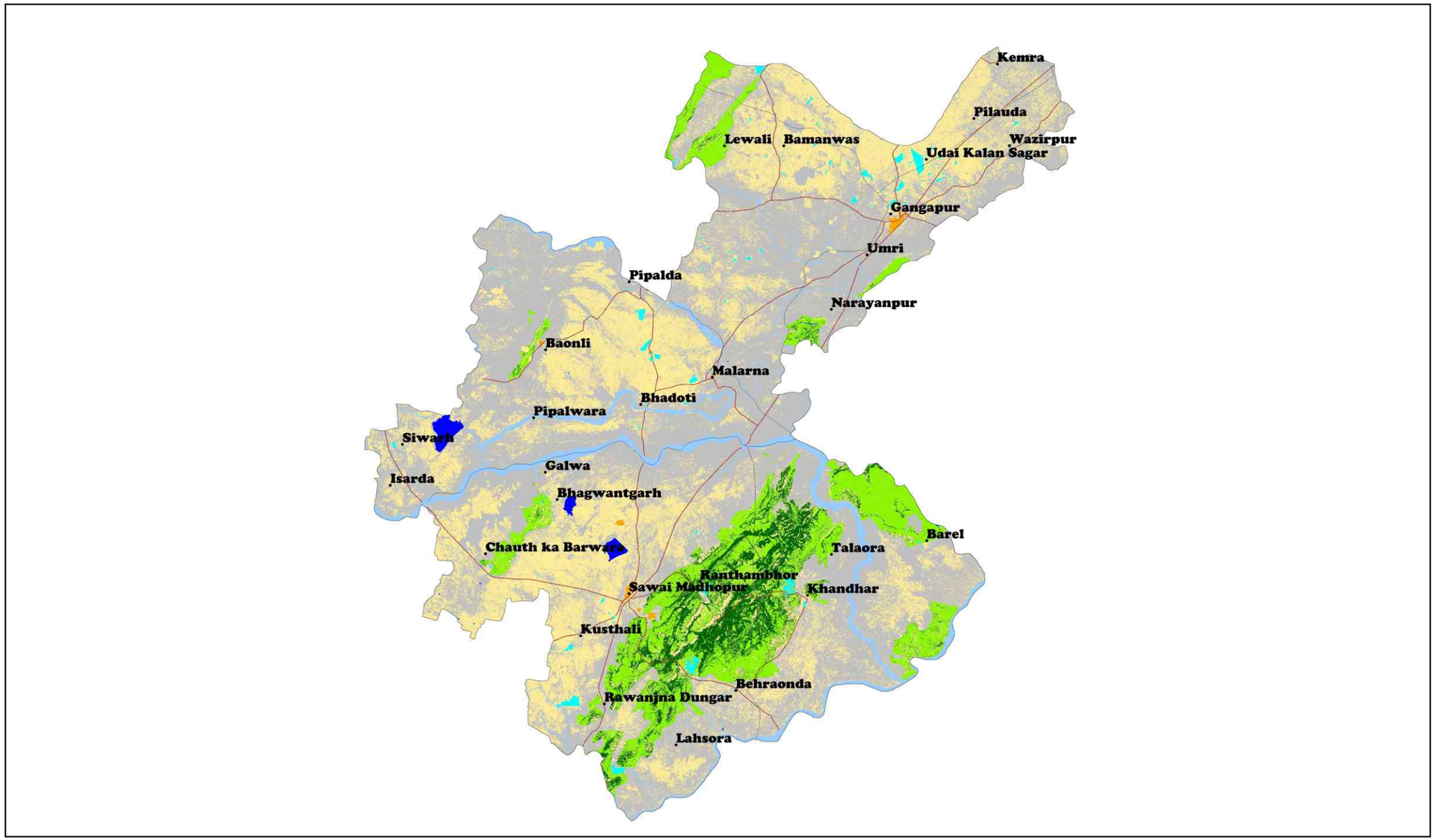
Integrated wetland and land use map

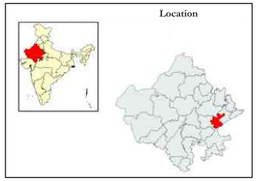
District Swai Madhupur, Rajasthan



Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Lake	Oxbow Lake/Cut-off	Others	Taluks/Tehsil Boundary
Open Forest	Township	Reservoir	Coastal-water	Roads	* Not Present
Arable Land	River	Water-logged	Marsh/Mud	District Boundary	

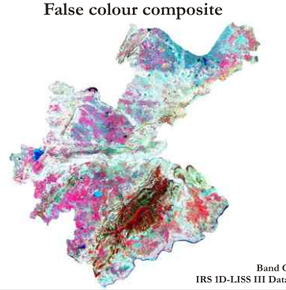
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D-LISS III Data (November 1999)

Wetland type and turbidity



Legend

Wetland	Turbidity		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged	*NP*	*NP*	*NP*
Oxbow			

Wetland type and aquatic vegetation



Legend

Wetland	Aquatic Vegetation		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged	*NP*	*NP*	*NP*
Oxbow			

Maps not to scale

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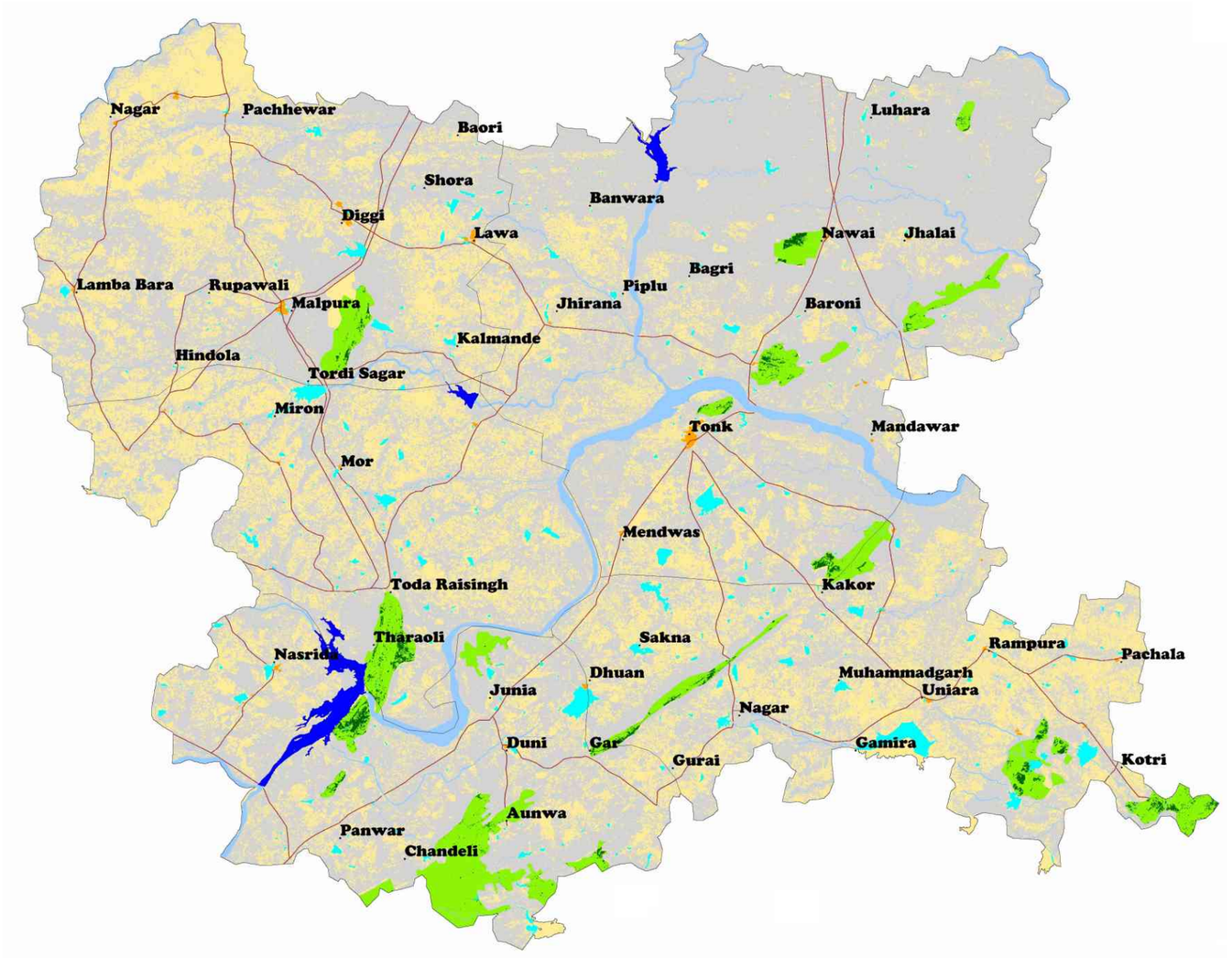
Integrated wetland and land use map

District Tonk, Rajasthan



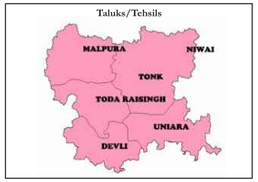
Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Tank	NP Water-logged	NP Others/Salt	District Boundary
Open Forest	River	Reservoir	NP Coastal-water	Roads	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Taluks/Tehsil Boundary	

Location



Taluks/Tehsils



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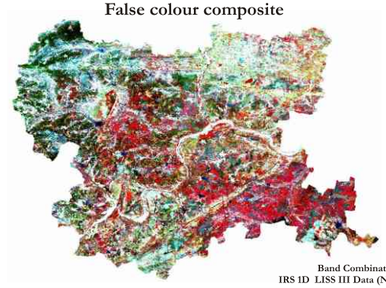
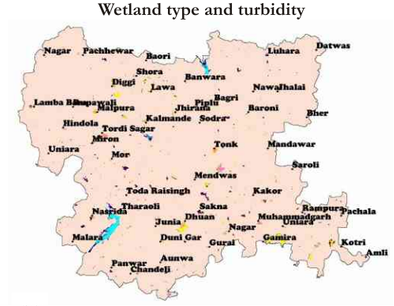


Band Combination: 3, 2, 1
IRS 1D LISS III Data (November)

Wetland type and turbidity



Legend Wetland Turbidity

Wetland	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend Wetland Aquatic Vegetation

Wetland	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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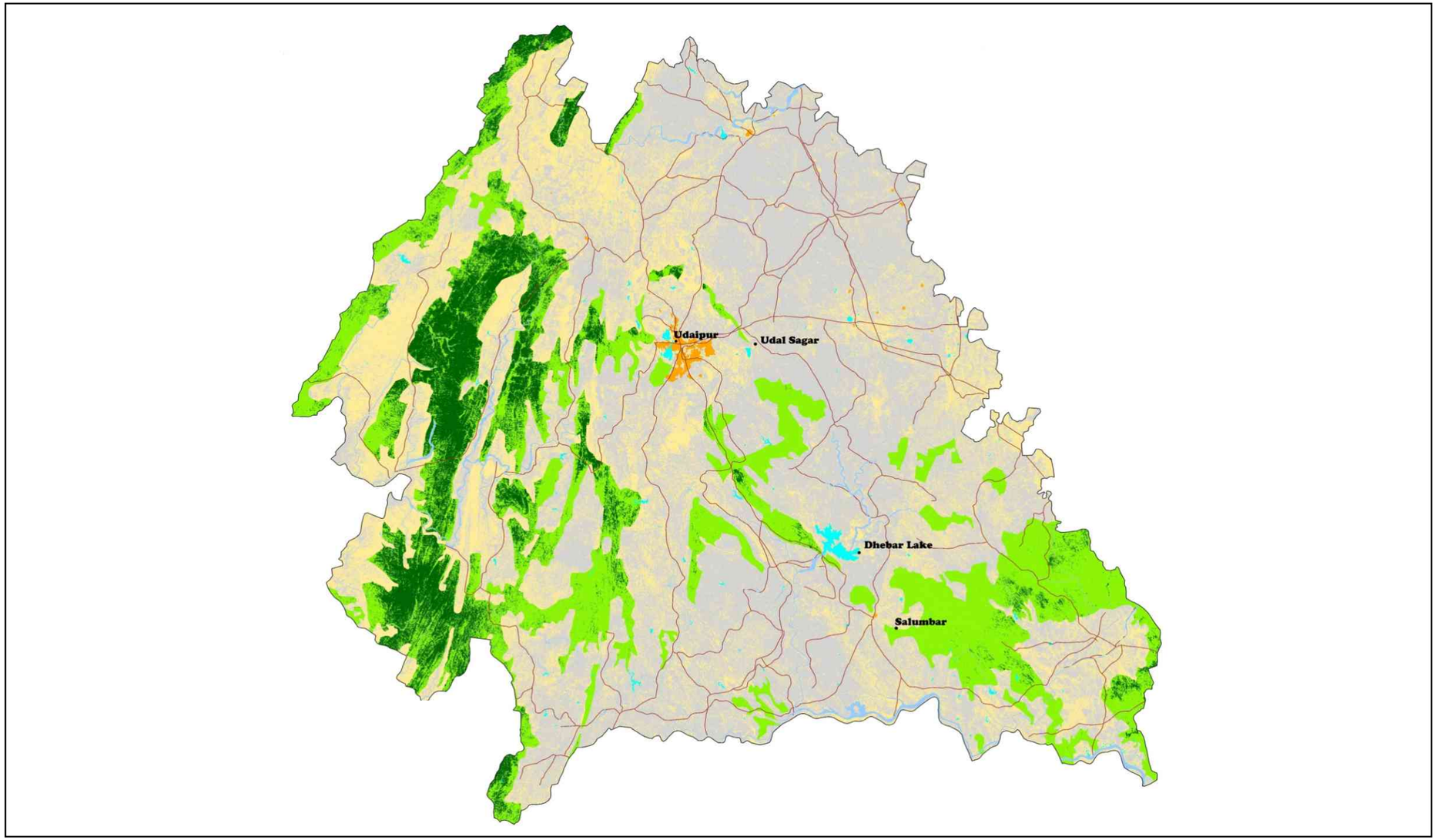
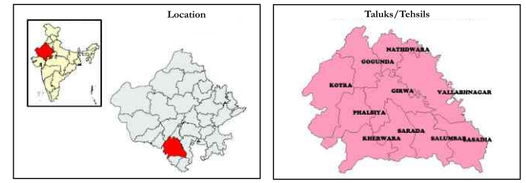
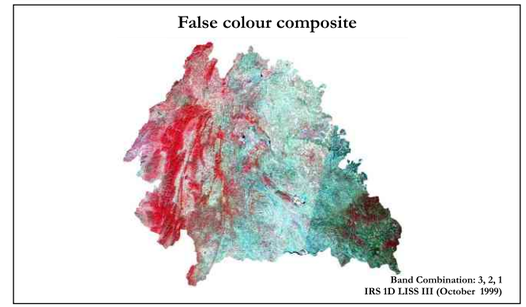
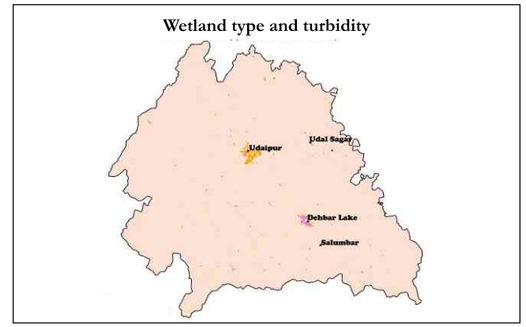
Integrated wetland and land use map

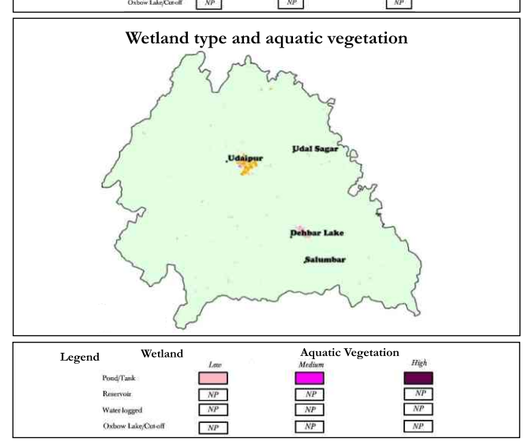
District Udaipur, Rajasthan











Integrated wetland type and land use

Dense Forest	Waste Land/Sand	Pond/Tank	NP Water-logged	NP Others/Salt	Taluks/Tehsil Boundary
Open Forest	River	NP Reservoir	NP Coastal-water	Roads	NP * Not Present
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	District Boundary	

Maps not to scale

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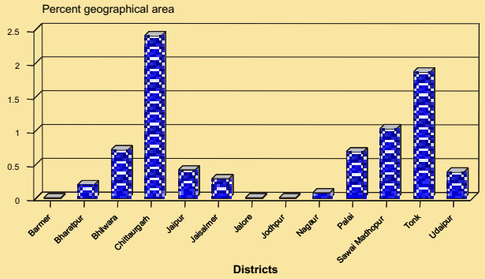


Area under wetland in select districts

Attributes of wetlands and environmental contamination

Wetlands

The area under wetland is the highest in Chitturgarh (2.41%), followed by Tonk (1.87%). The extent of wetland is low in Barmer, Jalore and Jodhpur. In the western desert district of Jaisalmer, a significant area was under wetland due to lakes formed by water logging from the Indira Gandhi Canal. Ponds/lakes contribute to most of the wetlands in the thirteen districts studied .In Chitturgarh, almost all the wetlands were formed due to water logging.

Turbidity

More than 50% area of the wetlands has low turbidity level in Bhilwara, Udaipur and Bharatpur districts. Barmer, Jalore, Jodhpur, Nagaur, Jaisalmer, Pali and Sawaimadhopur districts show high turbidity.

Summer recession of water

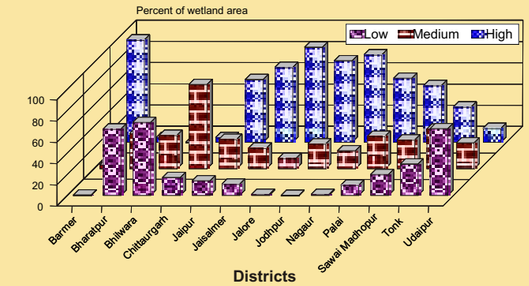
The summer recession of water was the highest in the wetlands of Tonk district followed by those of Sawaimadhopur, Bilwara and Pali. Maximum recession was found in Jaisalmer and Udaipur districts.

Heavy Metals

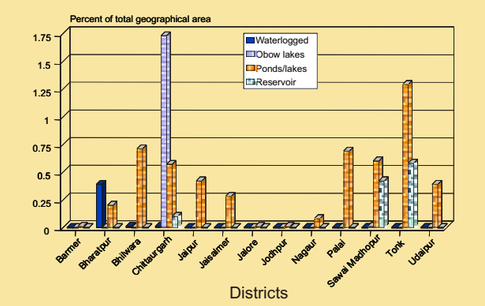
Among the three wetlands examined, Ramsagar recorded the highest concentration of lead and zinc while Keoladeo National Park, Bharatpur, recorded the lowest. Although other metals, namely copper, cadmium and chromium were detected, they fell within the safe limits. *Labeo rohita* measured the maximum concentrations of all the metals. The magnitude of contamination, particularly in led and zinc was significantly different among species and wetlands. The metal levels appear to be safe for human beings and piscivorous birds as well.

Pesticides

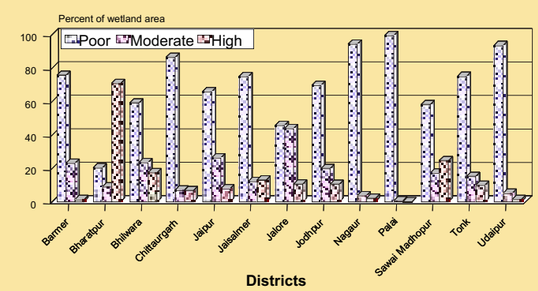
Near equal concentration of total organochlorine residues were recorded in Talabeshahi, Ramsagar and Koeladeo National park. Among the five species of fishes analyzed, *Channa striatus* and *Cirrhinus mrigala* had high levels. The least concentration was detected in *Channa punctatus*. p, p'-DDT and endosulfan residues were detected in all fishes analyzed. About 93% of fishes were contaminated with HCH and 43% fishes with dieldrin. It is also estimated that the annual consumption of pesticides in Rajashtan is about 3101 mt. Although, pesticide concentrations measured in Rajasthan wetland fishes appear to be safe for fish and its consumers (human and piscivorous birds), if the same concentration exists for long, it will exert harmful effects.



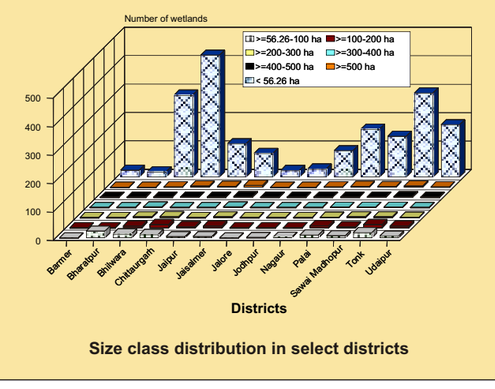
Turbidity pattern in select districts



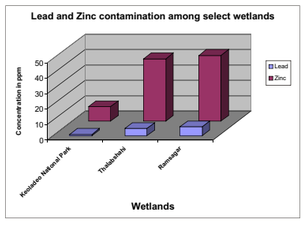
Area under different wetland classes in select districts

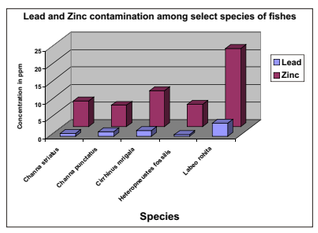


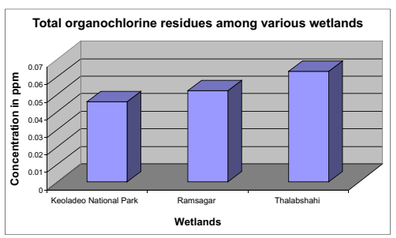
Aquatic vegetation in wetlands in select districts

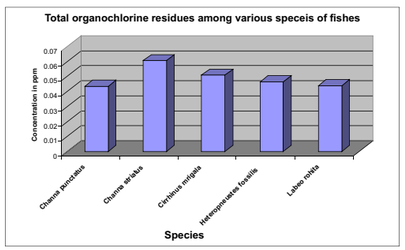


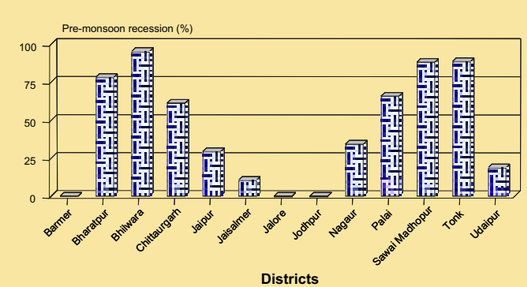
Size class distribution in select districts











Average summer recession in select districts

S.A. Hussain

Maps not to scale

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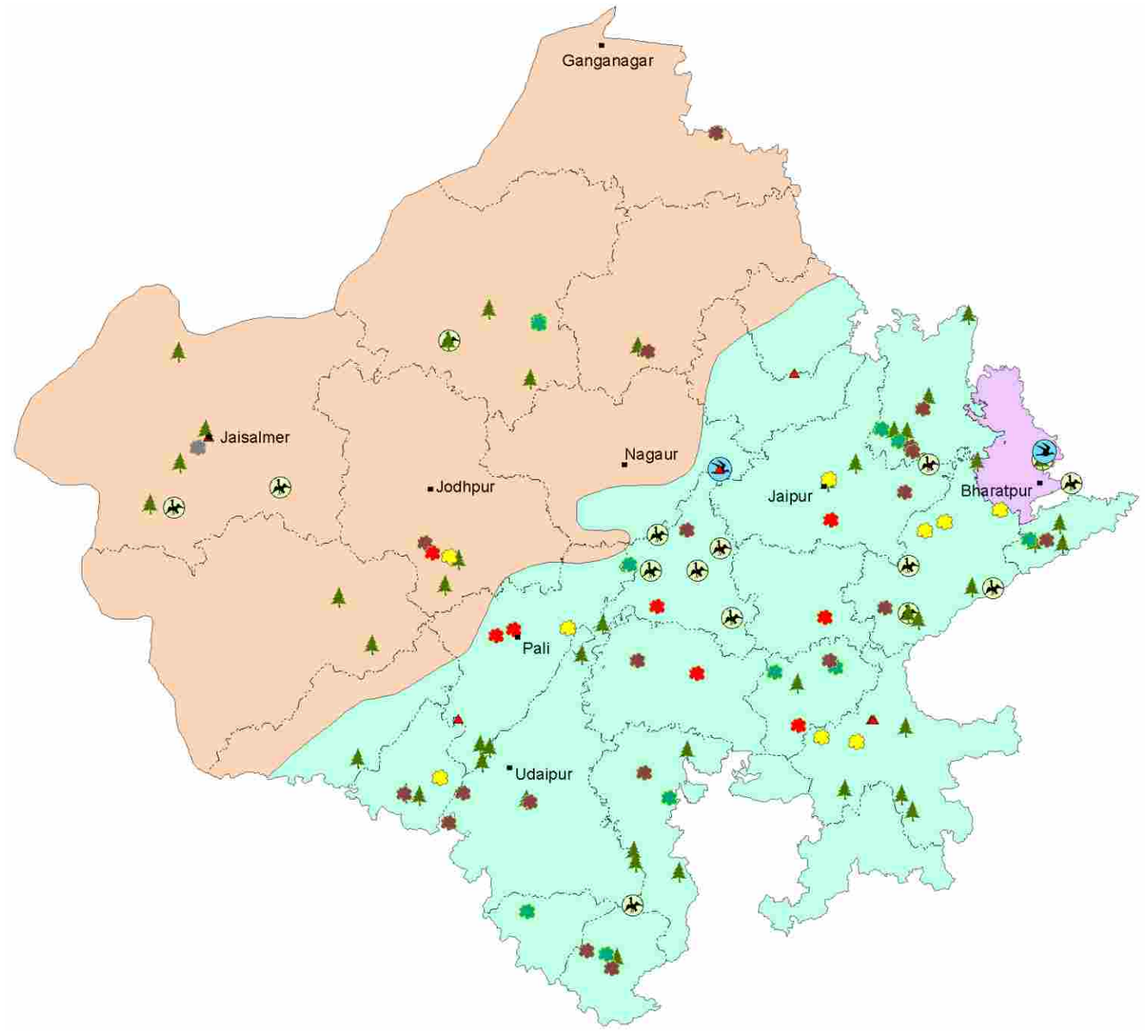
Prioritized inland wetlands of Rajasthan



Prioritized Wetland
- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*
- *Ramsar Site*

Biogeographic Provinces
- *3A, Desert-Thar*
- *3B, Desert-Katchchh*
- *4A, Semi Arid Punjab Plains*
- *4B, Semi Arid Gujarat Rajputana*
- *District Boundaries*

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Rajasthan

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ALNIYA DAM	KOTA	260000	755200	KOTA	1	H	4B
BADOPAL(SURATGARH)	GANGANAGAR	292100	745000	SRIGANGANAGAR	4	M	3A
BALSAMAND	JODHPUR	261800	738000	JODHPUR	3	M	4B
BANDH BARETHA	BHARATPUR	264800	771200	BHARATPUR	2	M	4B
BARDHA BANDH (TALERA)	BUNDI	251400	754200	BUNDI	1	H	4B
BARLI VILLAGE TANK	JODHPUR	262200	724400	JODHPUR	4	L	3A
BHANDHA VILLAGE TANK	UDAIPUR	242500	730330	UDAIPUR	4	L	4B
CHADWAS VILLAGE TANK	CHURU	274800	742300	CHURU	4	L	3A
CHANDLAI LAKE	JAIPUR	264100	755300	JAIPUR	1	M	4B
FATEH SAGAR	SAWAIMADHOPUR	264200	764600	UDAIPUR	2	H	4B
GADHISAR LAKE	JAISALMER	265500	705500	JAISALMER	4	H	3A
GAJNER (PALACE & VILLAGE) TANK	BIKANER	275800	733100	BIKANER	3	L	3A
GAMBHIRI DAM	CHITTAURGARH	244100	744400	CHITTAURGARH	3	M	4B
GHOSUNDA DAM	CHITTAURGARH	245100	743200	CHITTAURGARH	4	L	4B
JAISAMANAD	ALWAR	272900	763400	ALWAR	4	M	4B
JAITPUR VILLAGE TANK	BUNDI	253900	755800	BUNDI	3	L	4B
JAWAI DAM	PALI	256100	739400	PALI	1	M	4B
JAWAJA LAKE	AJMER	263400	744600	AJMER	4	L	4B
KALAKHO	JAIPUR	265400	762700	DAUSA	4	L	4B
KAYLANA & TAKHAT SAGAR	JODHPUR	261700	725600	JODHPUR	2	M	3A
KHAJURIYA LAKE	BANASWARA	233500	741000	BANASWARA	4	L	4B
KHARDA DAM	PALI	254500	732000	PALI	1	M	4B
MANASAROVAR	ALWAR	271500	762300	ALWAR	3	M	4B
MANGALSAR	ALWAR	271300	762900	ALWAR	4	L	4B
MANSAGAR LAKE	JAIPUR	265800	755100	JAIPUR	2	L	4B
MANSAROVER(TAHALA)	SAWAI MADHOPUR	263800	763700	SAWAIMADHOPUR	2	N.A.	4B
NAKKI LAKE	SIROHI	243600	724200	SIROHI	4	L	4B
PARVATI SAGAR	DHAULPUR	263600	772600	DHAULPUR	3	H	4B
PATELA (TALWARA) LAKE	BANASWARA	233400	741900	BANASWARA	3	L	4B
PICHHOLA LAKE	UDAIPUR	243600	734000	UDAIPUR	4	L	4B
RAJSAMAND LAKE	RAJSAMNAD	255000	736300	RAJSAMNAD	2	M	4B
RAMSAGAR BANDH (HIRDOLI)	BUNDI	253600	753000	BUNDI	3	N.A.	4B
RAMSAGAR LAKE	ALWAR	271100	763000	DHAULPUR	4	H	4B
RANAKPUR DAM	PALI	254800	732800	PALI	1	H	4B
RMC CANAL	KOTA	250811	760911	KOTA	2	H	4B
RMC CANAL SEEPAGES	KOTA	250944	755251	KOTA	2	H	4B
SABLA LAKE	DUNGARPUR	235000	734200	DUNGARPUR	3	L	4B
SAINTHAL	JAIPUR	272000	761500	DAUSA	3	L	4B
SARDAR SAMANAD	JODHPUR	261800	724800	JODHPUR	1	M	3A
SARERI BANDH	BHILWARA	253800	742600	BHILWARA	4	M	4B
SEI DAM	SIROHI	243800	730900	SIROHI	4	M	4B
SURWAL	SAWAI MADHOPUR	260500	762000	SWAI MADHOPUR	4	M	4B
SURWANIA LAKE	BANASWARA	232800	742200	BANASWARA	4	L	4B
TALABESHAHI	DHAULPUR	263600	773400	DHAULPUR	4	H	4B
UMMED SAGAR (SHAHPURA)	BHILWARA	253400	745400	BHILWARA	1	M	4B
UMMEDGANJ TANK	KOTA	254200	755500	KOTA	4	L	4B
WEST BANAS DAM(SARUPGANJ)	SIROHI	244400	725800	SIROHI	2	M	4B

V.S. Vijayan

Note:- N.A.-Not Available/Data Deficient; L-Low,M-Medium,H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Acharya

SIKKIM

SIKKIM

Habitat features

Sikkim has 160 wetlands of 2.25 ha and above, covering an area of 19.85 km^2. The state has only lakes/ponds (SRSAC & SAC, 1998). The wetlands constitute 0.28% of the total geographic area of the state.

Among the lakes, there are three categories, namely valley lakes, tectonic/landslide lakes and glacial lakes.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	4	15	19	N.A.	N.A.
Turtles	N.A.	N .A.	N.A.	1	N.A.	1	1
Birds	N.A.	N.A.	N.A.	N.A.	2	N.A.	N.A.

Prioritized Sites

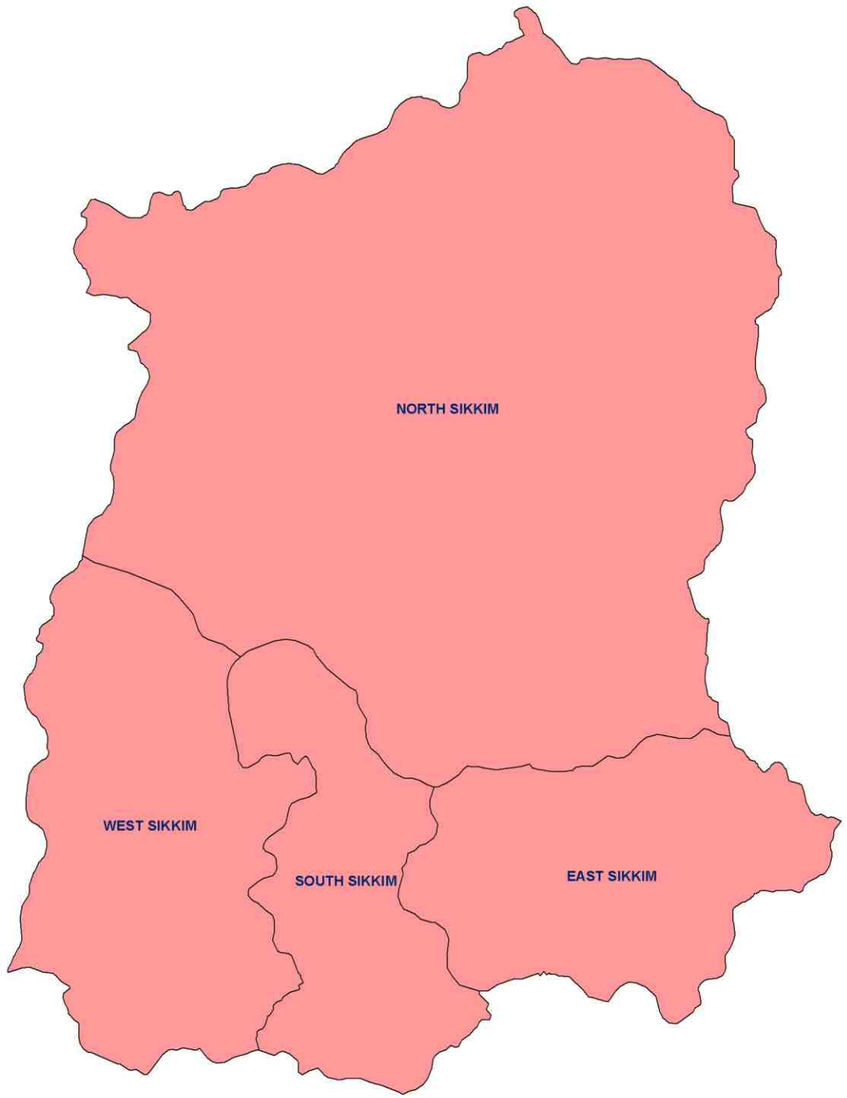
Number of Prioritized Wetlands	Rank 1	Rank 2
4	2	2

Thepley Tso and Khechiperi wetlands are qualified to be declared as Ramsar sites (page 215).

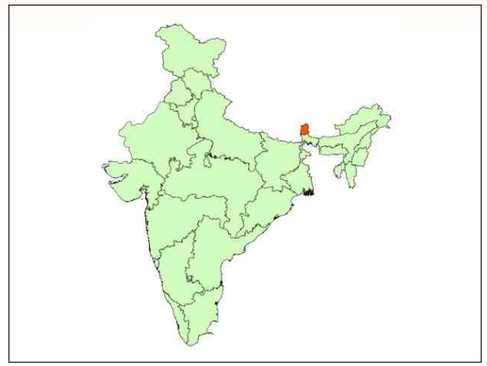


G.S. Rawat

A profile of wetlands in Sikkim



Aerial extent of wetland cover



Per cent geographic area under wetlands

- 0.0-0.5
- 0.5-1.0
- 1.0-1.5
- 1.5-2.0
- >2.0

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
EAST	954.00	1.20	0.13
NORTH	4226.00	18.07	0.42
SOUTH	750.00	N.A.	0.00
WEST	1166.00	0.56	0.05

Maps not to scale

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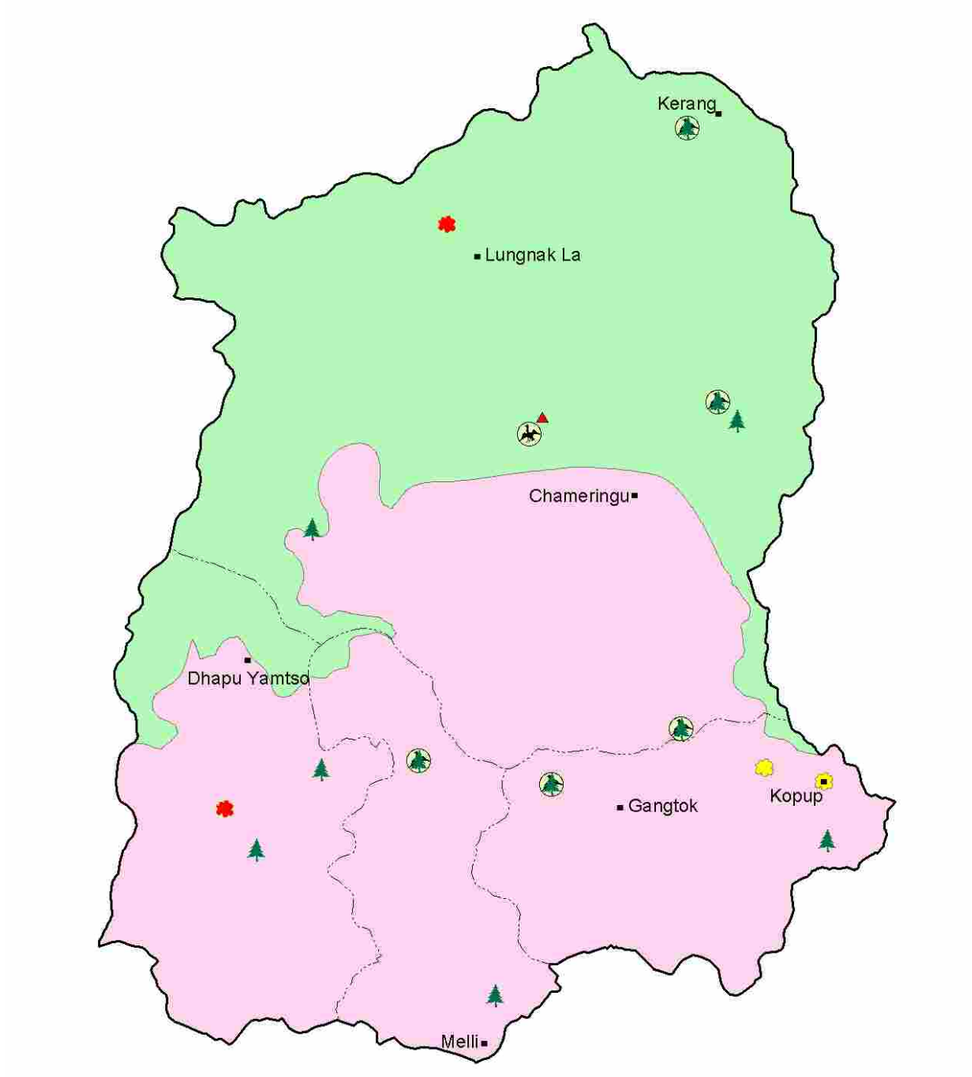
Prioritized inland wetlands of Sikkim



Prioritized Wetland

- *Rank 1*
- *Rank 2*

- *Important Bird Areas*
- *Wildlife Sanctuaries & National Parks*
- *BCCP Sites*

Biogeographic Provinces

- *1B, Trans Himalaya-Tibetan Plateau*
- *2C, Himalaya-Central Himalaya*
- *District Boundaries*

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Sikkim

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	BIODIVERSITY RANK	BIO-GEOGRAPHIC PROVINCE
BATANGCHO/BITANGCHO	EAST SIKKIM	272100	885100	2	2C
KHECHIPERI	WEST SIKKIM	272100	881000	1	2C
THEPLEY TSO	NORTH SIKKIM	275600	882700	1	1B
TSOMGO LAKE	EAST SIKKIM	272200	884700	2	2C



Anwaruddin Chaudhary

Note:-Nearest town and socio-economic use grade are not available.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Acharya

TAMIL NADU

TAMIL NADU

Habitat features

Tamil Nadu has 1615.11 km^2 (IRS & SAC, 1998) area under wetlands constituting 1.24% of the total geographic area of the state. It includes 1175 wetlands of the size 56.25 ha and above.

According to an estimate, the number of wetlands of the size two ha and above in the eight select districts are 4779, covering an area of 731.72 km^2. These are shown in pages 162 to 169. Ponds/ lakes outnumber all other types of wetlands. However, reservoirs cover large extent. Turbidity is low in reservoirs, whereas it is medium to high in ponds/ lakes.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	46	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	3	14	18	35	N.A.	N.A.
Turtles	N.A.	N.A.	3	1	N.A.	1	1
Birds	N.A.	N.A.	N.A.	N.A.	3	5	N.A.

Prioritized Sites

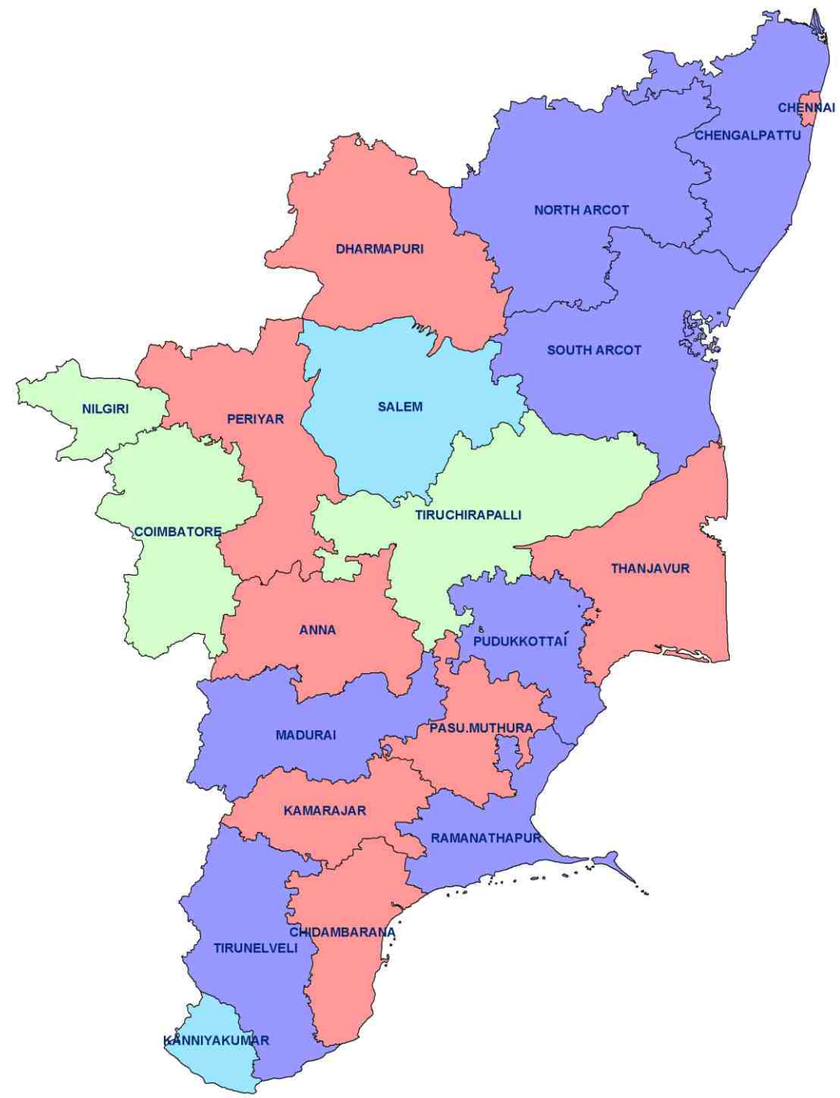
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
49	5	10	19	15

Five wetlands are qualified to be declared as Ramsar sites (page 215).

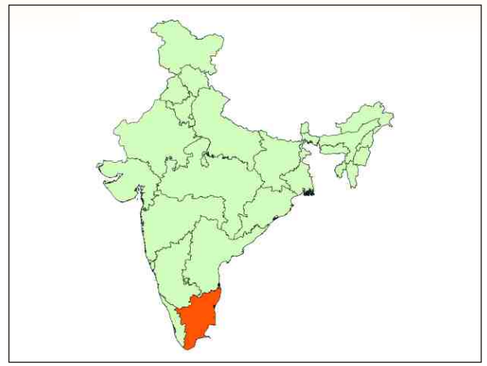


Ameen Ahmed

A profile of wetlands in Tamil Nadu



Aerial extent of wetland cover



DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
ANNA	6163.70	N.A.	0.00
CHENGALPATTU	7887.00	223.67	2.84
CHENNAI	174.00	N.A.	0.00
CHIDAMBARANAR	N.A.	N.A.	0.00
COIMBATORE	7469.00	104.23	1.40
DHARMAPURI	9622.00	27.28	0.28
KAMARAJAR	N.A.	N.A.	0.00
KANNIYAKUMARI	1684.00	29.63	1.76
MADURAI	3497.80	103.78	2.97
NILGIRI	2549.00	27.31	1.07
NORTH ARCOT	6077.00	132.99	2.19
PASU.MUTHURAMALINGAM	N.A.	N.A.	0.00
PERIYAR	8209.00	N.A.	0.00
PUDUKKOTTAI	4651.00	251.54	5.41
RAMANATHAPURAM	4129.00	132.16	3.20
SALEM	5219.6	92.90	1.78
SOUTH ARCOT	3645.00	126.82	3.48
THANJAVUR	3396.60	116.18	3.42
TIRUCHIRAPPALLI	4403.80	60.25	1.37
TIRUNELVELI KATTABOM	6810.00	186.37	2.74

Maps not to scale

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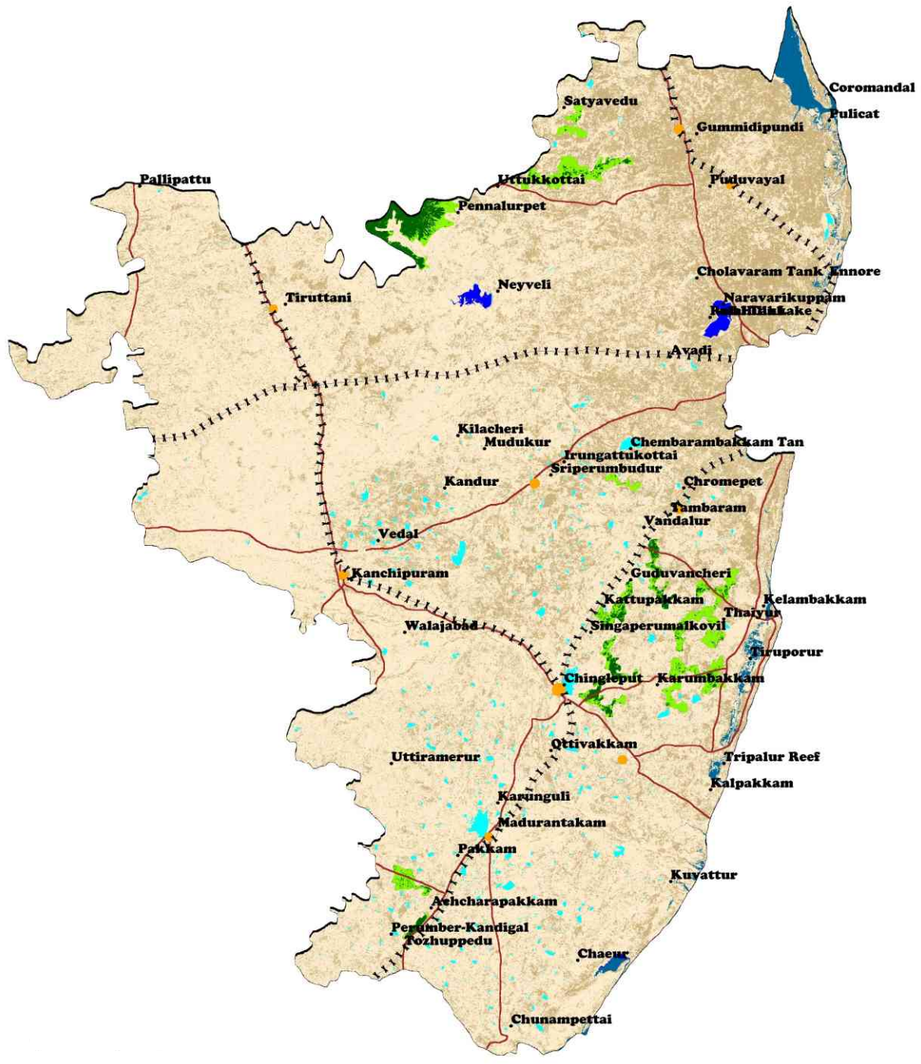
Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	Reservoir	Coastal-water	NP Others	Taluks/Tehsil Boundary
Open Forest	Township	NP Water-logged	NP Marsh/Mud	Roads	District Boundary
Arable Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railways	NP * Not Present

Maps not to scale

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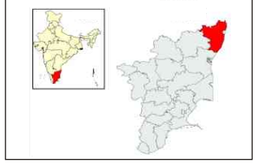
District Chengalpet, Tamilnadu

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (February 2001)

Wetland type and turbidity



Legend — Wetland — Turbidity

Wetland type and aquatic vegetation

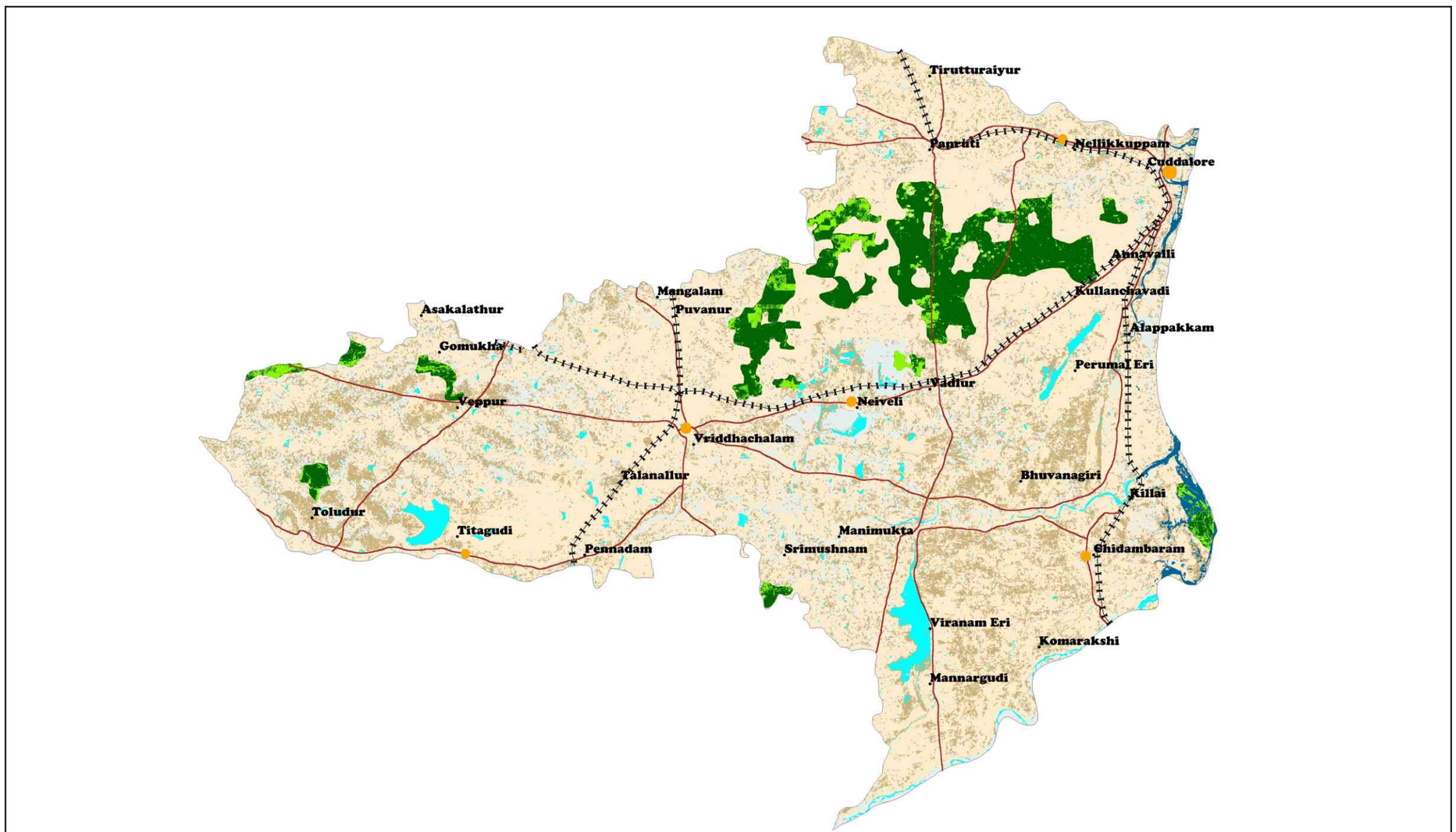


Legend — Wetland — Aquatic Vegetation

Regional Remote Sensing Service Centre, Banglore and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map

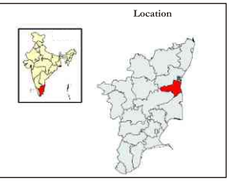
District Cuddalore, Tamilnadu



Integrated wetland type and land use

Dense Forest	Waste Land	Sand	Oxbow Lake/Cut-off	Railways	District Boundary
Open Forest	River	Pond/Tank	Water-logged	Roads	* Not Present
Arable Land	Township	Reservoir	Coastal-water	Taluks/Tehsil Boundary	

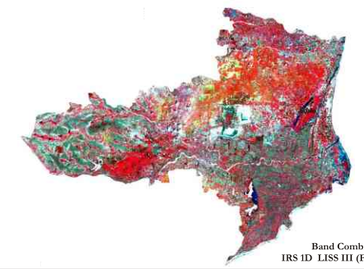
Location



Taluks/Tehsils

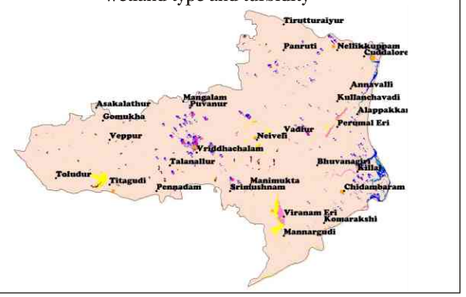


False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (February 2001)

Wetland type and turbidity



Legend	Wetland	Turbidity		
		Low	Medium	High
Ponds/Tank				
Reservoir	NP	NP	NP	NP
Water-logged	NP	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP	NP
Coastal water				

Wetland type and aquatic vegetation

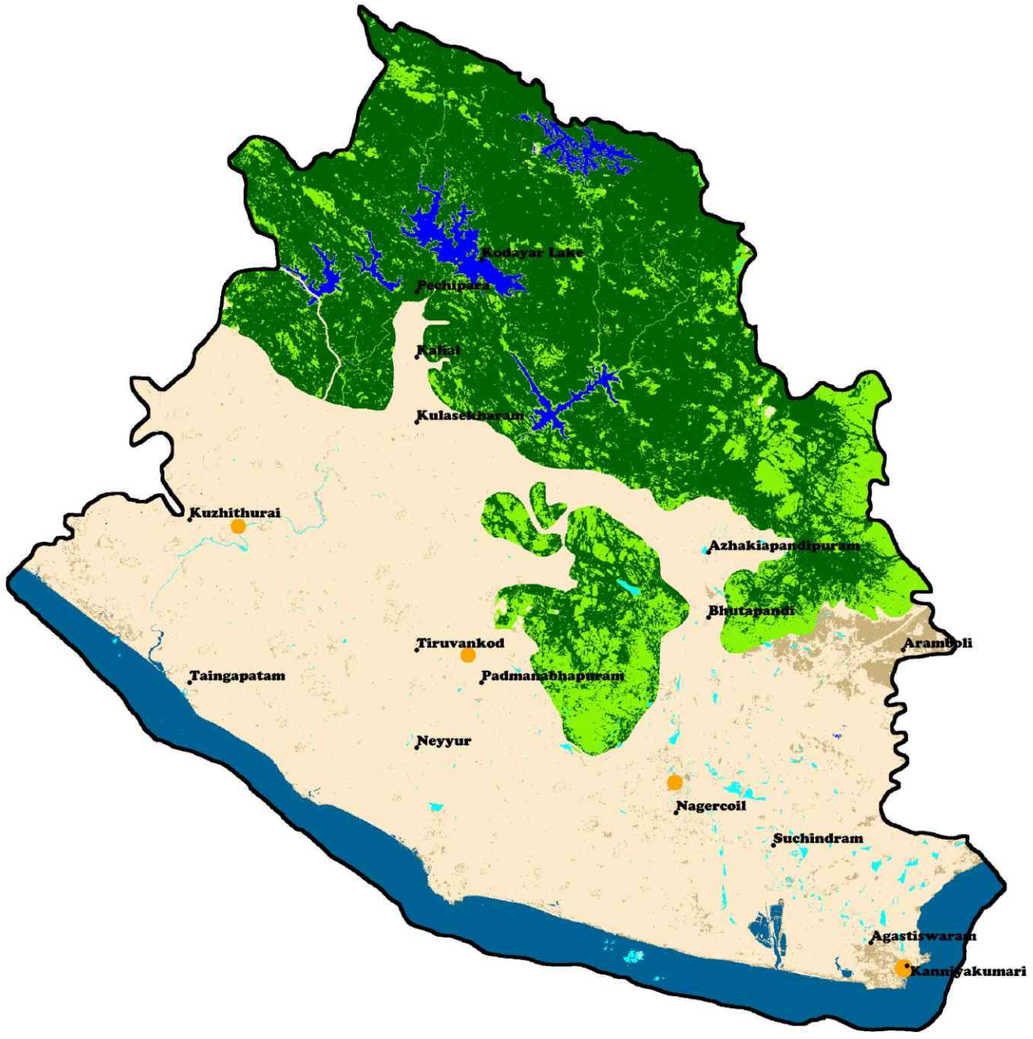


Legend	Wetland	Aquatic Vegetation		
		Low	Medium	High
Ponds/Tank				NP
Reservoir	NP	NP	NP	NP
Water-logged	NP	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP	NP
Coastal Water				NP

Maps not to scale

©SACON 2004

Integrated wetland and land use map



Integrated wetland type and land use

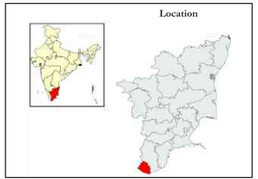
Dense Forest	Waste Land	Reservoir	Coastal-water	NP Others	District Boundary
Open Forest	Township	NP Water-logged	NP Marsh/Mud	Roads	NP * Not Present
Arable Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Taluks/Tehsil Boundary	

Maps not to scale

©SACON 2004

District Kanyakumari, Tamilnadu

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (December 1999)

Wetland type and turbidity



Legend Wetland Turbidity



Wetland type and aquatic vegetation

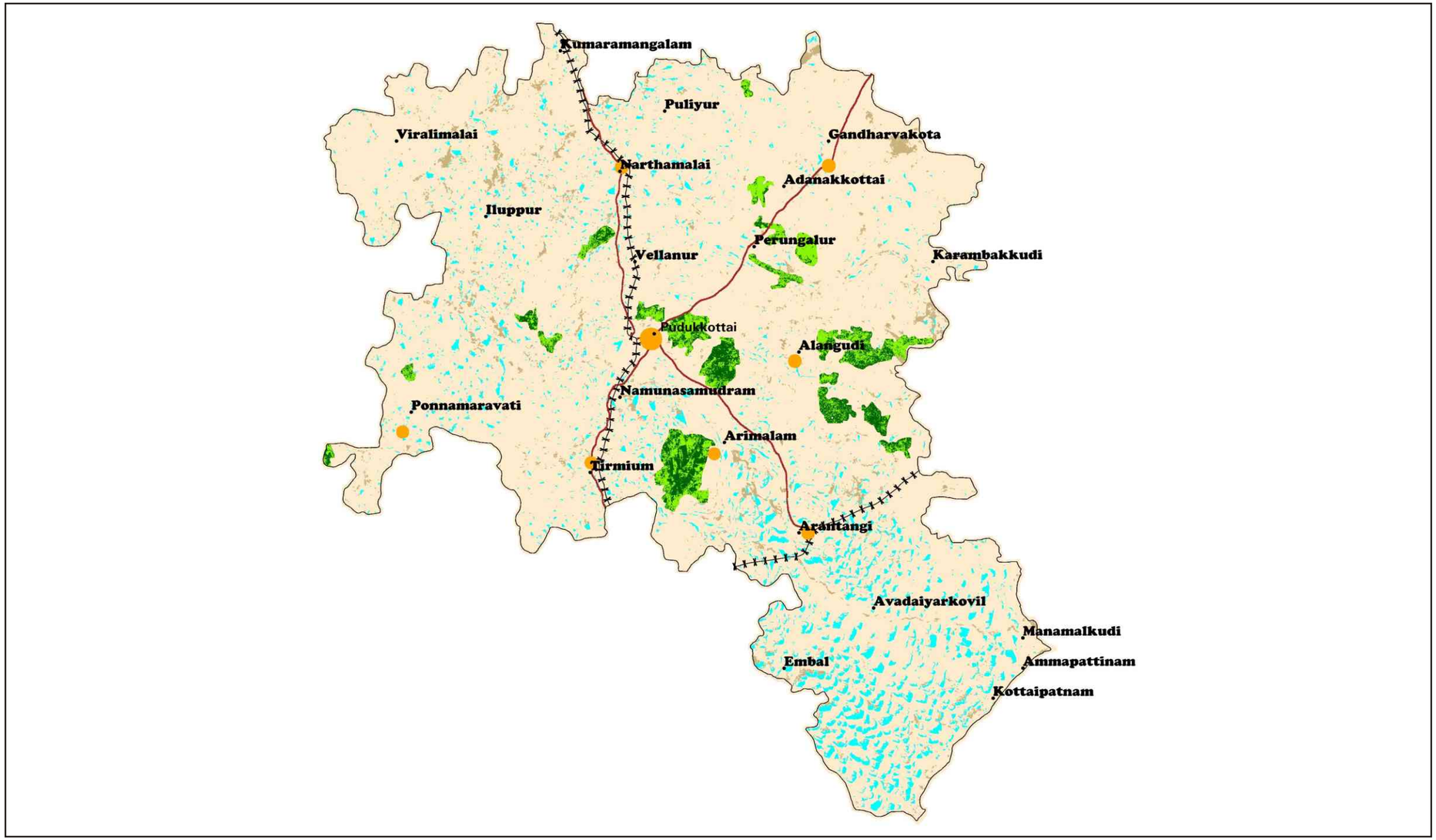


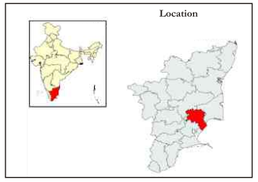
Legend Wetland Aquatic Vegetation

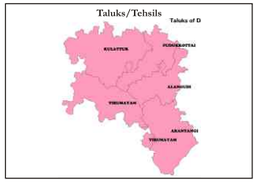


Integrated wetland and land use map

District Puddukottai, Tamilnadu







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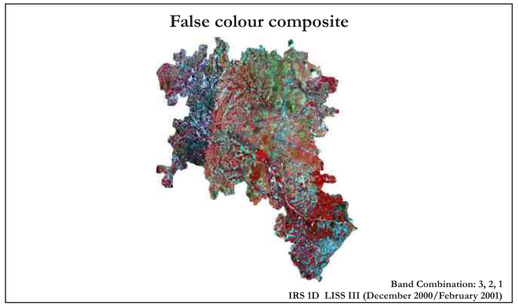
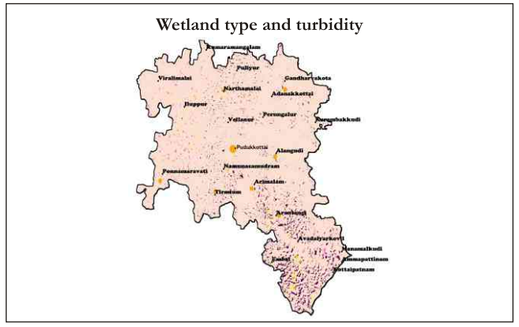
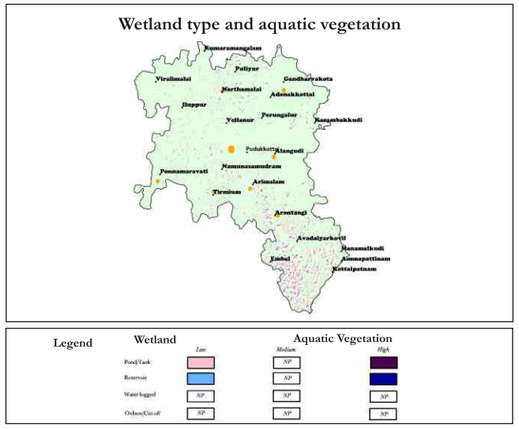


Wetland type and turbidity



Wetland type and aquatic vegetation



Integrated wetland type and land use

Dense Forest	Waste Land	NP Reservoir	NP Coastal-water	NP Others	Taluks/Tehsil Boundary
Open Forest	Township	NP Water-logged	NP Marsh/Mud	Roads	District Boundary
Arable Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railways	NP * Not Present

Maps not to scale

Regional Remote Sensing Service Centre, Banglore and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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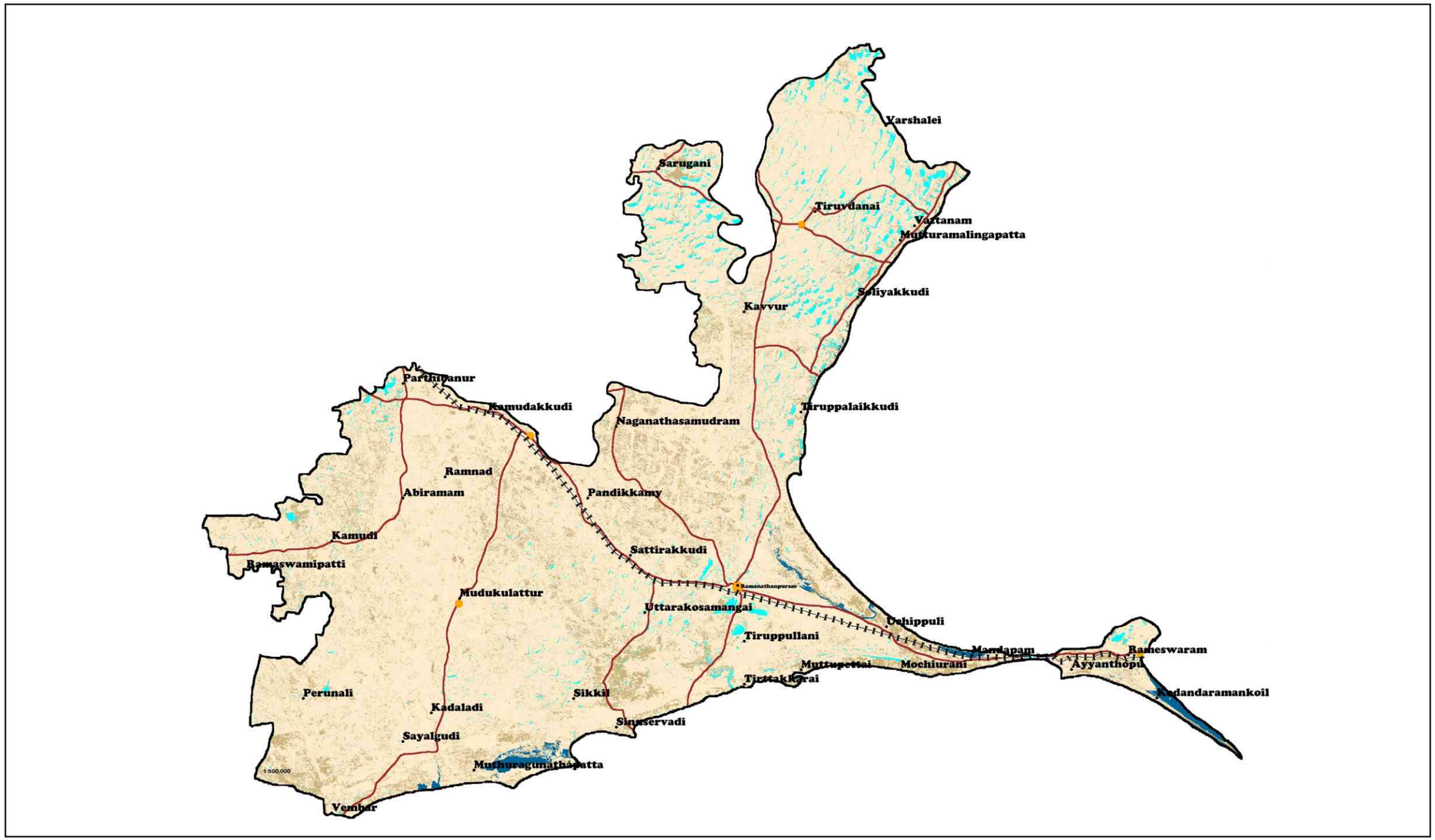
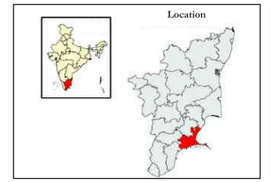
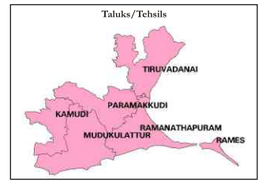
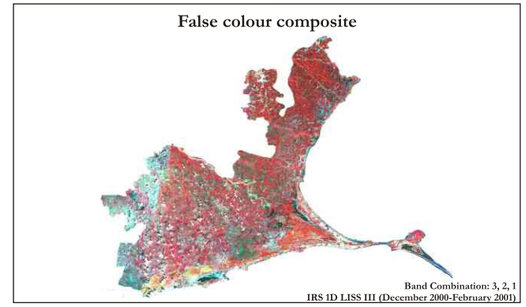
Integrated wetland and land use map

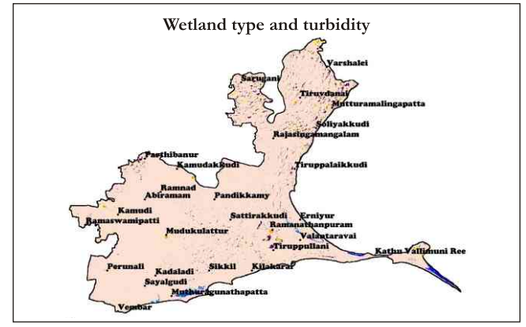
District Ramanathapuram, Tamilnadu

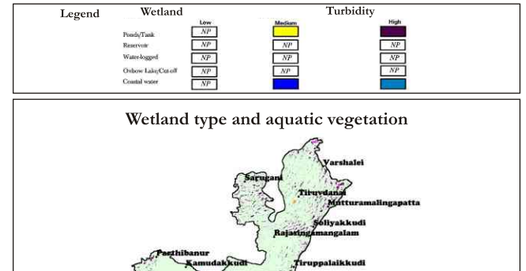












Integrated wetland type and land use

NP Dense Forest	Waste Land	NP Reservoir	Coastal-water	NP Others	District Boundary
NP Open Forest	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary
Arable Land	Pond/Tank	NP Water-logged	NP Sand	Railways	NP * Not Present

Maps not to scale

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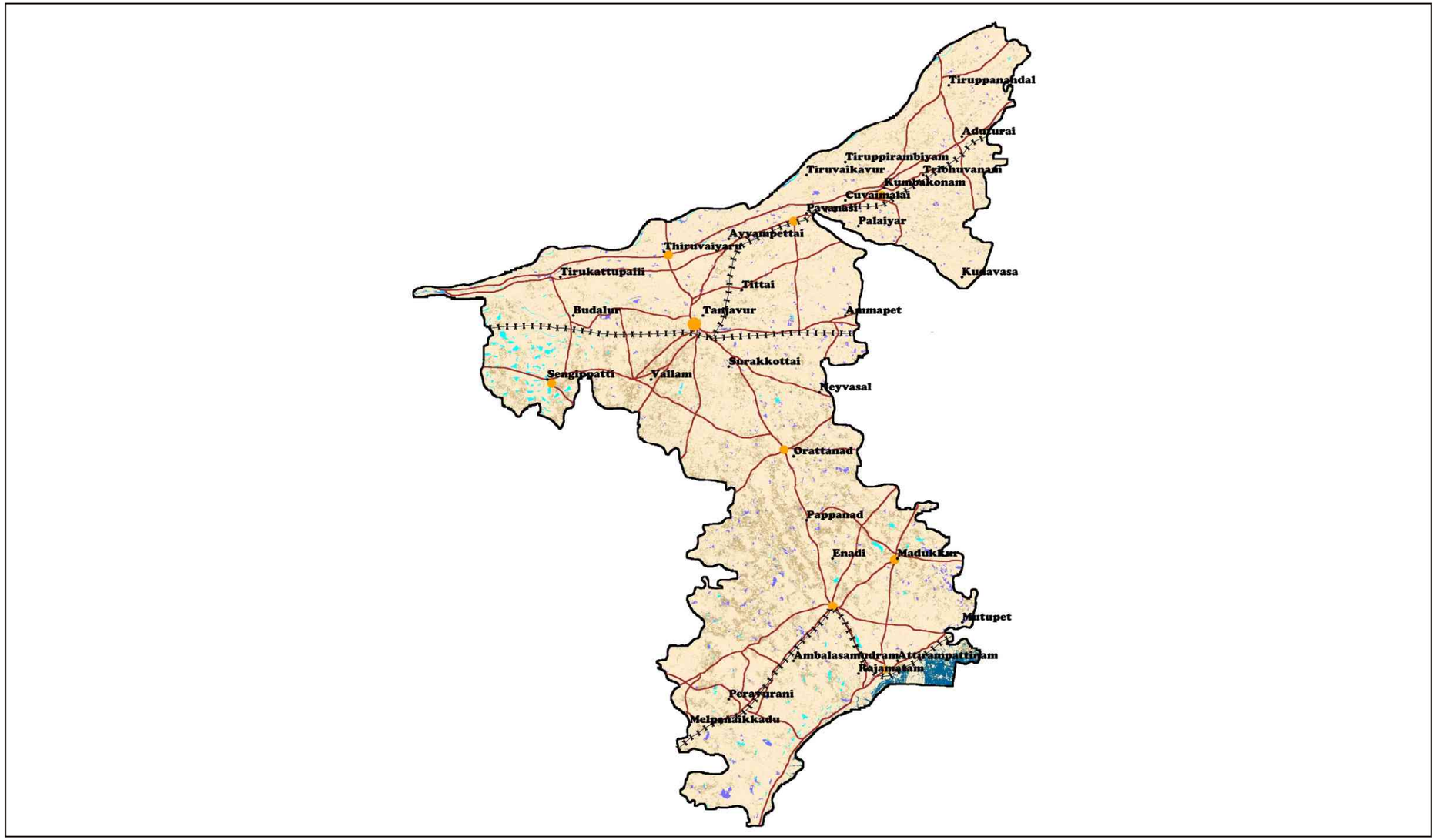
Integrated wetland and land use map

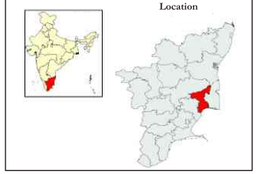
District Thanjavur, Tamilnadu



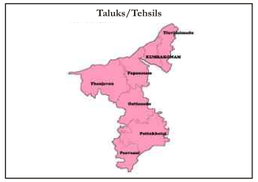
Integrated wetland type and land use

NP Dense Forest	Waste Land	NP Reservoir	Coastal-water	NP Others	Taluks/Tehsil Boundary
NP Open Forest	Township	Water-logged	NP Marsh/Mud	Roads	District Boundary
Arable Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railways	NP * Not Present

Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1D LISS III (February 2001)

Wetland type and turbidity



Legend Wetland Turbidity

Wetland	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Waterlogged			
Oxbow	NP	NP	NP
Coastal-water	NP		

Wetland type and aquatic vegetation



Legend Wetland Aquatic Vegetation

Wetland	Low	Medium	High
Pond/Tank		NP	NP
Reservoir	NP	NP	NP
Waterlogged			
Oxbow	NP	NP	NP
Coastal-water		NP	NP

Maps not to scale

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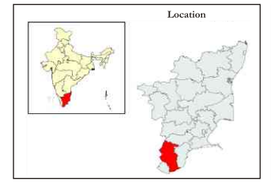
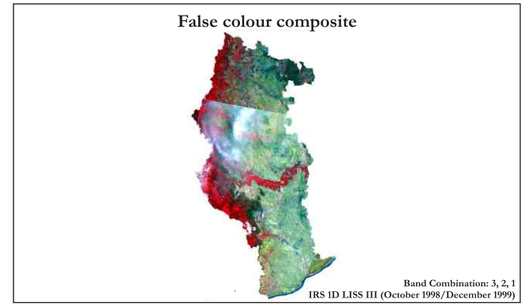
Integrated wetland and land use map

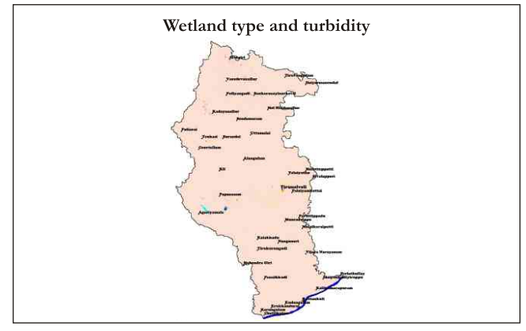
District Tirunelveli, Tamilnadu



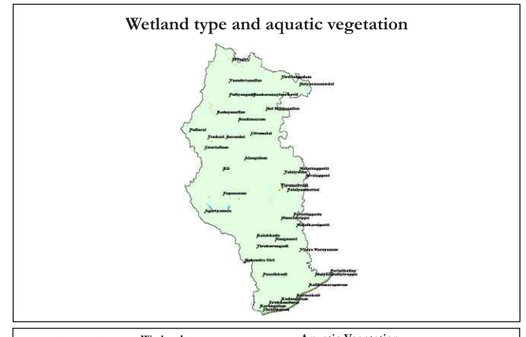














Integrated wetland type and land use

Dense Forest	Waste Land	Reservoir	Coastal-water	NP Others	Taluks/Tehsil Boundary
Open Forest	Township	NP Water-logged	NP Marsh/Mud	Roads	District Boundary
Arable Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railways	NP * Not Present

Maps not to scale

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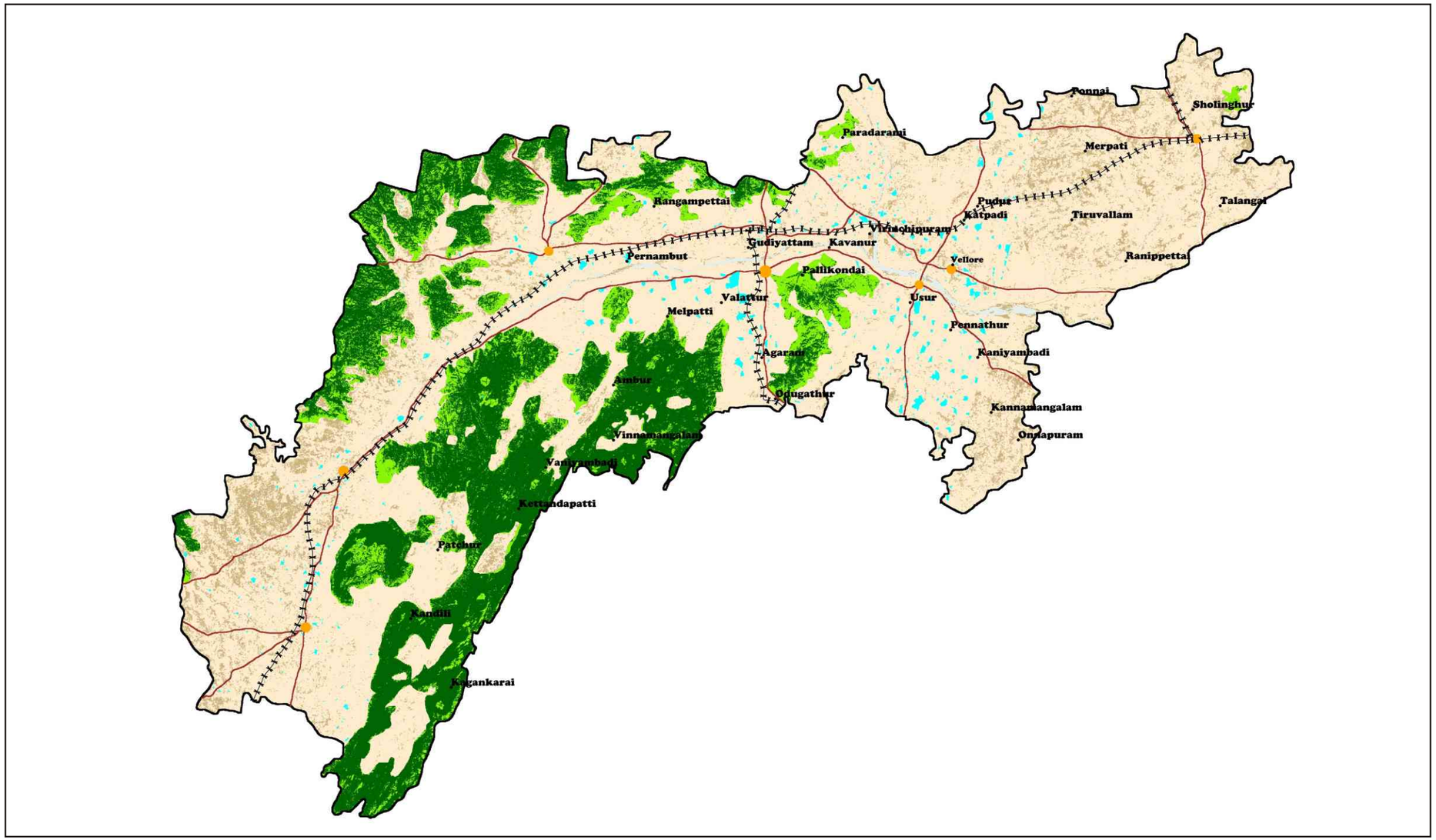
Integrated wetland and land use map

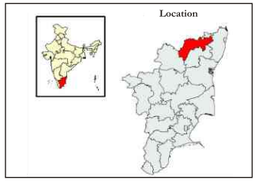
District Vellore, Tamilnadu



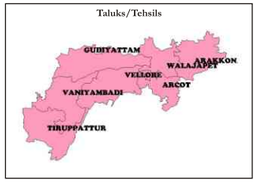
Integrated wetland type and land use

Dense Forest	Waste Land	NP Reservoir	NP Coastal-water	Sand	District Boundary
Open Forest	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Taluks/Tehsil Boundary
Arable Land	Pond/Tank	NP Water-logged	NP Others	Railways	NP * Not Present

Location



Taluks/Tehsils

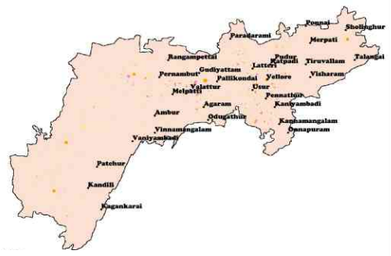


False colour composite



and Combination: 3, 2, 1
III (February 1999-2001)

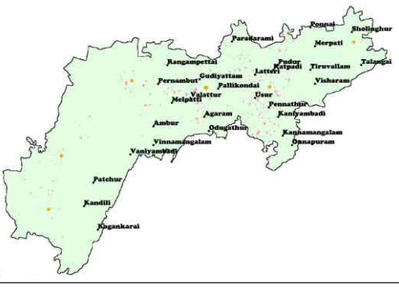
Wetland type and turbidity



Legend

Wetland	Turbidity: Low	Medium	High
Ponds/Tank		NP	NP
Reservoir	NP	NP	NP
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP
Coastal water	NP	NP	NP

Wetland type and aquatic vegetation



Legend

Wetland	Aquatic Vegetation: Low	Medium	High
Ponds/Tank		NP	NP
Reservoir	NP	NP	NP
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP
Coastal Water	NP	NP	NP

Maps not to scale

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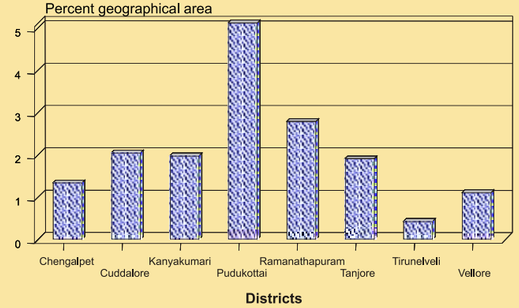
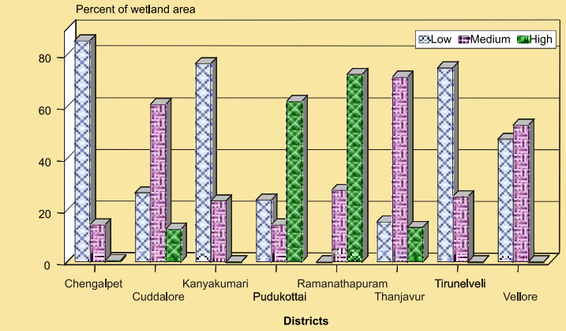


Area under wetland in select districts

Attributes of wetlands and environmental contamination

Wetlands

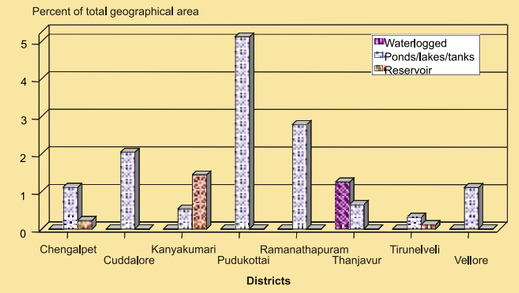
The area under wetland in the eight districts ranges between 0.42% (Tirunelveli) and 5.11% (Pudukkottai). Three categories of wetlands are found, namely ponds/lakes, reservoirs and waterlogged areas. Waterlogged category is the dominating type of wetland in Thanjavur district, whereas it is reservoir in Kanyakumari district. All other districts have more ponds/lakes. It is striking that all the districts have smaller wetlands (smaller than 56.25 ha.) several times more than the larger ones.



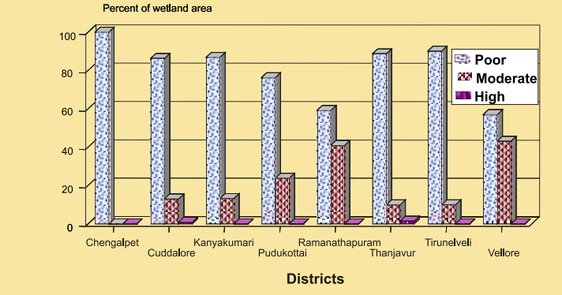
Turbidity pattern in select districts

Turbidity

Among the wetlands of the districts studied in Tamil Nadu, those in three districts, namely Chengalpet, Kanyakumari and Tirunelveli have low turbidity.Thanjavur, Vellore and Cuddalore districts have high proportion of wetlands under medium turbidity.



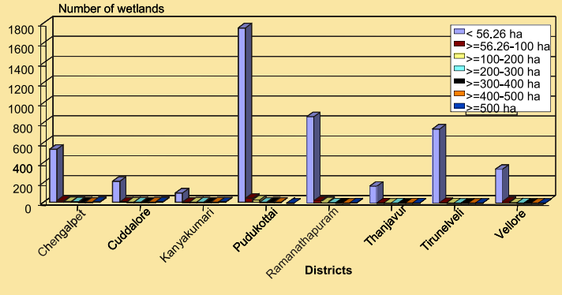
Area under different wetland classes in select districts



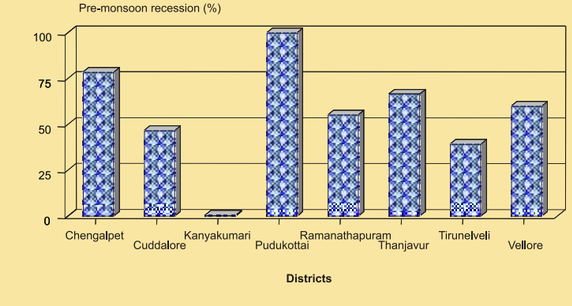
Aquatic vegetation in different wetlands in select districts

Summer recession of water

Summer recession of water varied from 0.56% in Kanyakumari to 100% in Pudukkottai. In all other districts, excepting Tirunelveli, the recession is between 50-80%. Such a landscape level recession will have its bearing on the aquatic birds fully dependent on wetlands.



Size class distribution in select districts



Average summer recession in select districts

Ameen Ahmed

Maps not to scale

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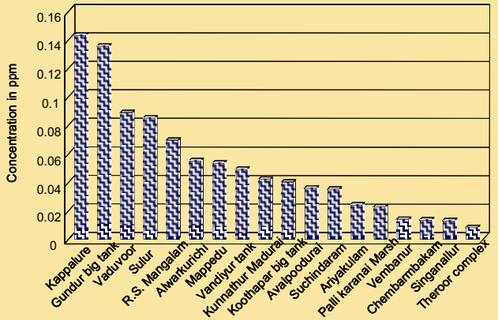


Total organochlorine residues among select wetlands

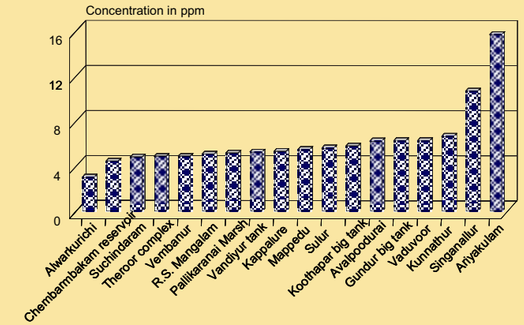
Attributes of wetlands and environmental contamination

Heavy metals

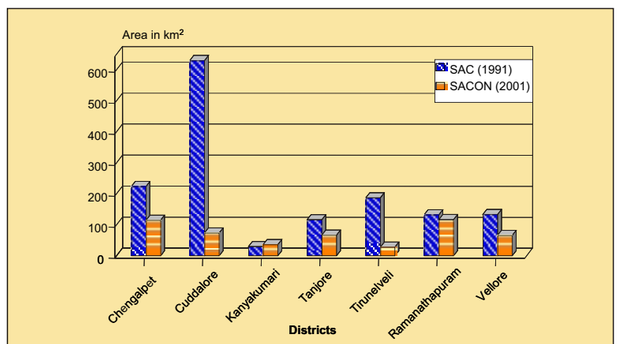
Among all the wetlands, Ariyakulam of Tirunelveli district has the highest concentrations of lead followed by Singanallur of Coimbatore district. Fishes such as *Heteropneustes fossilis, Puntius dorsalis* and *Oreochromis mossambicus* exceeded the lead levels stipulated for human consumption. Regular consumption of these fishes may create conspicuous physiological complications in the consumers. The other metals are found to be within the tolerable limits. Significant differences are observed in the contamination level of copper, zinc, lead and cadmium among the wetlands.

Pesticides

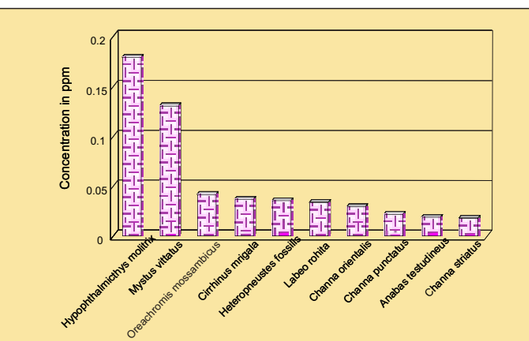
Pesticides among the wetlands reveal that fishes from Kappalur of Tiruvannamalai district have maximum load of total organochlorine residues followed by Gundur big tank of Tiruchirapalli district and Vaduvoor of Mannarkudi. The least concentrations are recorded in Theroor complex in Kanyakumari district. Of the various species analyzed for organochlorine residues, *Hypophthalmicthys molitrix* has the maximum residues followed by *Mystus vittatus,* while low concentrations are recorded in *Anabas testudineus* and *Channa striatus.* Variation in organochlorine residues among the wetlands appears to be significant. The annual pesticide consumption in Tamil Nadu is estimated at 1,685 mt. It is be noted that Tamil Nadu is the highest consumer of pesticides (1,120 g/ha), followed by Andhra Pradesh (1050 g/ha) and Haryana (900 g/ha).



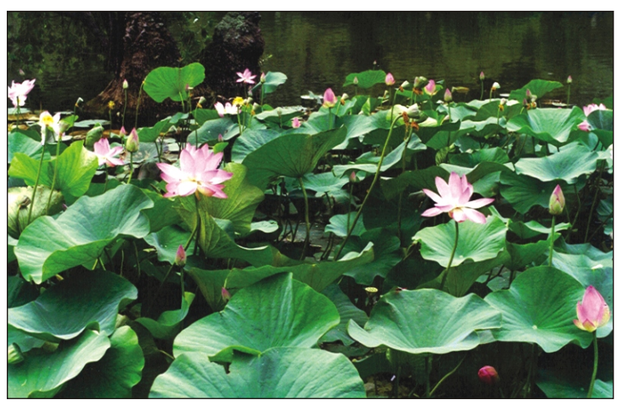
Lead contamination in select wetlands



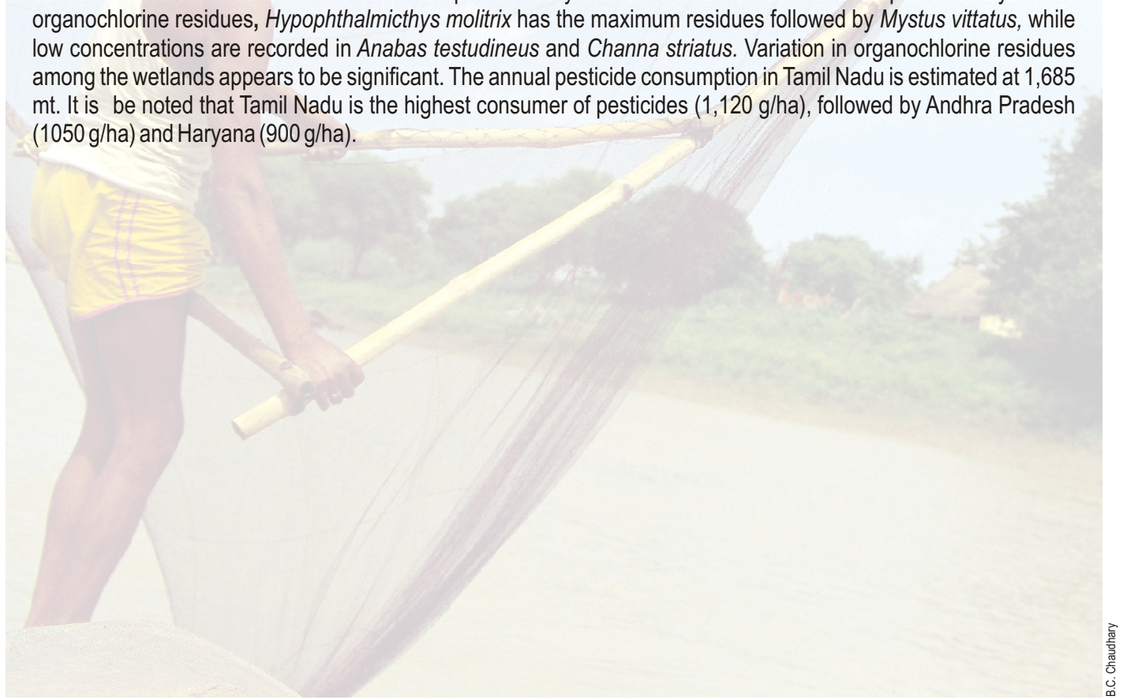
Difference in total wetland area (km²) in select districts



Total organochlorine residues among various fish species



S.K. Srivastava



B.C. Chaudhary



V.S. Vijayan

Maps not to scale

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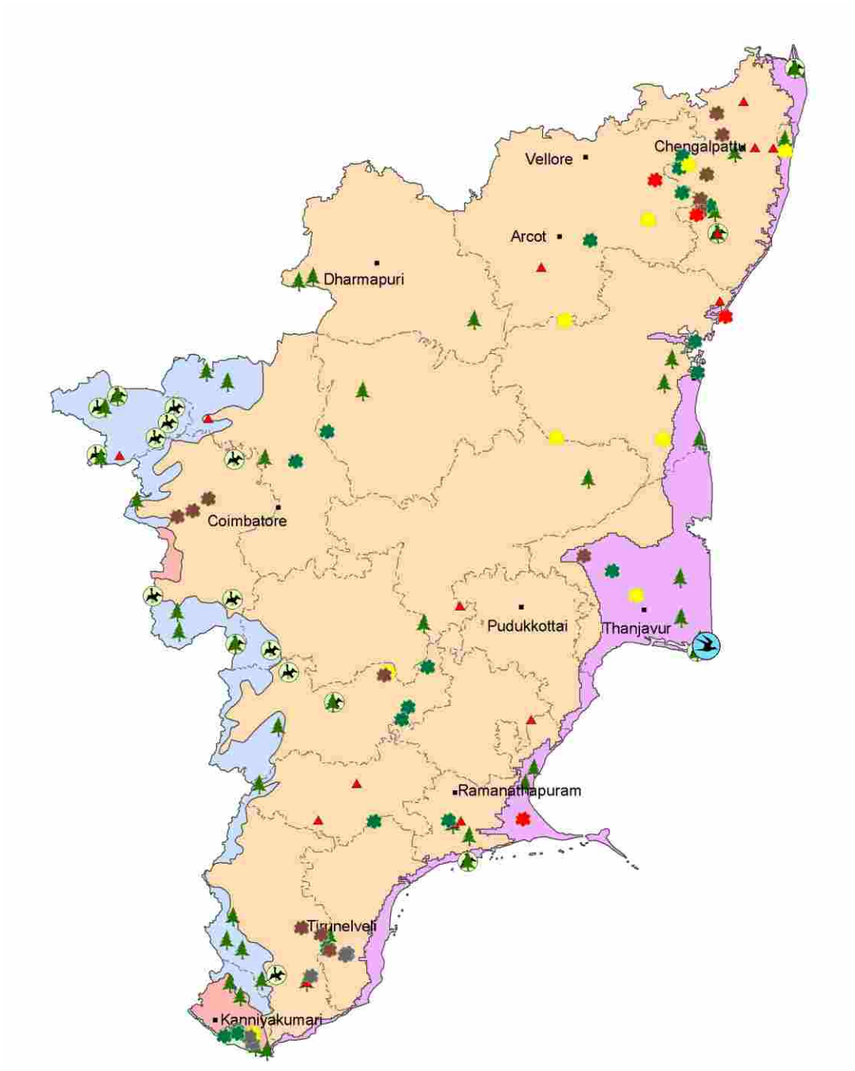
Prioritized inland wetlands of Tamilnadu



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *5A, Western Ghats-Malabar Plains*
- *5B, Western Ghats-Western Ghats Mountains*
- *6E, Deccan Peninsula-Deccan South*
- *8A, Coasts-West Coast*
- *8B, Coasts-East Coast*
- *District Boundaries*
- *Ramsar site*

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Tamilnadu

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ARAPAKKAM BIG AND SMALL TANKS	CHENGALPATTU	124300	794600	CHENGALPATTU	4	M	6E
ARIYAKULAM	TIRUNELVELI	084317	774758	PALAYAMKOTTAI	4	M	6E
AVAL POONDARAI	PERIYER	111500	773500	PERIYER	3	L	6E
BAHUR	PONDICHERRY	114800	794600	PONDICHERRY	3	M	6E
CHATHIRAMPUDUKULAM	TIRUNELVELI	084517	774143	RANIYAMPATTY	4	L	6E
CHEMABARAMBAKKAM	CHENGALPATTU	125900	801400	CHENNAI	2	H	6E
CHITRANGUDI	RAMANATHAPURAM	092100	782800	MUDUKULATHUR	3	M	6E
DUSIMAMANDOOR	TIRUVANNAMALAI	124500	794000	TIRUVANNAMALAI	3	M	6E
GOVINDAVADI	CHENGALPATTU	125700	794000	CHENGALPATTU	3	M	6E
GUNDUR BIG TANK	TIRUCHIRAPALI	100800	780700	TIRUCHIRAPALLI	2	M	6E
KALIVELI	CHENGALPATTU	120500	795500	MARAKANAM	1	M	8B
KALLAPERAMBER	THANJAVUR	104700	791000	THANJAVUR	4	M	6E
KAPPALUR	TIRUVANNAMALAI	122900	791000	POLUR	3	M	6E
KOONTHANKULAM SANCTUARY	TIRUNELVELLI	083000	774500	PALAYAMKOTTAI	2	M	6E
KOORAM	CHENGALPATTU	125300	793900	CHENGALPATTU	3	M	6E
KOOTHAPAR BIG TANK	TIRUCHIRAPALLI	100700	780600	TIRUCHIRAPALLI	4	M	6E
KOVAIPUDUR	COIMBATORE	105600	765700	COIMBATORE	4	L	6E
KUNNATHUR	MADURAI	095700	781400	MADURAI	3	M	6E
MAGAREL	CHENGALPATTU	124100	794900	CHENGALPATTU	3	M	6E
MANAVALAKURICHI KULAM	KANYAKUMARI	081000	771805	NEYYOOR	3	M	5A
MAPEDU PERIAERI	THIRUVELLUR	130400	795300	THIRUVELLUR	4	M	6E
MELAKULAM	TIRUNELVELI	083826	775046	SRIVAKINDAM	4	M	6E
OUSTERI	PONDICHERRY	115700	794500	PONDICHERRY	3	M	8B
PALLIKARNAI	CHENGALPATTU	125900	801400	VELACHERY	3	M	6E
PARANDUR	CHENGALPATTU	125400	794200	CHENGALPATTU	2	M	8B
PERIAKANMOI AND SAKKARAKOTTAI	RAMANATHAPURAM	092200	785200	RAMANATHAPURAM	1	M	6E
PONNUR	TIRUVANNAMALAI	120300	790200	VANDAVASI	2	M	8B
POONDI RESERVOIR	THIRUVELLUR	131100	795100	THIRUVELLUR	4	H	6E
R S MANGALAM	RAMANATHAPURAM	092200	785200	R S MANGALAM	4	M	6E
SIEDUNGANALLUR KULAM	TIRUNELVELI	083922	775012	SRIVAKINDAM	3	M	6E
SINGANALLUR	COIMBATORE	105800	770200	COIMBATORE	4	L	6E
SUCHINDRAKULAM COMPLEX	KANNIYAKUMARI	080900	772705	NAGERCOIL	1	M	5A
SULUR	COIMBATORE	110200	770700	COIMBATORE	4	M	6E
THENNAMPATTU	TIRUVANNAMALAI	124900	793100	CHEYYAR	1	M	6E
THEROOR WETLAND COMPLEX	KANYAKUMARI	081100	772700	NAGERCOIL	2	M	5A
THIRUMENI	THANJAVUR	103441	792676	MANNARGUDI	2	M	8B
THIRUPULIVANAM	CHENGALPATTU	123900	794600	UTHIRAMERUR	4	M	6E
UDAYAMARTHANDAPURAM	THIRUVARUR	104212	791912	N.A.	4	M	6E
UTHIRAKOSAMANGAI	RAMANATHAPURAM	092000	780400	N.A.	3	M	6E
UTHIRAMERUR	CHENGALPATTU	123800	794500	UTHIRAMERUR	1	M	6E
UTHUKADU	CHENGALPATTU	125100	794800	SUNGUVARICHATRAM	4	M	6E
VADUVOOR LAKE	THANJAVUR	104212	791912	N.A.	3	M	8B
VAKKADAI	TIRUVANNAMALAI	123600	792900	CHEYYAR	2	M	6E
VANDIYOOR	MADURAI	095300	781200	MADURAI	3	M	6E
VEERANAM TANK	SOUTH ARCOT	112500	793500	CHIDAMBARAM	2	H	6E
VELLODE	PERIYER	112500	774500	ERODE	3	L	6E
VEMBANUR WETLAND COMPLEX	KANNIYAKUMARI	081100	772205	NAGERCOIL	3	M	5A
VETANGUDI	SIVAGANGA	101000	782000	MELUR	3	M	6E
WELLINGTON LAKE	SOUTH ARCOT	112500	790000	VIRUTHACHALAM	2	M	6E

V.S. Vijayan

Note:-N.A.-Not Available/Data Deficient; L-Low, M-Medium,H-High.

Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Parasanya

TRIPURA

TRIPURA

Habitat features

In Tripura, the SAC (1998) has reported 408 wetlands of 2.25 ha and above, covering a total area of 98.95 km^2. Thus, the wetlands constitute 0.94% of the total geographic area of the state.

There are six types of wetlands of which reservoirs cover the largest area but waterlogged wetlands are more in number.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	N.A.	2	12	14	N.A.	N.A.
Turtles	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Birds	N.A.	N.A.	N.A.	N.A.	N.A.	1	N.A.

Prioritized Sites

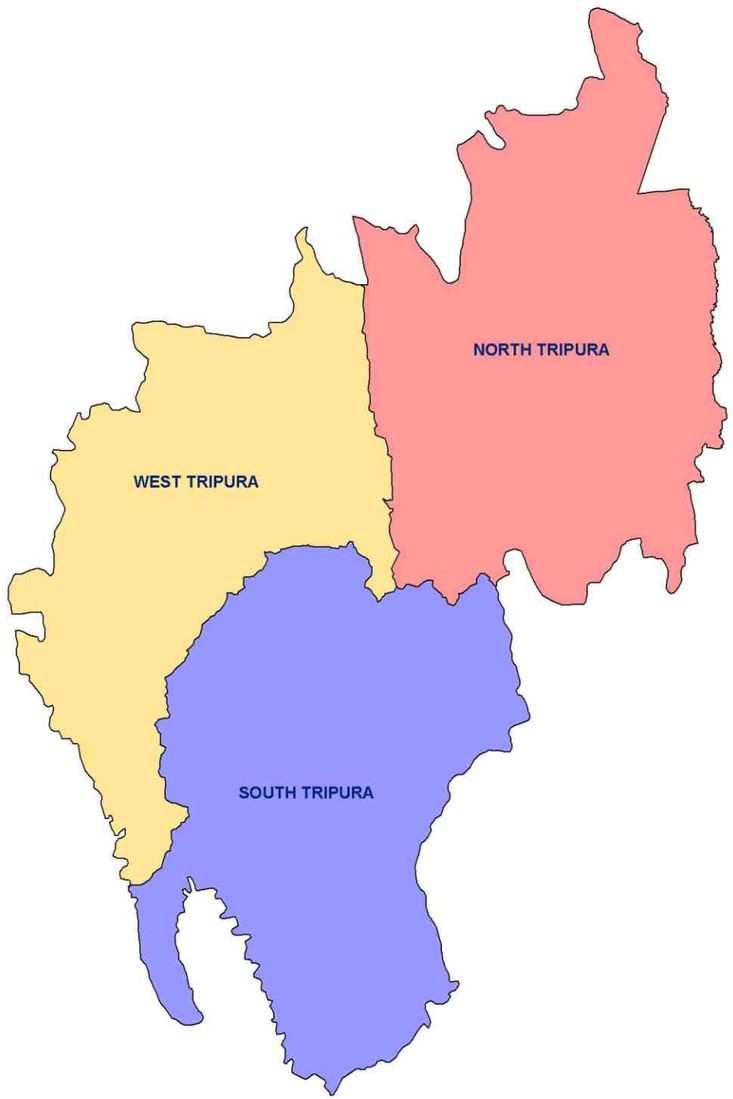
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3
7	2	3	2

Gumti Reservoir and Rudrasagar are qualified to be declared as Ramsar sites (page 215).

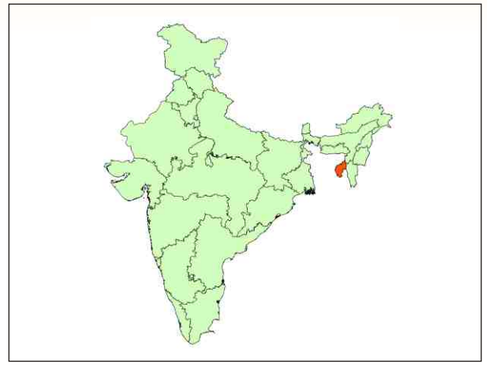


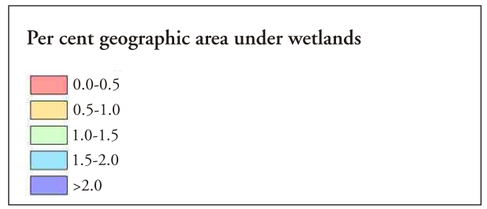
B. Sinha

A profile of wetlands in Tripura



Aerial extent of wetland cover





DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
North Tripura	4313	10.25	0.24
South Tripura	3140	67.95	2.16
West Tripura	3033	20.77	0.68

Maps not to scale

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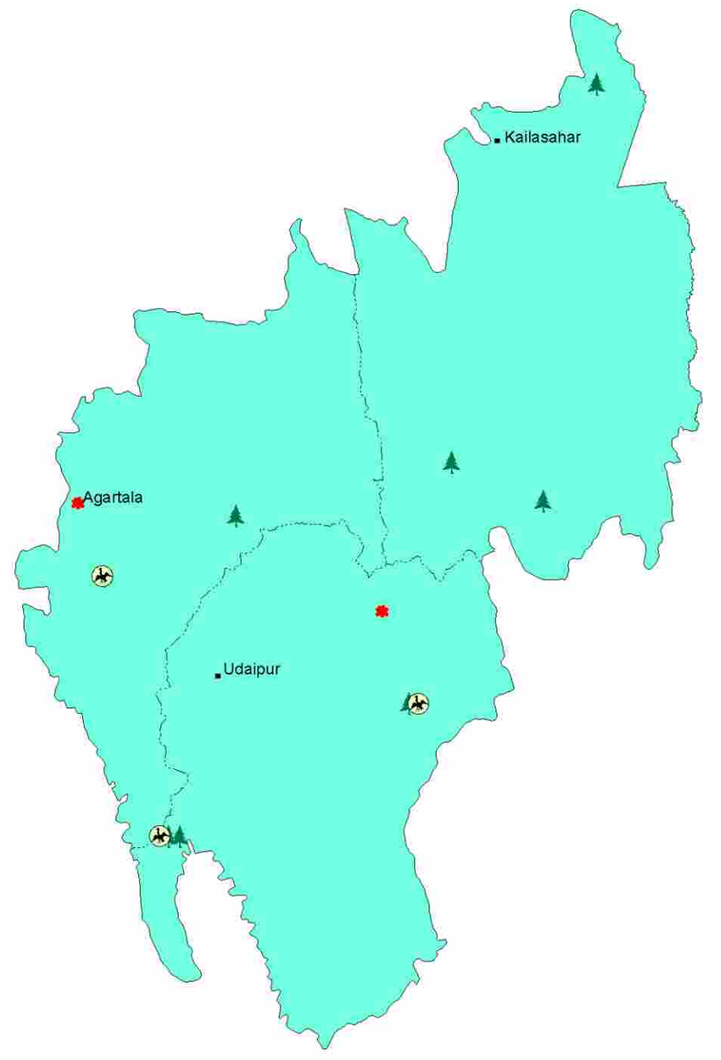
Prioritized inland wetlands of Tripura



Prioritized Wetland
- *Rank 1*

Important Bird Areas
Wildlife Sanctuaries & National Parks

Biogeographic Provinces
- *9B, North East-North East Hills*

District Boundaries

Maps not to scale

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Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Tripura

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
GUMTI RESERVOIR(DUMBUR LAKE)	WEST TRIPURA	233700	914600	AGARTALA	1	M	9B
RUDRASAGAR (NIRMAHAL)	SOUTH TRIPURA	234900	911600	UDAIPUR	1	M	9B

V.S. Vijayan

Note:- In Trishna wetlands, Sipahijala reservoir, Sattar Mia's Haor, Batapura lake and College Tilla lake information is not available; L-Low, M-Medium, H-High.



Acharya

UTTAR PRADESH & UTTARANCHAL

UTTAR PRADESH & UTTARANCHAL

Habitat features

The undivided state of Uttar Pradesh has 1193 wetlands of the size 56.25 ha and above, covering a total area of 3286.82 km^2 (RSACUP, 1996). Thus, the wetlands constitute 1.12% of the total geographic area of the state. Wetland distribution in forty-eight districts is given in pages 176 to 187.

In the seven select districts studied in 2001, the number of wetlands of the size two ha and above are 768, covering a total area of 1845.55 km^2. These are shown in pages 188 to 194. Four different types of wetland are present, including twenty-six reservoirs, covering 40% of the wetland area. Turbidity, as revealed by satellite imageries, is low in most of the wetlands. In general, aquatic vegetation is low in larger parts of the wetland area, although some of the wetlands have dense vegetation.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	3	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	3	8	22	33	N.A.	N.A.
Turtles	N.A.	1	2	7	N.A.	3	2
Birds	N.A.	N.A.	N.A.	N.A.	13	9	N.A.

Prioritized Sites

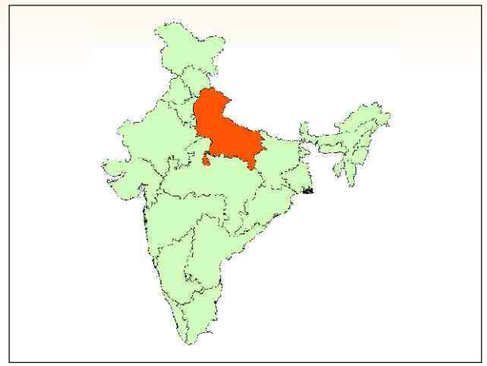
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
50	14	17	12	7

Twenty-five wetlands are qualified to be declared as Ramsar sites (page 215).



S.K. Srivastava

A profile of wetlands in Uttar Pradesh and Uttaranchal





Per cent geographic area under wetlands

- 0.0-0.5
- 0.5-1.0
- 1.0-1.5
- 1.5-2.0
- >2.0

Aerial extent of wetland cover

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
AGRA	4027	1.43	0.04
ALIGARH	5498	35.88	0.65
ALLAHABAD	7261	84.66	1.17
ALMORA	5385.3	N.A.	0.00
AZAMGARH	4210	38.49	0.91
BADAUN	5168	48.63	0.94
BAHRAICH	6877	134.55	1.96
BALLIA	2981	52.86	1.77
BANDA	7624	56.24	0.74
BARA BANKI	3825	62.78	1.64
BAREILLY	4120	11.31	0.27
BASTI	4476.1	70.83	1.58
BIJNOR	4561	41.19	0.90
BULANDSHAHR	3717.7	14.22	0.38
CHAMOLI	9504.4	N.A.	0.00
DEHRA DUN	3088	N.A.	0.00
DEORIA	5445	25.34	0.47
ETAH	4446	38.25	0.86
ETAWAH	4340.1	37.87	0.87
FAIZABAD	5136	21.33	0.42
FARRUKHABAD	4274	38.51	0.90
FATEHPUR	4152	35.78	0.86
FIROZABAD	2361	37.97	1.61
GARHWAL	5399	N.A.	0.00
GHAZIABAD	3224.4	16	0.50
GHAZIPUR	3377	64.5	1.91
GONDA	7352	53.3	0.72
GORAKHPUR	3321	46.92	1.41
HAMIRPUR	7166.1	1.57	0.02
HARDOI	5986	146.42	2.45
HARIDWAR	2360	3.7	0.16
JALAUN	4565	6.98	0.15
JAUNPUR	4038	23.7	0.59
JHANSI	5024	51.27	1.02
KANPUR DEHAT	3146	28.00	0.89
KANPUR NAGAR	3030	2.42	0.08
KHERI	7680	89.34	1.16
LALITPUR	5039	196.77	3.90
LUCKNOW	2528	20.81	0.82
MAINPURI	2746	56.23	2.05
MATHURA	3332	29.67	0.89
MAU	1713	48.79	2.85
MEERUT	3911	22.43	0.57
MIRZAPUR	4522	129.82	2.87
MORADABAD	3646.5	42.91	1.18
MUZAFFARNAGAR	4008	50.87	1.27
NAINI TAL	6768.8	N.A.	0.00
PILIBHIT	3499	23.03	0.66
PITHORAGARH	8881	N.A.	0.00
PRATAPGARH	3717	87.51	2.35
RAE BARELI	4586	72.74	1.59
RAMPUR	2367	3.54	0.15
SAHARANPUR	3689	2.29	0.06
SHAHJAHANPUR	4575	20.84	0.46
SIDDHARTH NAGAR	2752	27.11	0.99
SITAPUR	5743	121.87	2.12
SONBHADRA	6788	360.41	5.31
SULTANPUR	4436	37.33	0.84
TEHRI GARHWAL	4080	N.A.	0.00
UNNAO	4558	148.7	3.26
UTTARKASHI	8016	N.A.	0.00
VARANASI	5091.9	55.76	1.10

Maps not to scale

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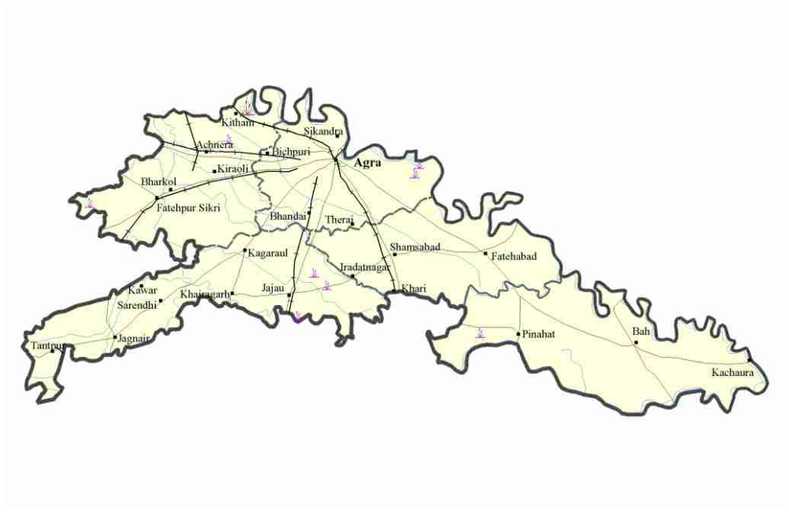
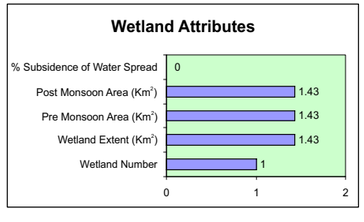
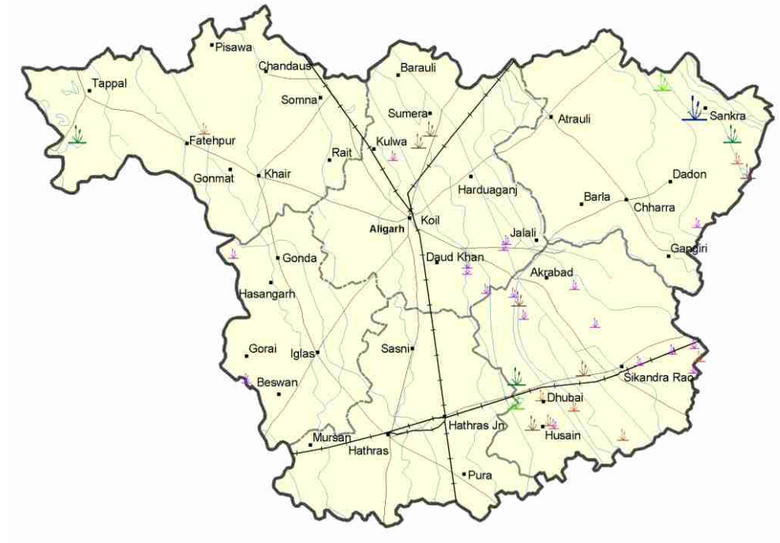
District - wise spatial distribution of wetlands



District Agra

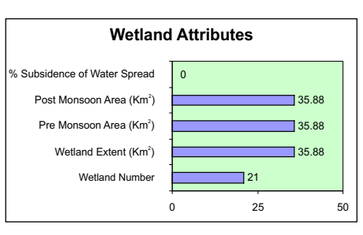


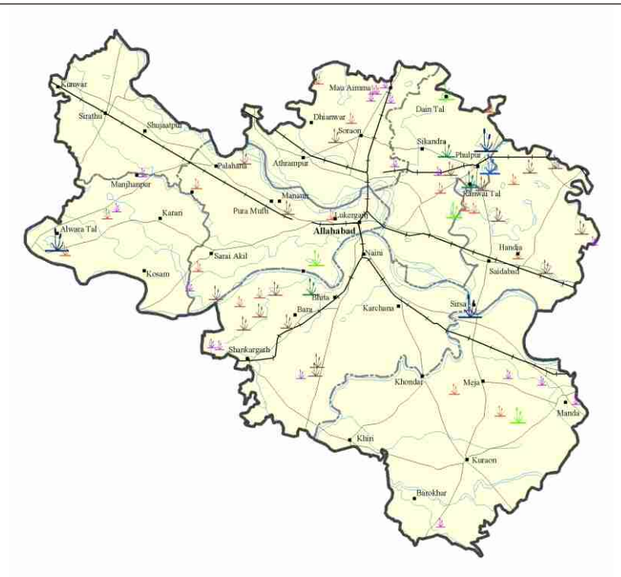




District Aligarh

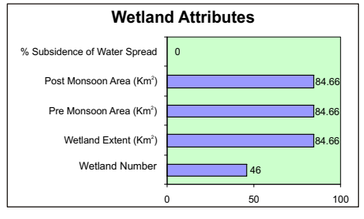


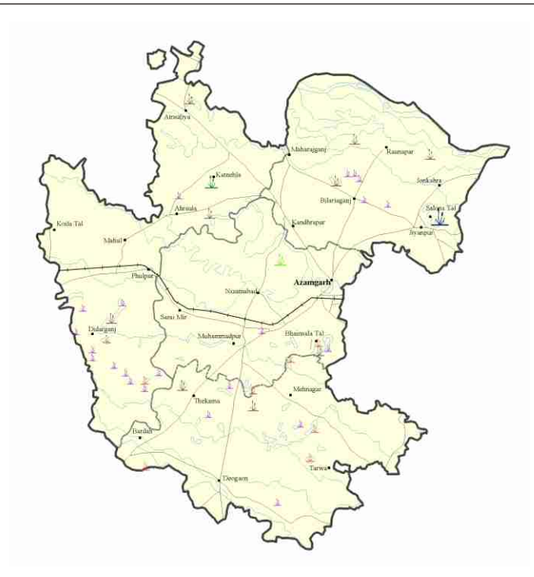




District Allahabad

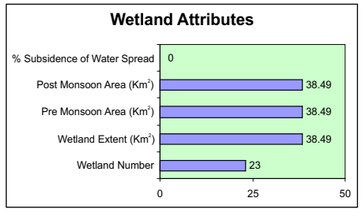






District Azamgarh





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

©SACON 2004

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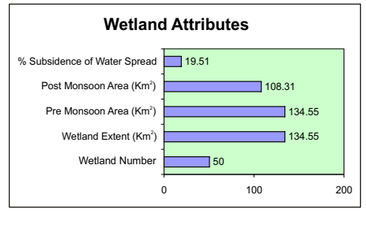
District - wise spatial distribution of wetlands



District Bahraich

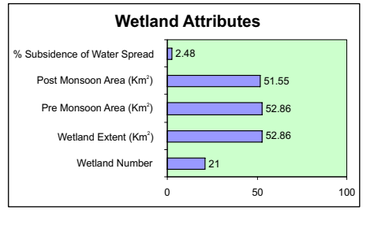


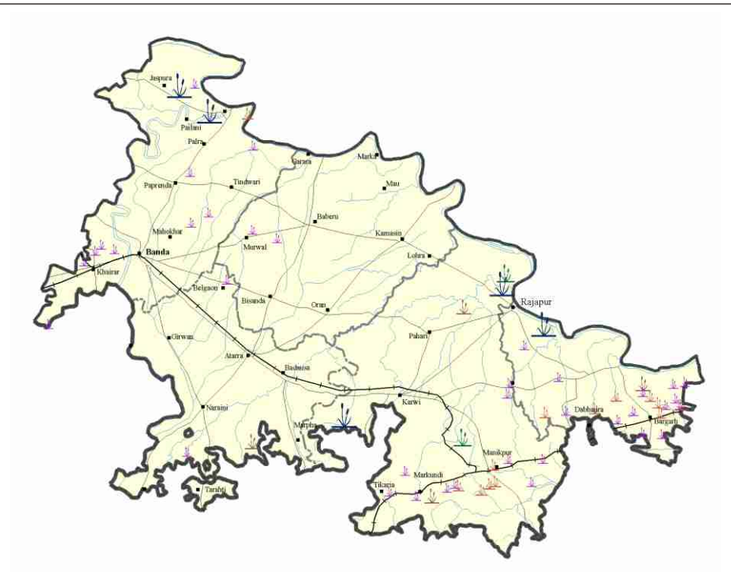




District Ballia

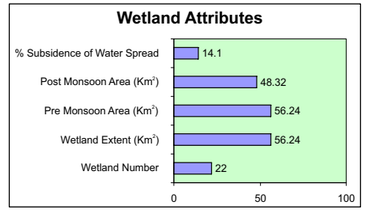


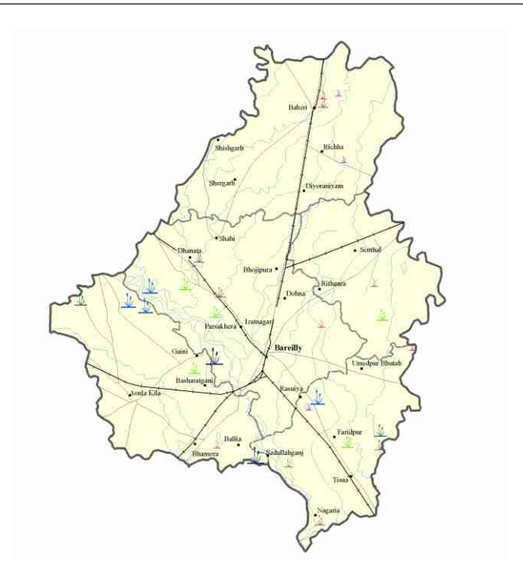




District Banda

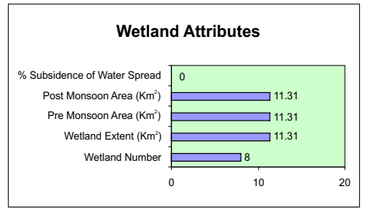






District Bareilly





Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

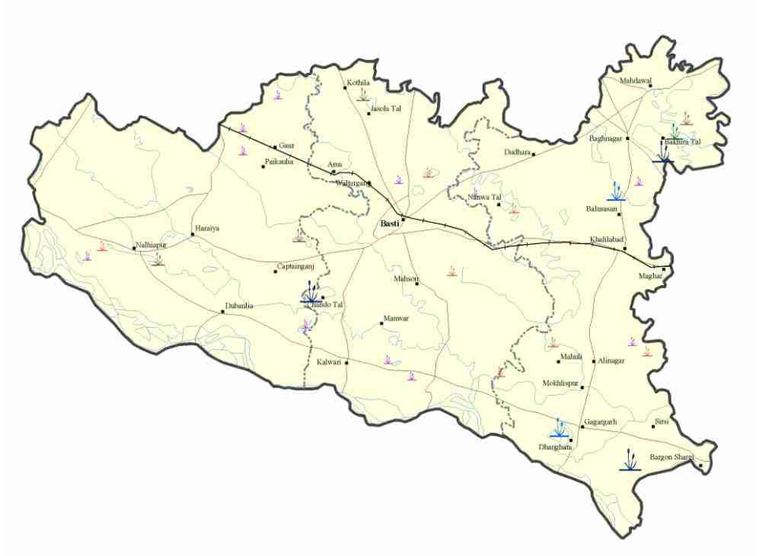
Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Maps not to scale

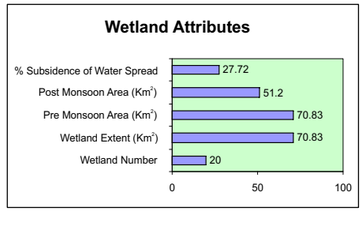
©SACON 2004

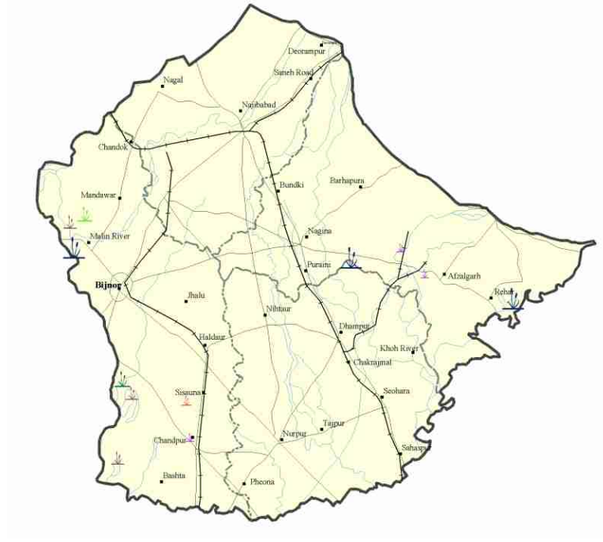
District - wise spatial distribution of wetlands



District Basti

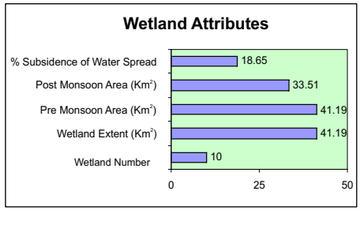






District Bijnor

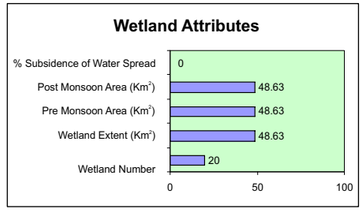


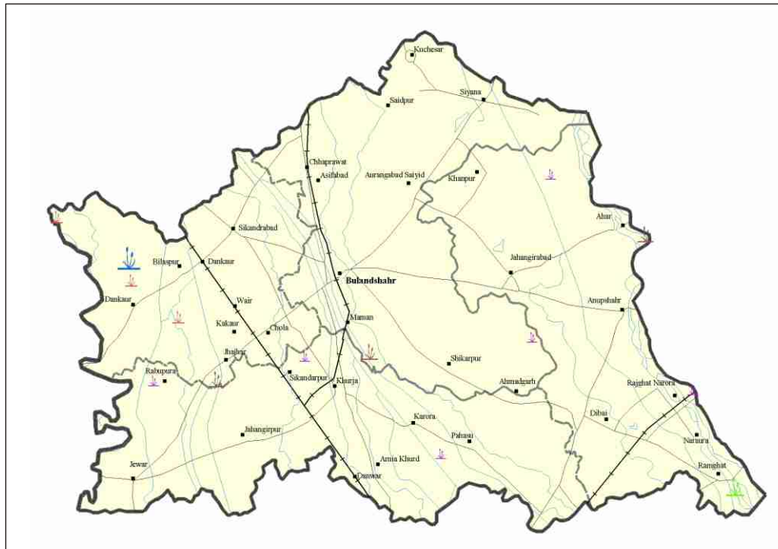




District Budaun

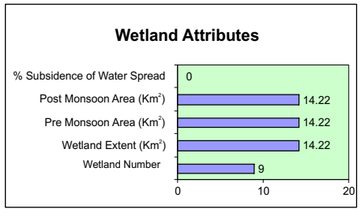






District Bulandshahr





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Wetlands

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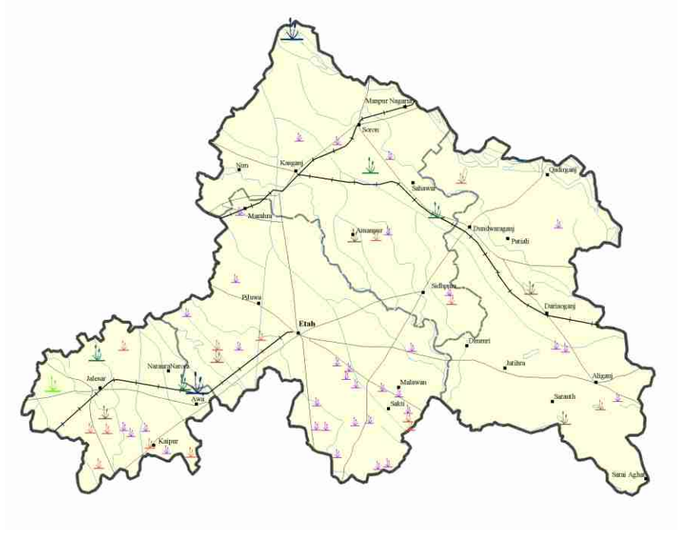
Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

©SACON 2004

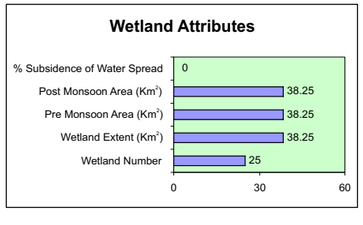
District - wise spatial distribution of wetlands

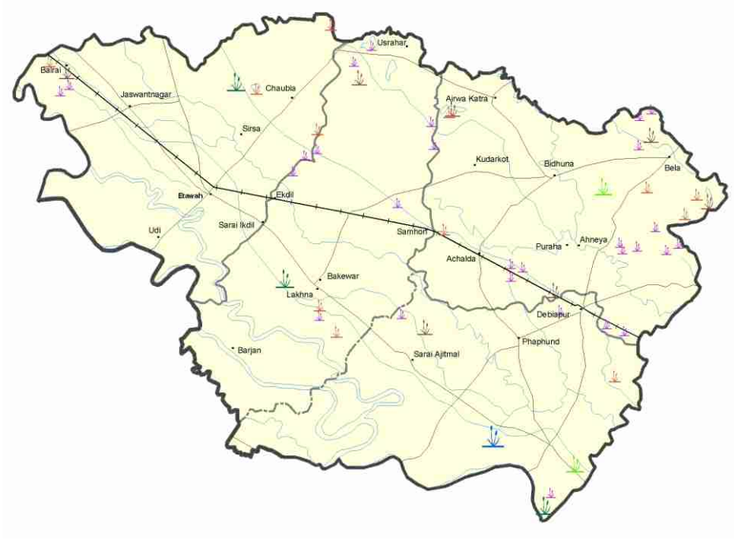


District Etah



Wetland Attributes

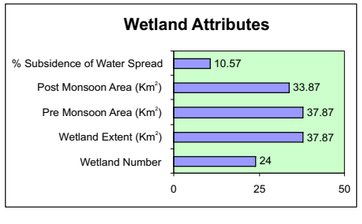




District Etawah



Wetland Attributes

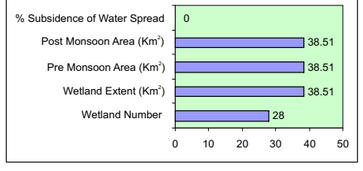


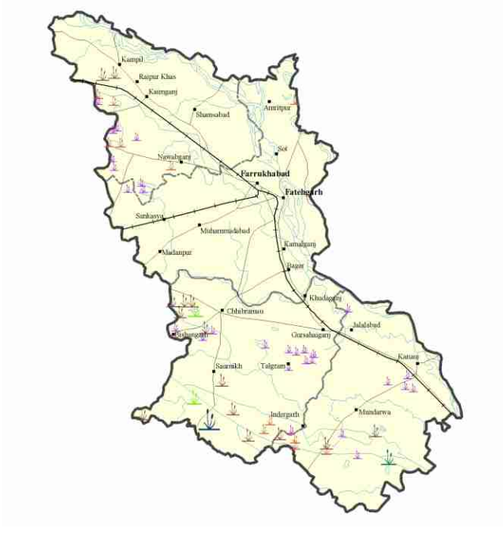


District Faizabad



Wetland Attributes

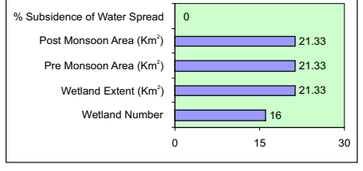




District Farrukhabad



Wetland Attributes



Wetlands

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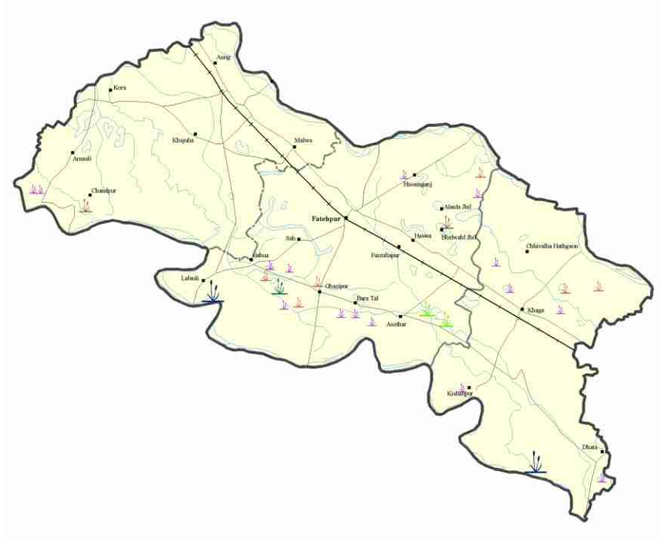
Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Maps not to scale

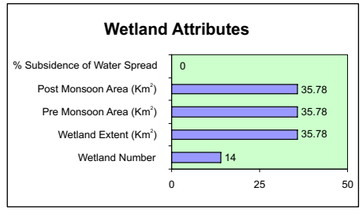
©SACON 2004

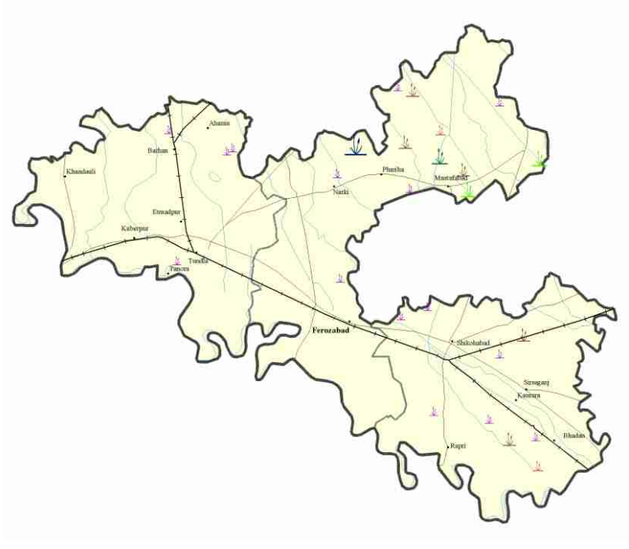
District - wise spatial distribution of wetlands



District Fatehpur

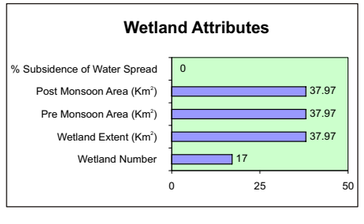


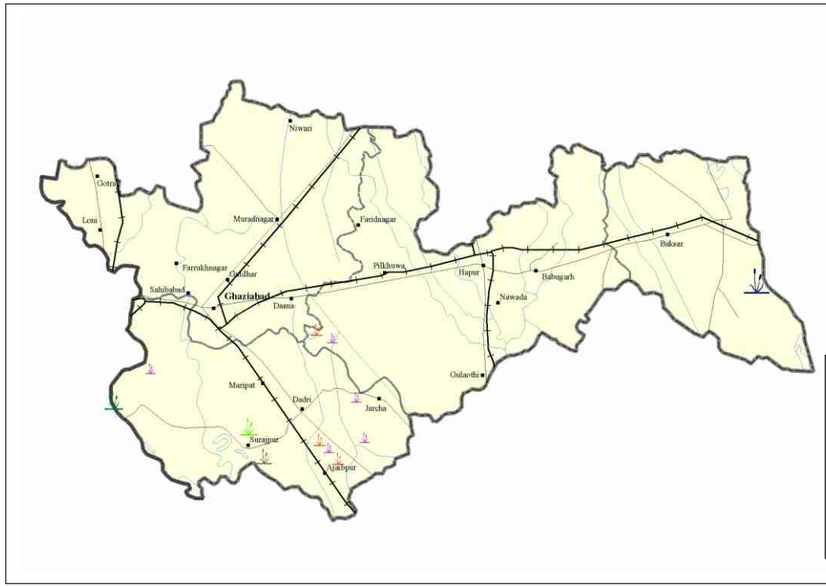




District Ferozabad

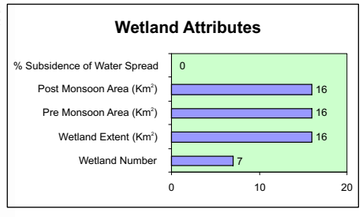


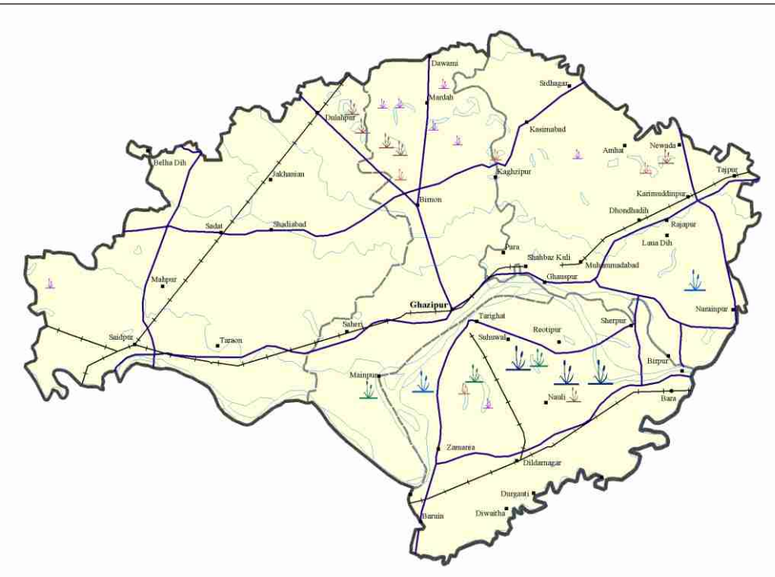




District Ghaziabad

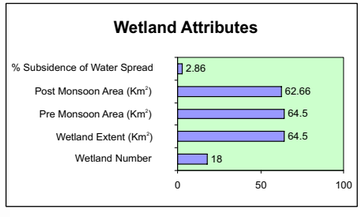






District Ghazipur





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha | Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

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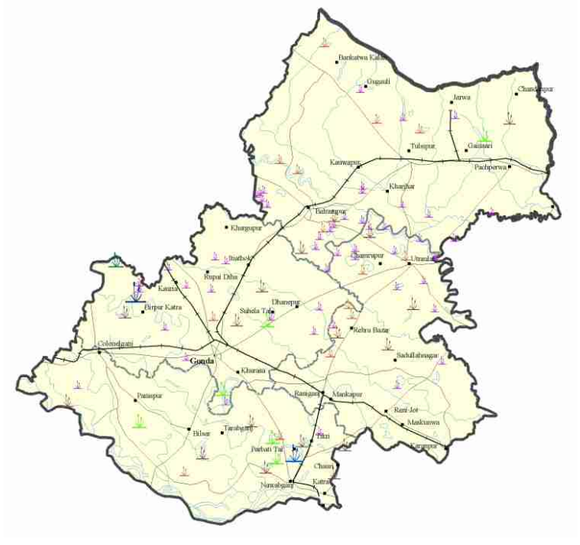
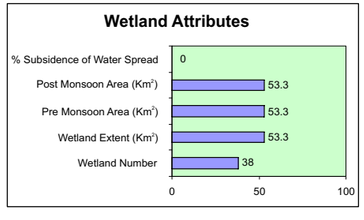
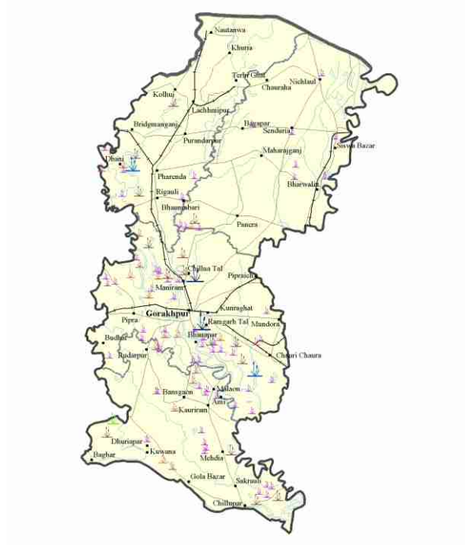
District - wise spatial distribution of wetlands



District Gonda

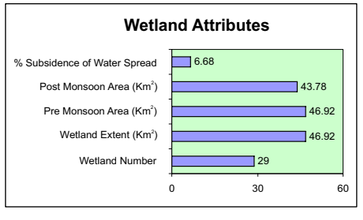






District Gorakhpur

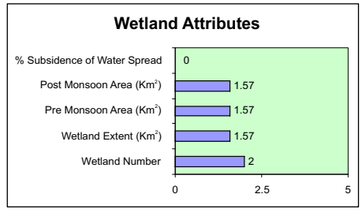


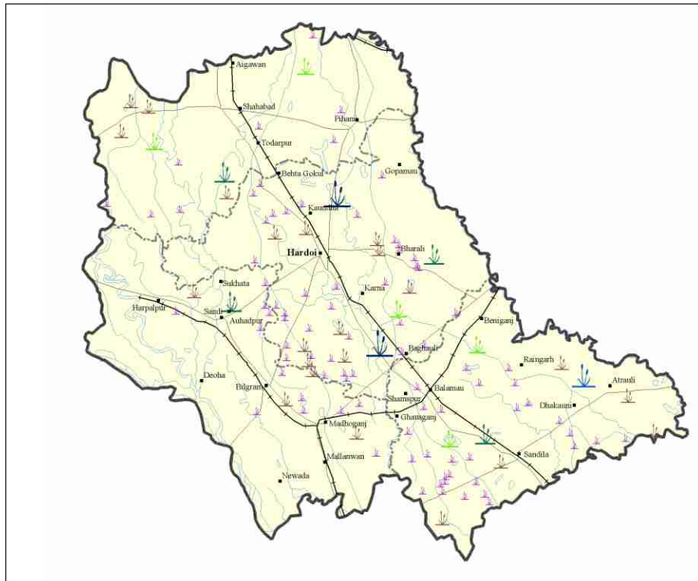




District Hamirpur

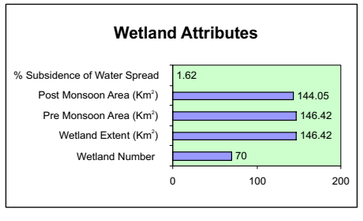






District Hardoi





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

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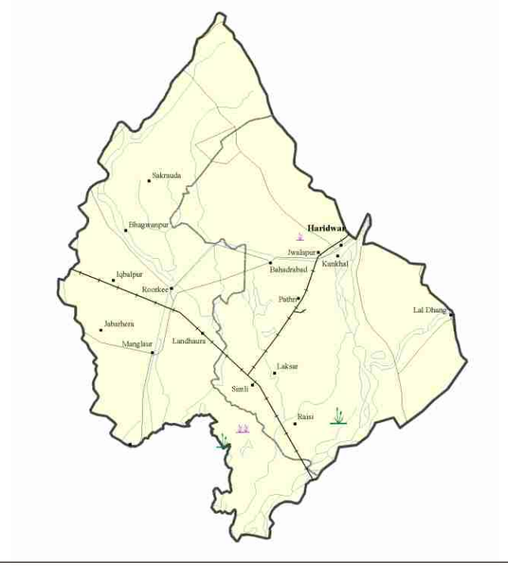
Maps not to scale

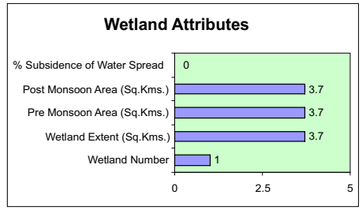
©SACON 2004

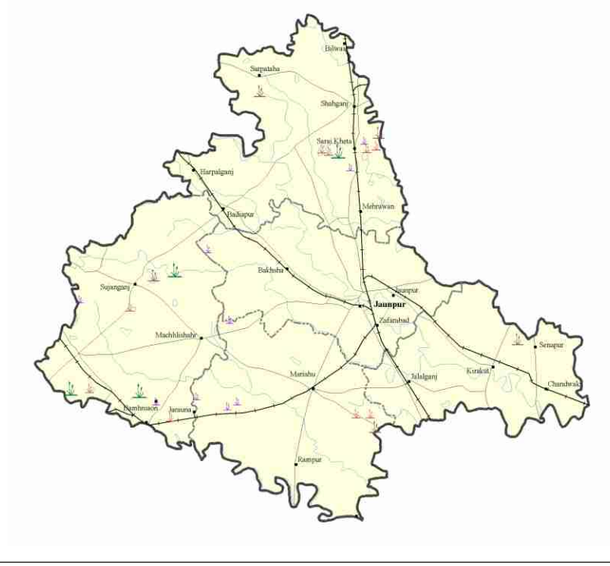
District - wise spatial distribution of wetlands



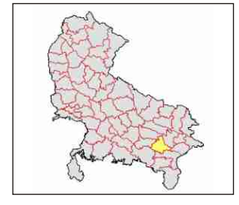
District Haridwar

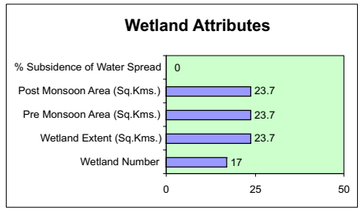


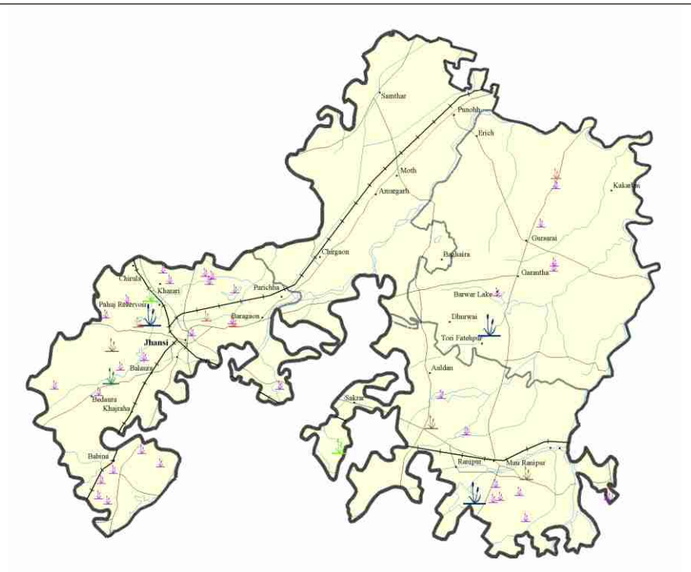




District Jaunpur

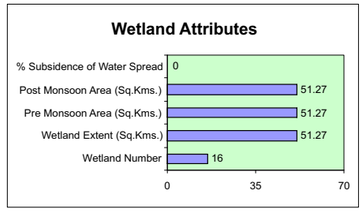


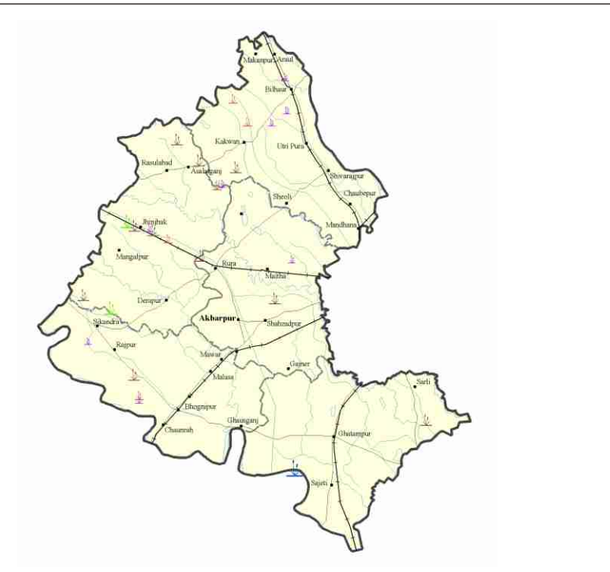




District Jhansi

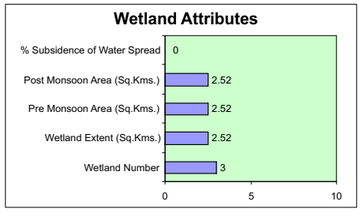






District Kanpur Dehat





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

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Maps not to scale

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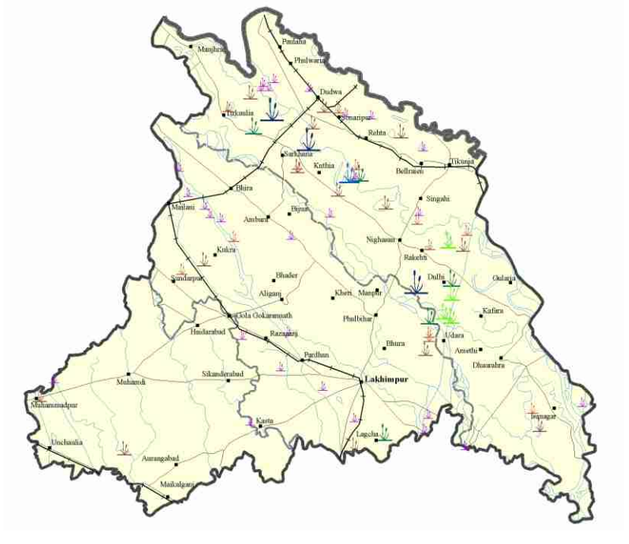
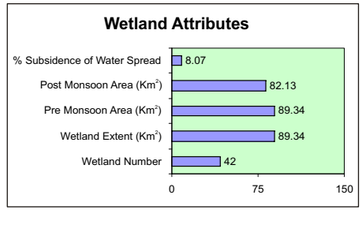
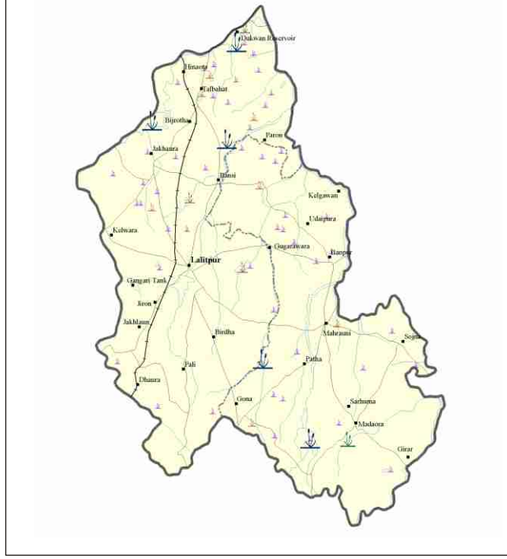
District - wise spatial distribution of wetlands



District Kheri

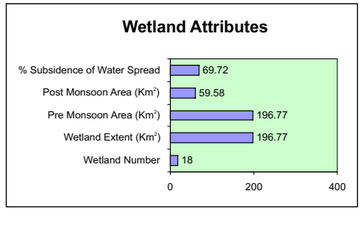






District Lalitpur

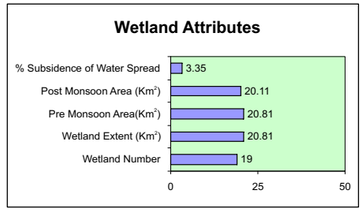


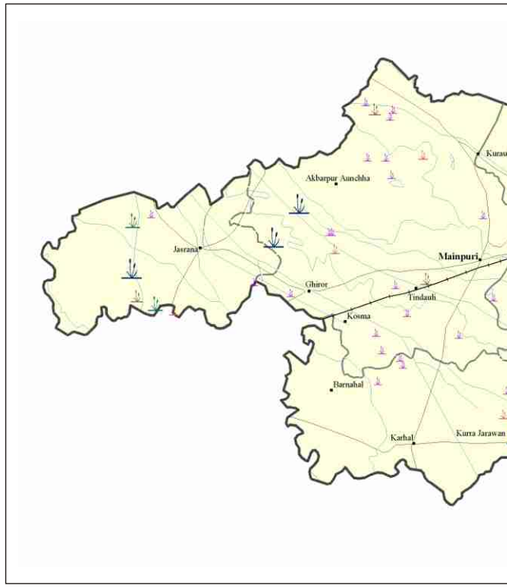




District Lucknow

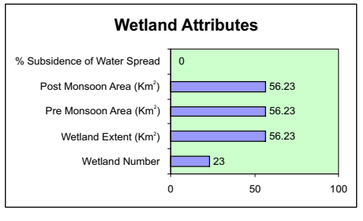






District Mainpuri





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

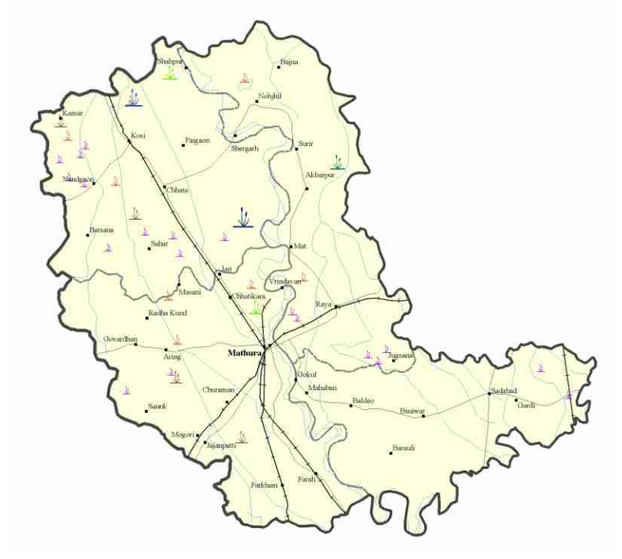
Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha | Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

©SACON 2004

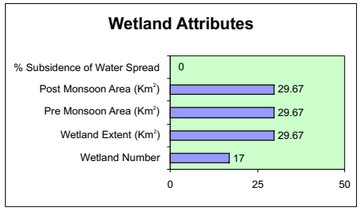
District - wise spatial distribution of wetlands

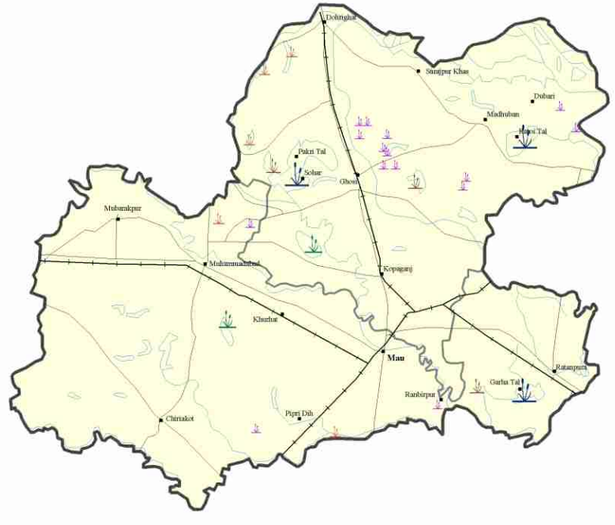


District Mathura



Wetland Attributes

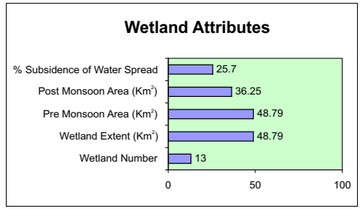


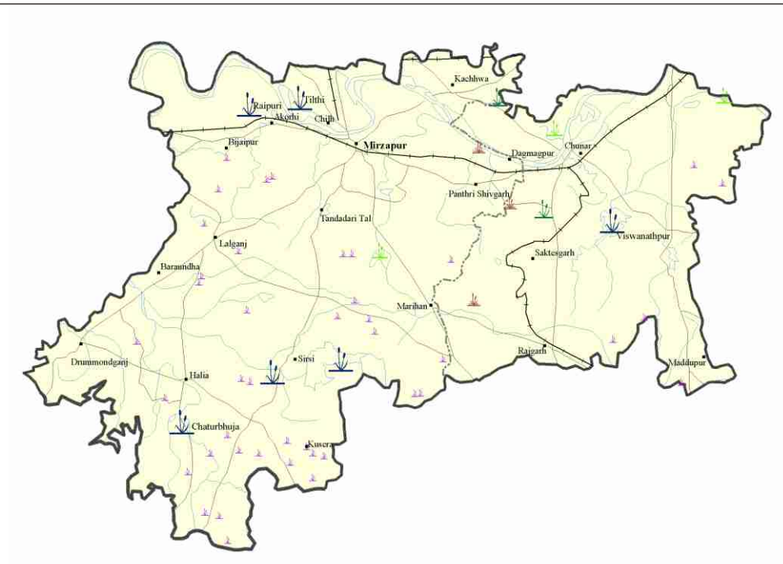


District Mau



Wetland Attributes

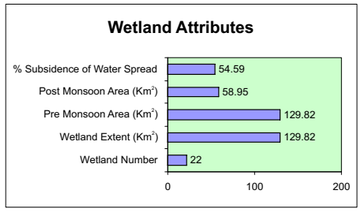


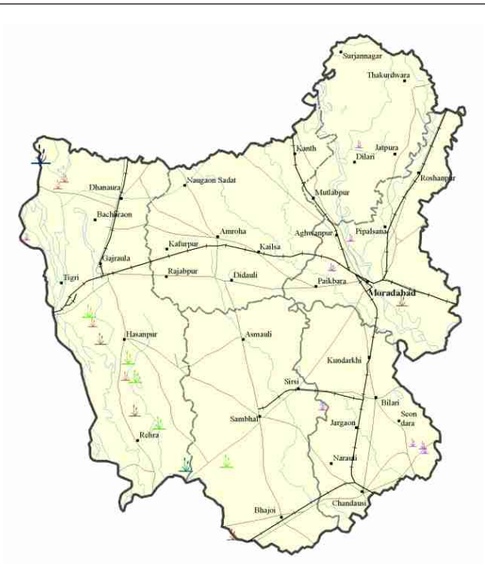


District Mirzapur



Wetland Attributes

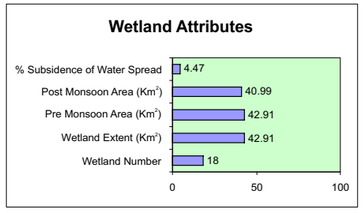




District Moradabad



Wetland Attributes



Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

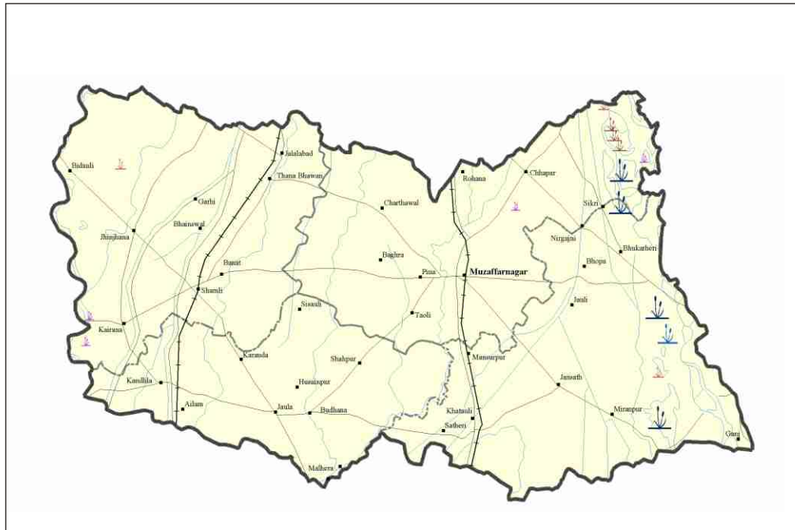
Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Maps not to scale

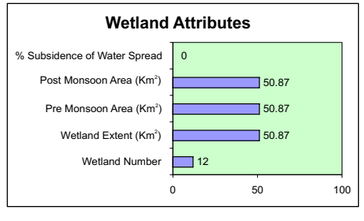
©SACON 2004

District - wise spatial distribution of wetlands



District Muzaffarnagar

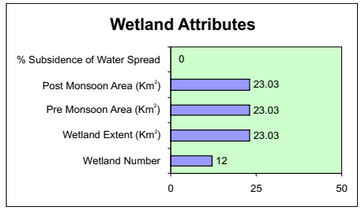


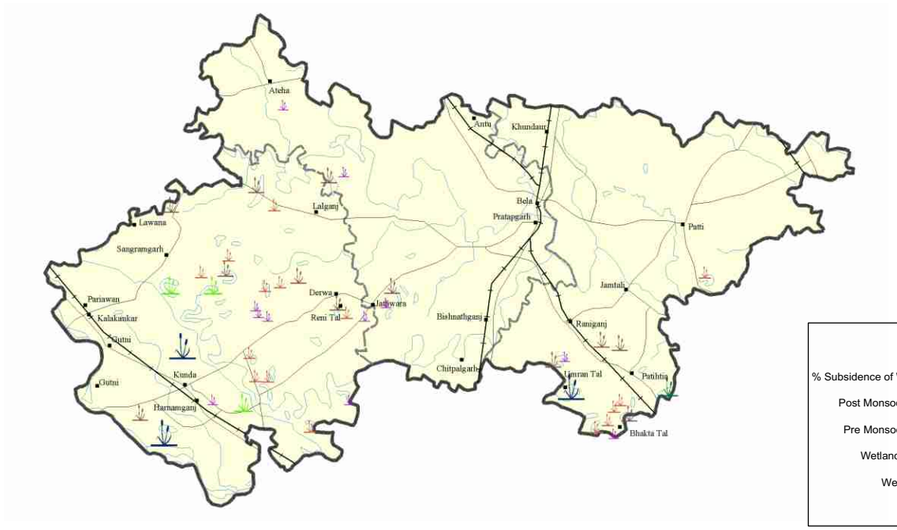




District Pilibhit

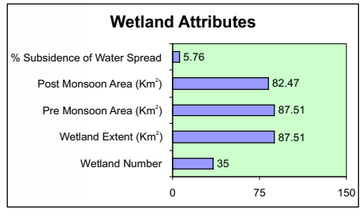


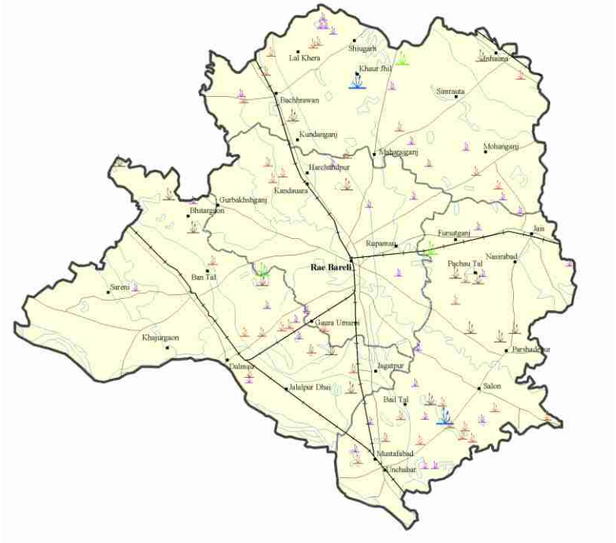




District Pratapgarh

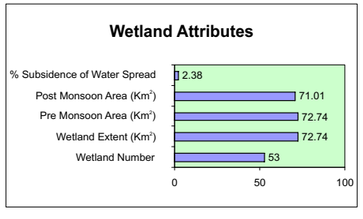






District Rae Bareli





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Wetlands

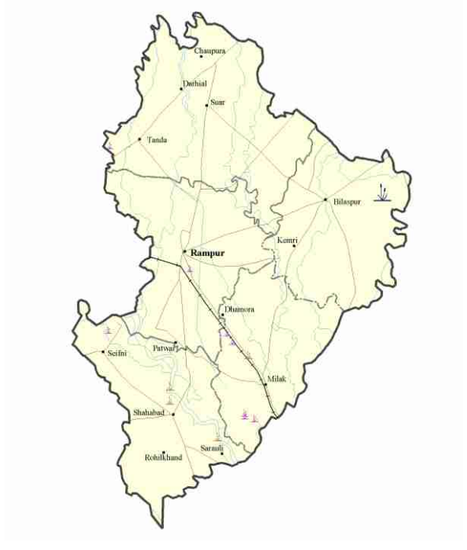
Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Maps not to scale

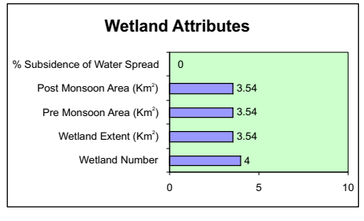
©SACON 2004

District - wise spatial distribution of wetlands



District Rampur

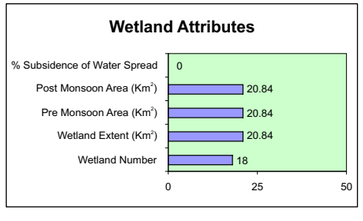


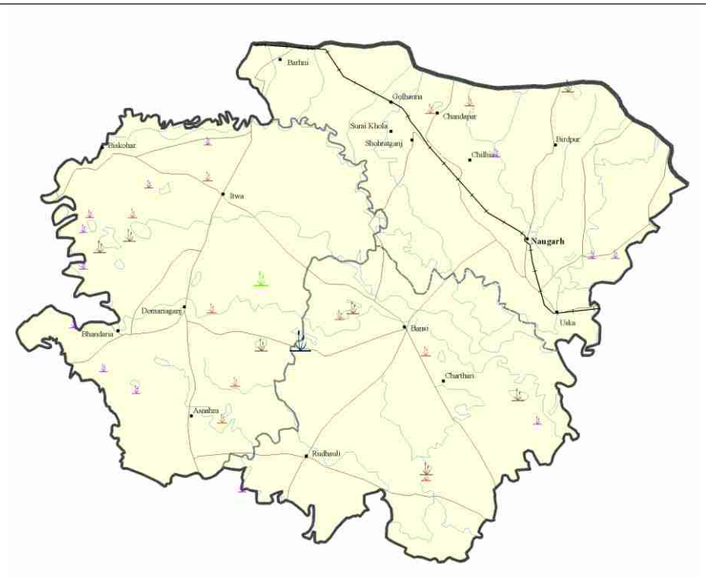




District Shahjahanpur

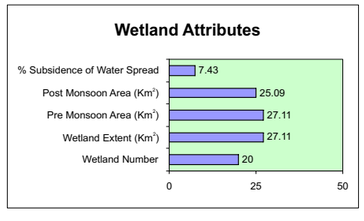


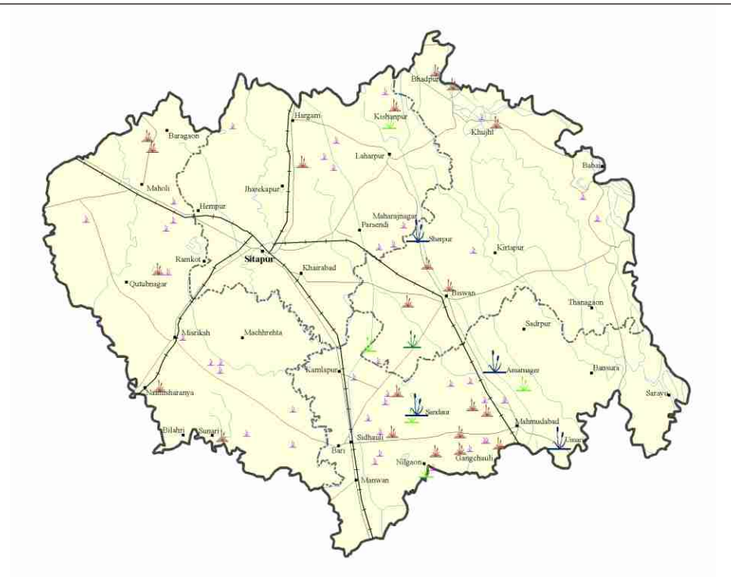




District Siddharth Nagar

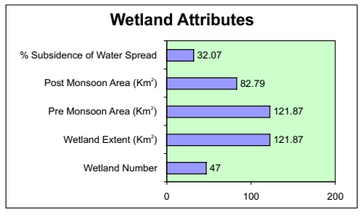






District Sitapur





Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Wetlands

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Maps not to scale

©SACON 2004

Sálim Ali Centre for Ornithology and Natural History, Coimbatore

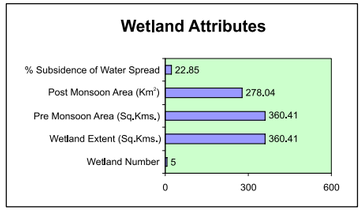
District - wise spatial distribution of wetlands

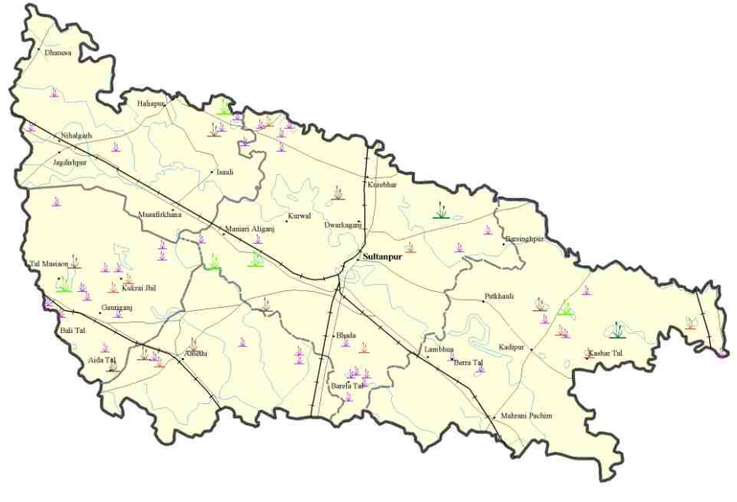


District Sonbhadra



Wetland Attributes

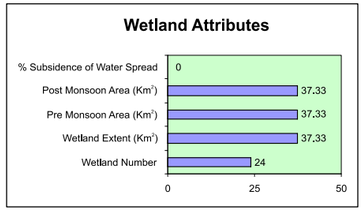


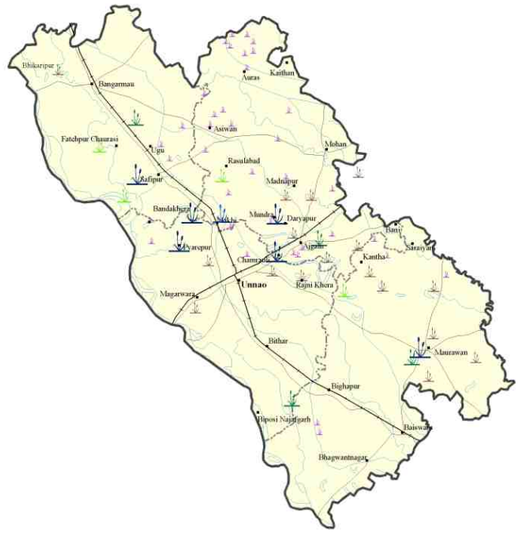


District Sultanpur



Wetland Attributes

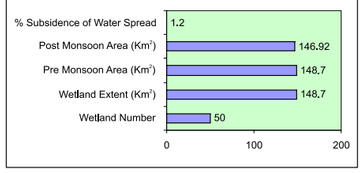


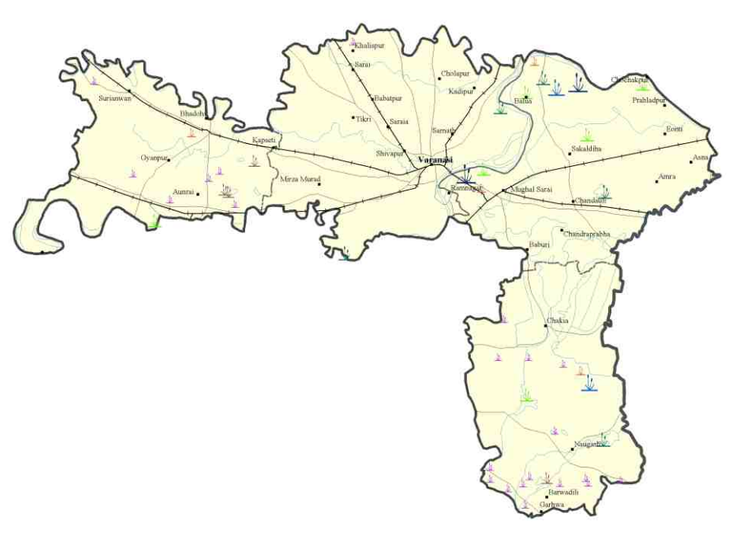


District Unnao



Wetland Attributes

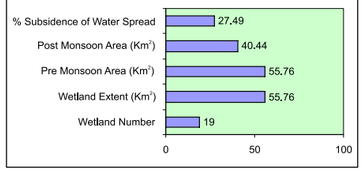




District Varanasi



Wetland Attributes



Wetlands

Area >= 500 ha | Area >= 400 ha and <500 ha | Area >= 300 ha and < 400 ha | Area >= 200 ha and < 300 ha | Area >= 100 ha and < 200 ha | Area >= 56 ha and < 100 ha | Area <= 56 ha

Rivers/Streams | Cities/Towns/Villages | Railways | Roads | International Boundary | State Boundary | District Boundary | Taluk Boundaries

Source: Wetland point data; Remote Sensing Applications Centre Uttar Pradesh, Lucknow

Maps not to scale

©SACON 2004

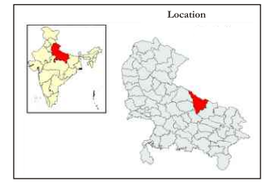
Integrated wetland and land use map



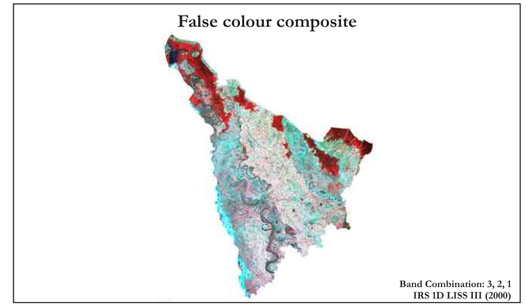
Integrated wetland type and land use

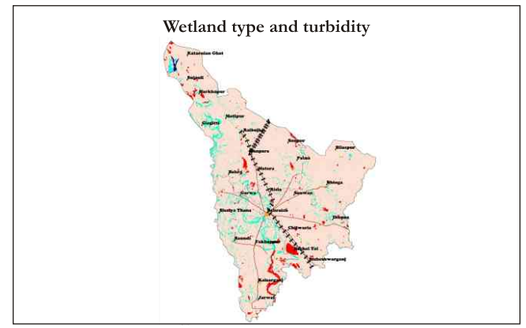
Dense Forest	Waste Land	NP Pond/Tank	Oxbow Lake/Cut-off	NP Sand	Railways	NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary	
Arable Land	Township	Water-logged	NP Marsh/Mud	Roads	Tehsil Boundary	

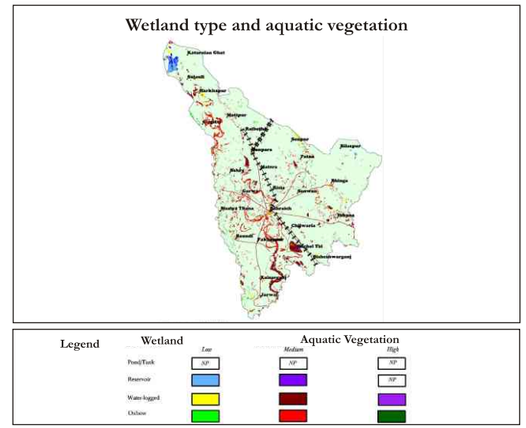
District Bahraich, Uttar Pradesh











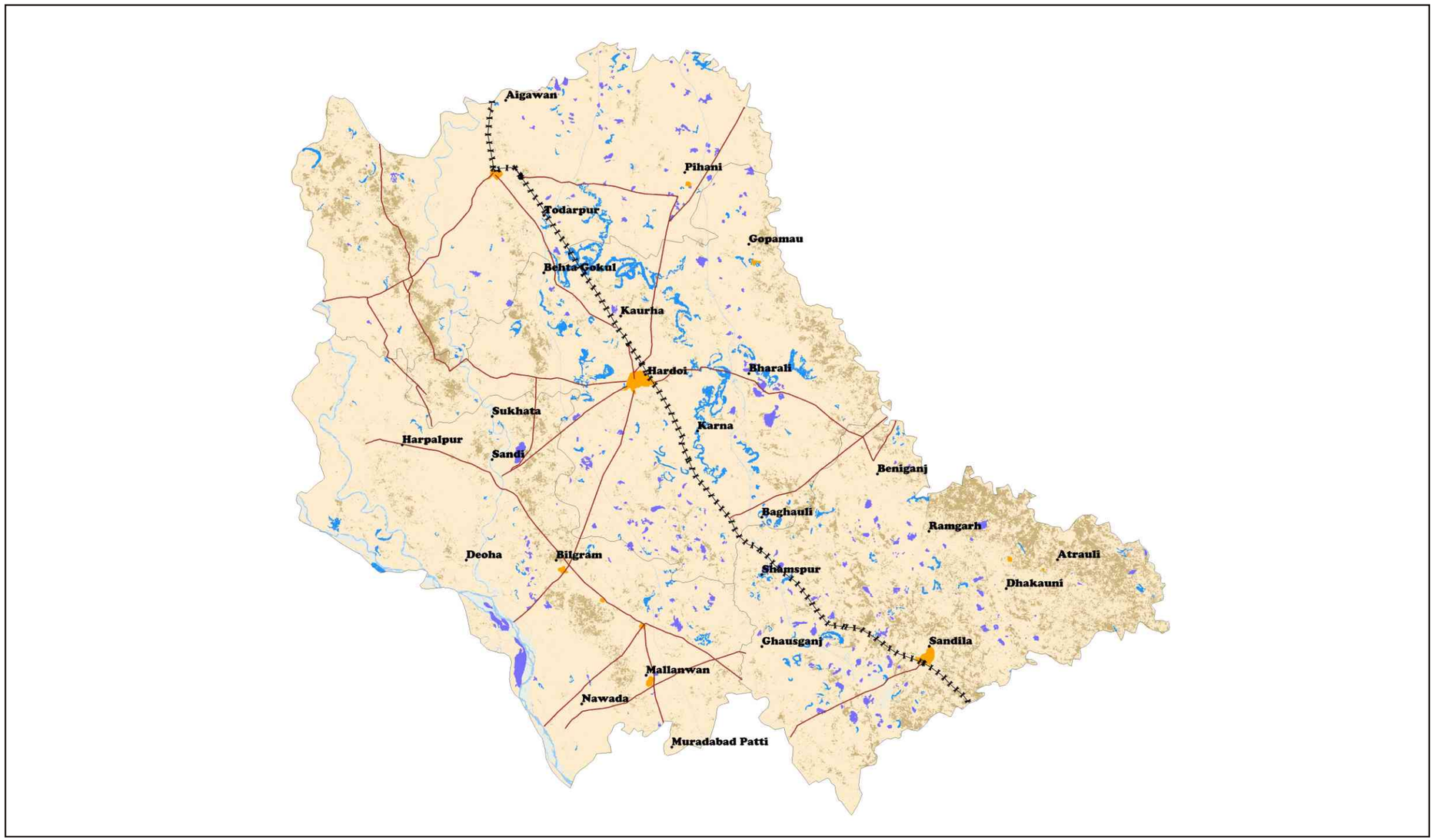
Maps not to scale

©SACON 2004

Regional Remote Sensing Service Centre, Dehradun and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map

District Hardoi, Uttar Pradesh

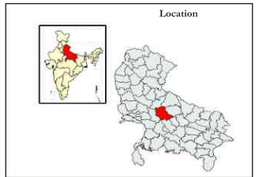


Integrated wetland type and land use

NP Dense Forest	Waste Land	NP Pond/Tank	Water-logged	Sand	Railways
NP Open Forest	River	NP Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Tehsil Boundary

NP * Not Present

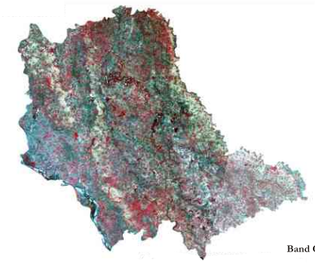
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1C LISS III

Wetland type and turbidity



Legend — Wetland — Turbidity

	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged			
Oxbow Lake/Cut-off			

Wetland type and aquatic vegetation



Legend — Wetland — Aquatic Vegetation

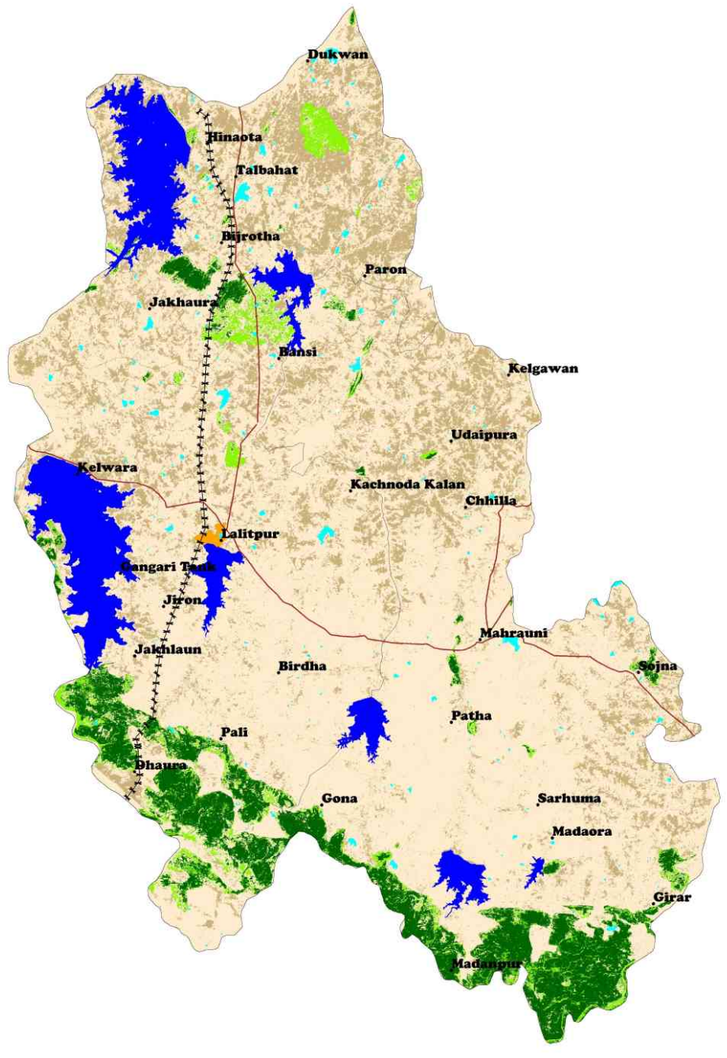
	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged		NP	
Oxbow Lake/Cut-off			

Maps not to scale

©SACON 2004

Regional Remote Sensing Service Centre, Dehradun and Sálim Ali Centre for Ornithology and Natural History, Coimbatore SACON

Integrated wetland and land use map



Integrated wetland type and land use

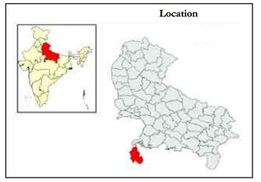
Dense Forest	Waste Land	Pond	NP Water-logged	NP Sand	Railways	NP * Not Present
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary	
Arable Land	Township	NP Oxbow /Cut-off	NP Marsh/Mud	Roads	Tehsil Boundary	

Maps not to scale

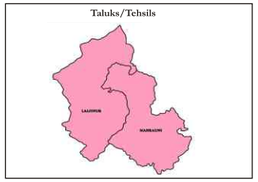
©SACON 2004

District Lalitpur, Uttar Pradesh

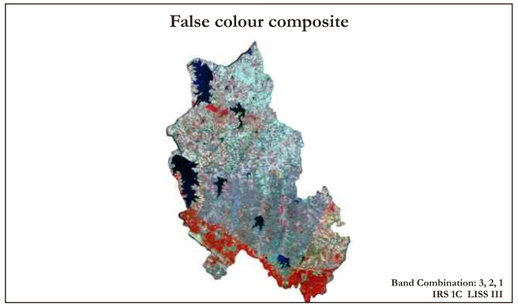
Location



Taluks/Tehsils

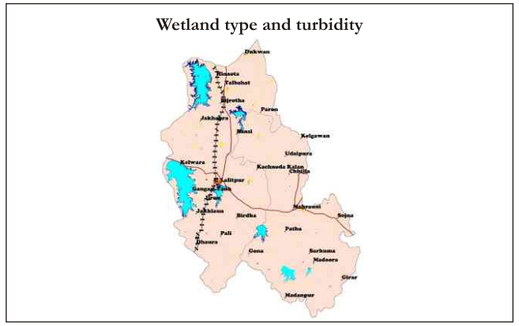


False colour composite



Band Combination: 3, 2, 1
IRS 1C LISS III

Wetland type and turbidity



Legend — Wetland / Turbidity

Wetland	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow /Cut-off	NP	NP	NP

Wetland type and aquatic vegetation

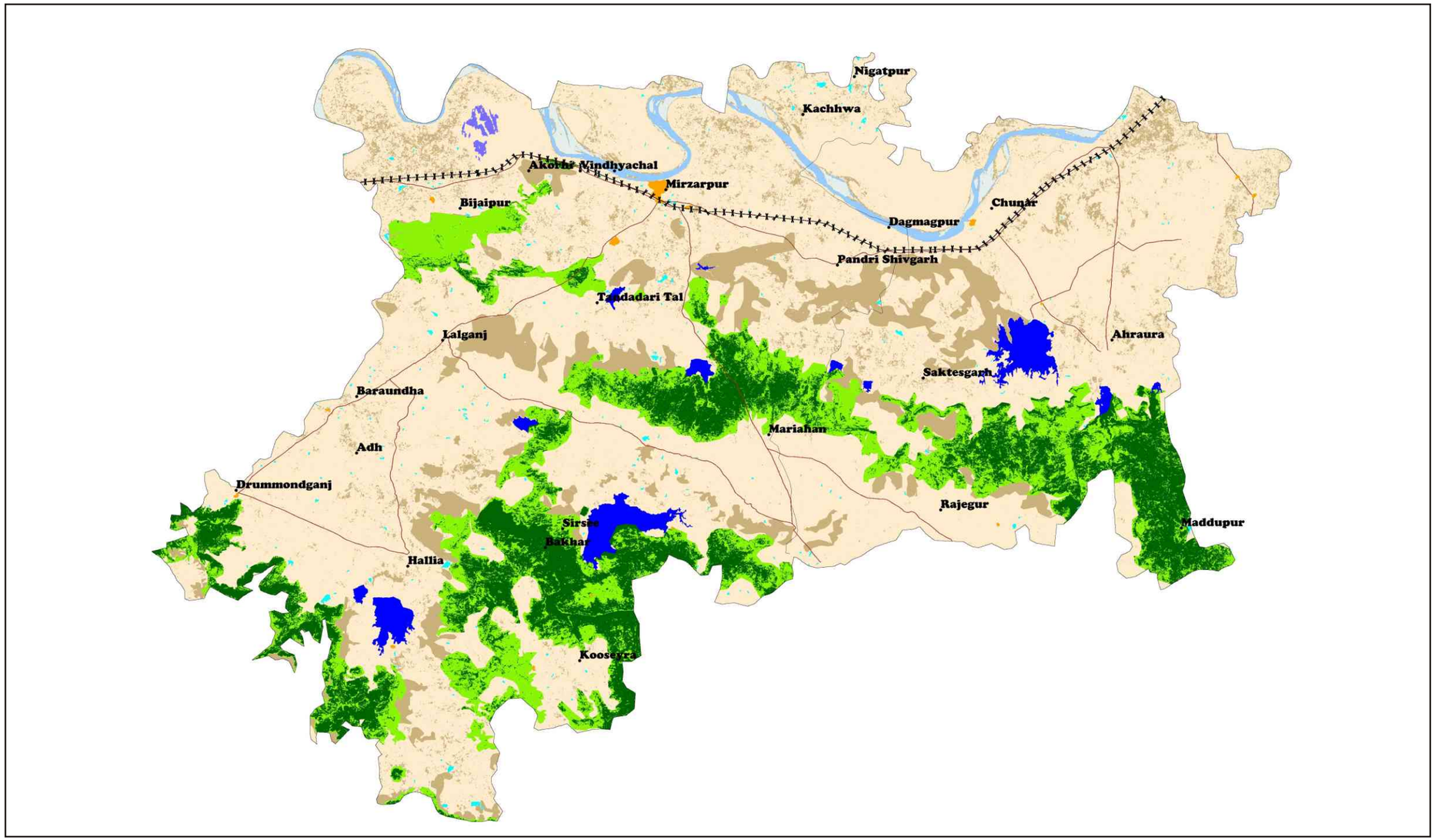


Legend — Wetland / Aquatic Vegetation

Wetland	Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow /Cut-off	NP	NP	NP

Integrated wetland and land use map

District Mirzapur, Uttar Pradesh



Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	Water-logged	Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	NP Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Tehsil Boundary

NP * Not Present

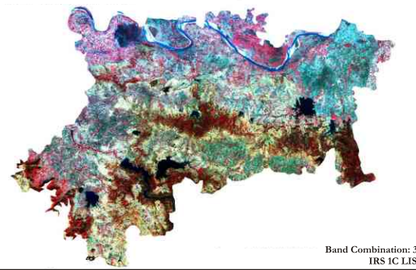
Location



Taluks/Tehsils



False colour composite



Band Combination: 3, 2, 1
IRS 1C LISS III

Wetland type and turbidity



Legend Wetland	Turbidity: Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged	NP	NP	NP
Oxbow Lake/Cut-off	NP	NP	NP

Wetland type and aquatic vegetation



Legend Wetland	Aquatic Vegetation: Low	Medium	High
Pond/Tank			
Reservoir			
Water-logged			
Oxbow Lake/Cut-off	NP	NP	NP

Maps not to scale

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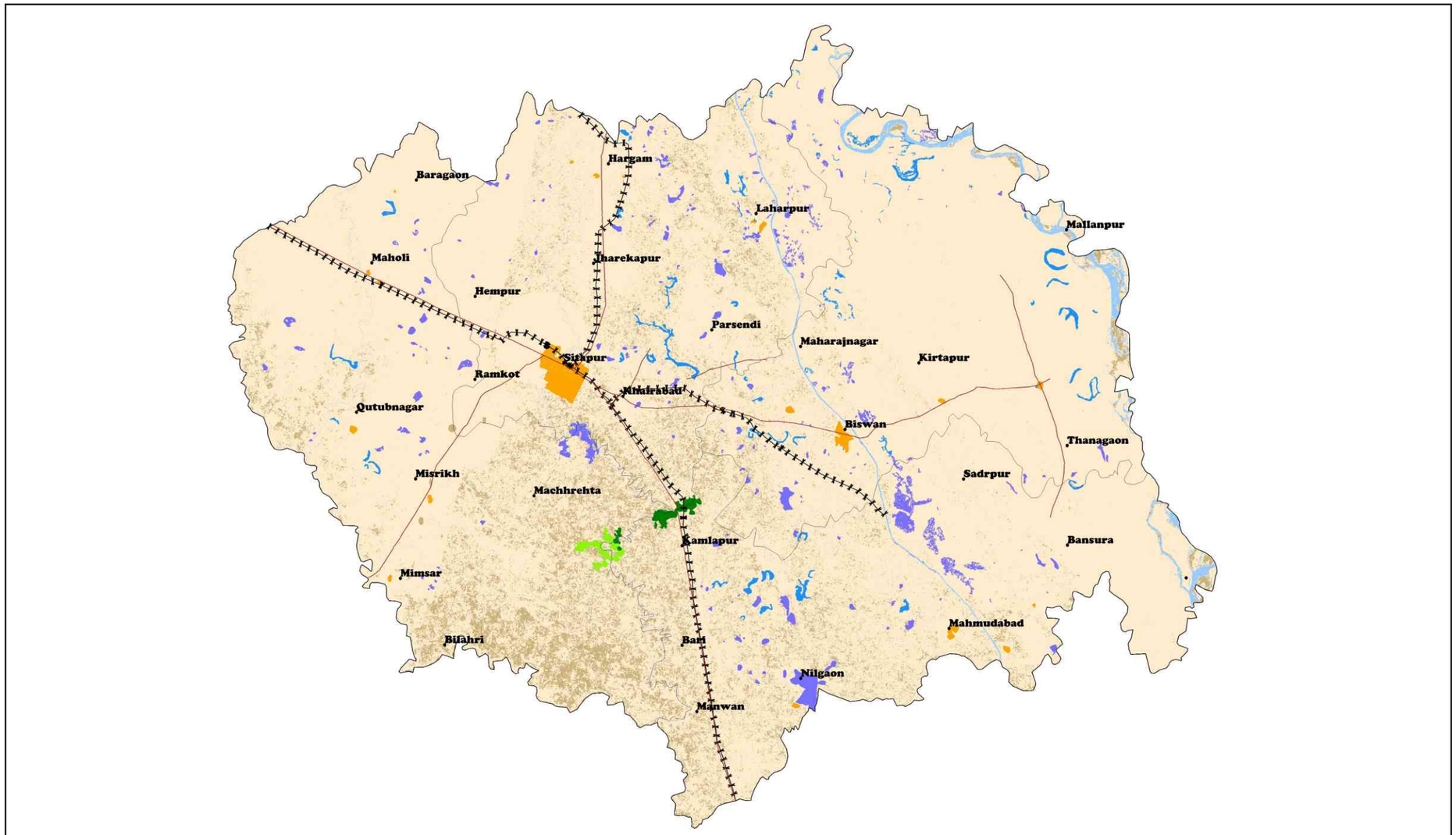
Regional Remote Sensing Service Centre, Dehradun and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Integrated wetland and land use map



Integrated wetland type and land use

Dense Forest	Waste Land	NP	Pond/Tank		Water-logged		Railways
Open Forest	River	NP	Reservoir	NP	Coastal-water		Tehsil Boundary
Arable Land	Township		Oxbow Lake/Cut-off		Roads		District Boundary

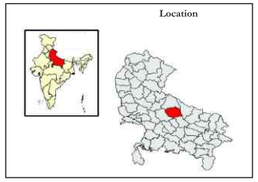
NP * Not Present

Maps not to scale

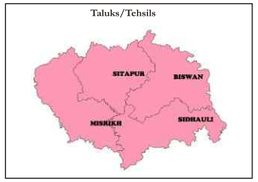
©SACON 2004

District Sitapur, Uttar Pradesh

Location



Taluks/Tehsils



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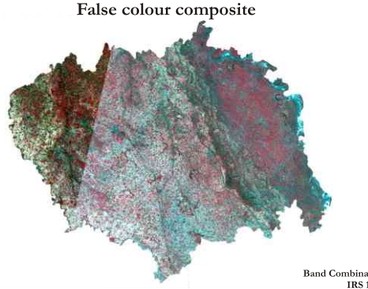
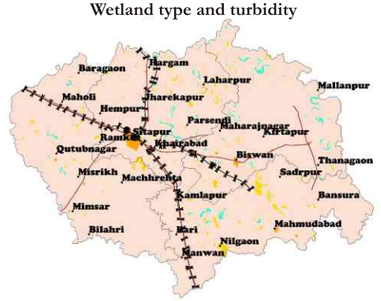


Band Combination: 3, 2, 1
IRS 1C LISS III

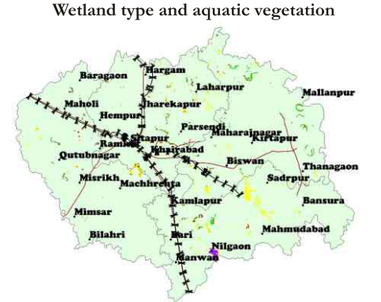
Wetland type and turbidity



Legend

Wetland	Turbidity		
	Low	Medium	High
Ponds/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged		NP	NP
Oxbow Lake/Cut-off		NP	NP

Wetland type and aquatic vegetation



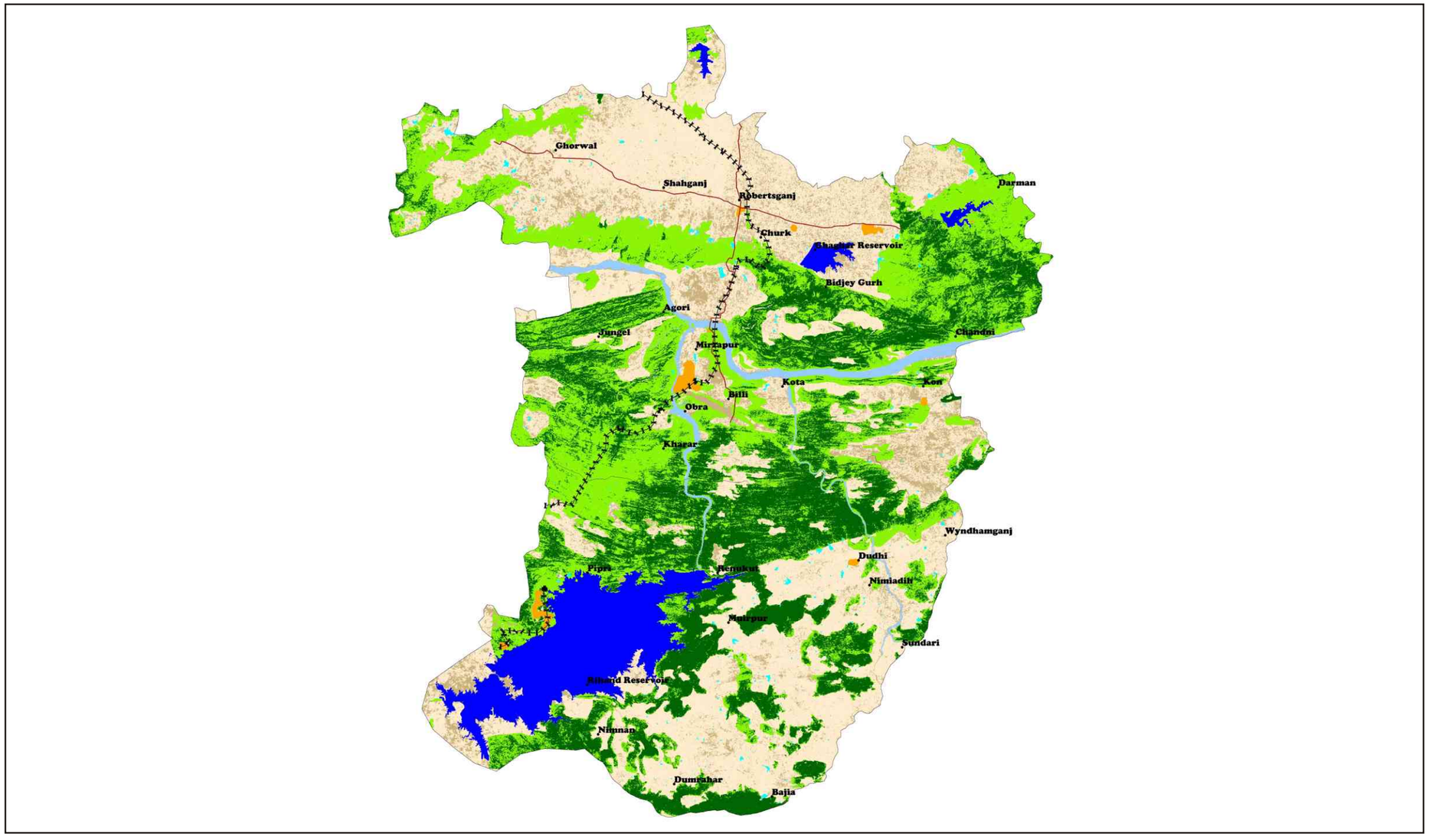
Legend

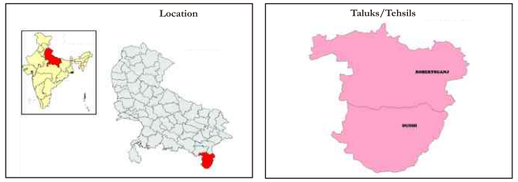
Wetland	Aquatic Vegetation		
	Low	Medium	High
Ponds/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged			
Oxbow Lake/Cut-off			

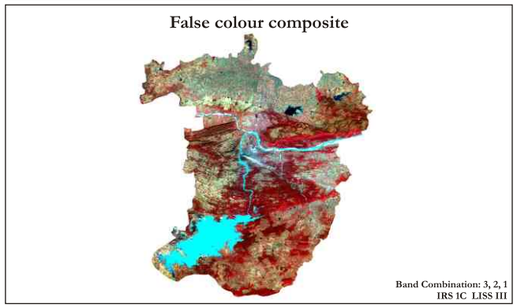
Regional Remote Sensing Service Centre, Dehradun and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

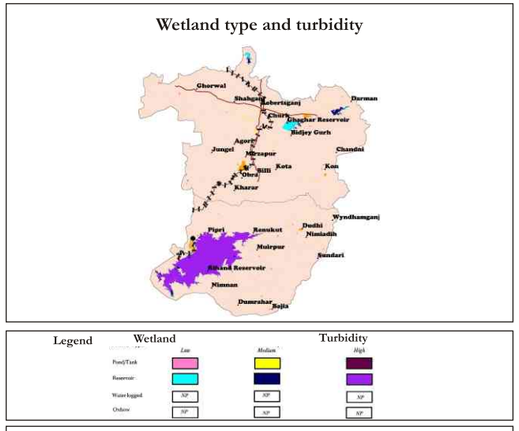
Integrated wetland and land use map

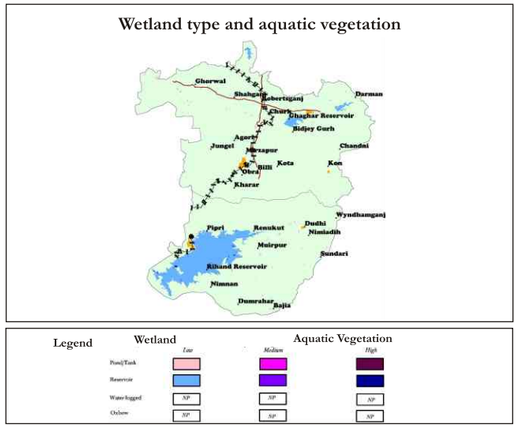
District Sonbhadra, Uttar Pradesh











Integrated wetland type and land use

Dense Forest	Waste Land	Pond/Tank	NP Oxbow Lake/Cut-off	NP Sand	Railways
Open Forest	River	Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	NP Water-logged	NP Marsh/Mud	Roads	Tehsil Boundary

NP * Not Present

Maps not to scale

Regional Remote Sensing Service Centre, Dehradun and Sálim Ali Centre for Ornithology and Natural History, Coimbatore

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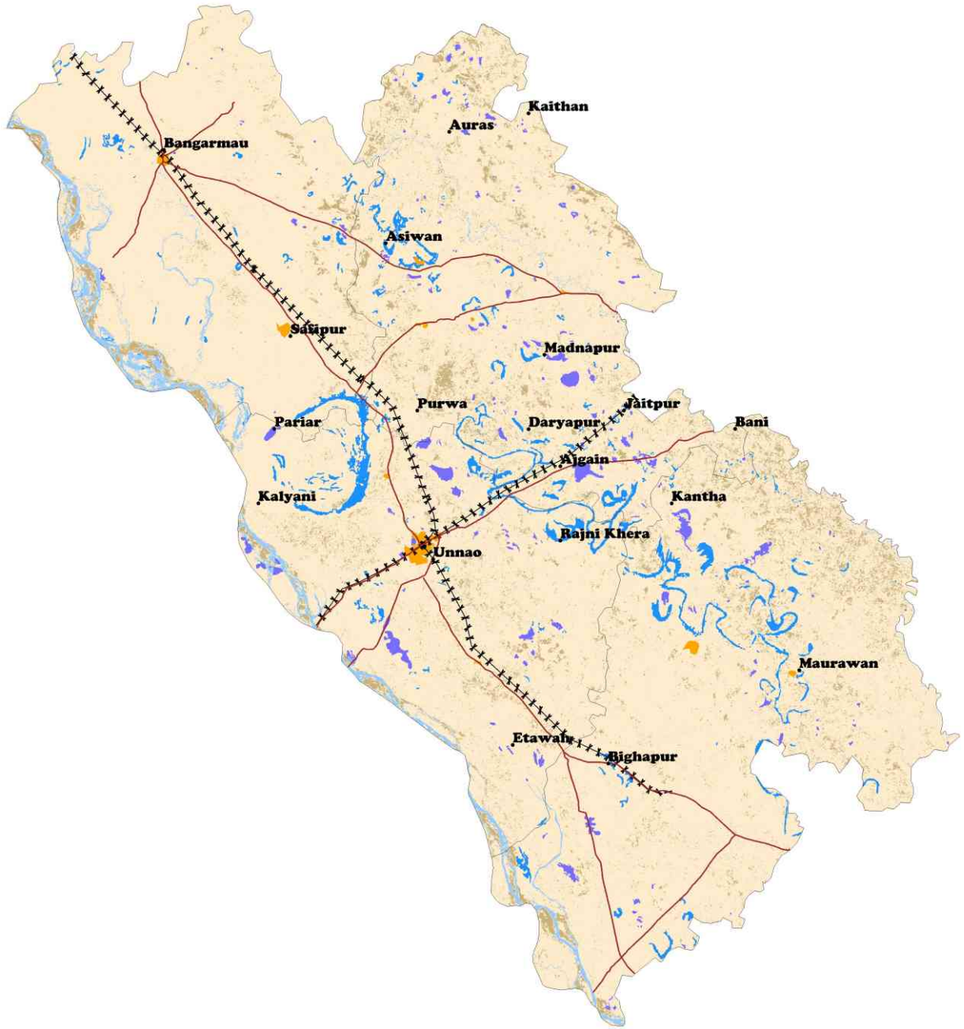
Integrated wetland and land use map

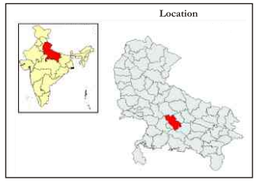


Integrated wetland type and land use

NP Dense Forest	Waste Land	NP Pond/Tank	Oxbow Lake/Cut-off	NP Sand	Railways	NP * Not Present
NP Open Forest	River	NP Reservoir	NP Coastal-water	NP Others	District Boundary	
Arable Land	Township	Water-logged	NP Marsh/Mud	Roads	Tehsil Boundary	

District Unnao, Uttar Pradesh

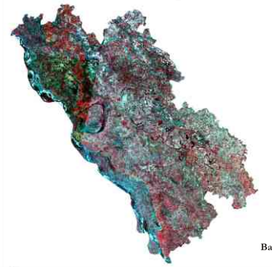
Location



Taluks/Tehsils

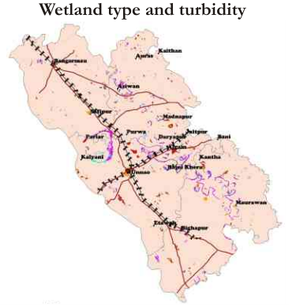


False colour composite



Band Combination: 3, 2, 1
IRS 1C LISS III

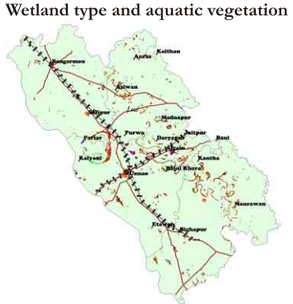
Wetland type and turbidity



Legend — Wetland / Turbidity

Wetland	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged			
Oxbow			

Wetland type and aquatic vegetation



Legend — Wetland / Aquatic Vegetation

Wetland	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged			
Oxbow/Cut-off			

Maps not to scale

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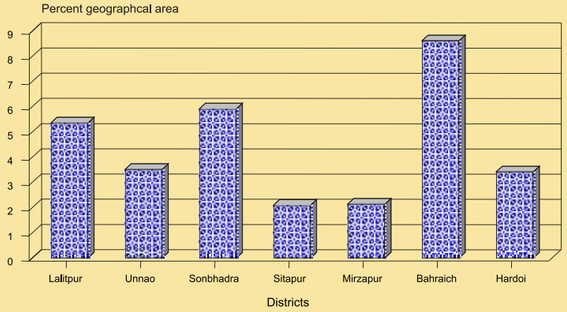
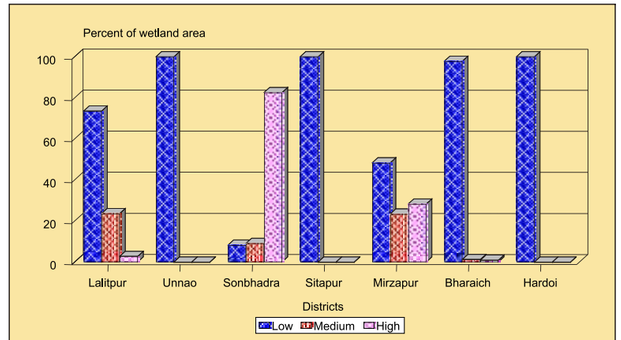


Area under wetlands in select Districts

Attributes of wetlands and environmental contamination

Wetlands

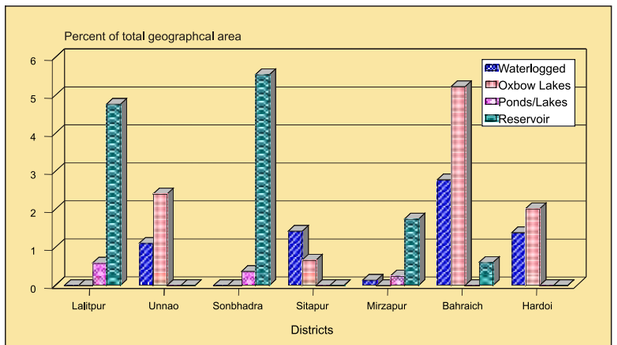
The area under wetlands in the seven districts varies from a minimum of 2.1 percent in Sitapur to a maximum of 8.62 in Mirzapur. Four major categories of wetlands occur. While reservoirs dominate Sonbhadra and Lalitpur districts, Oxbow lakes and water logged areas dominate Bahraich and Hardoi districts. It is very interesting to note that the smaller wetlands below 56.25 ha dominate the districts of Lalitpur, Unnao, Sitapur and Mirzapur. Bigger wetlands occur in equal abundance in Bahraich and Hardoi districts .



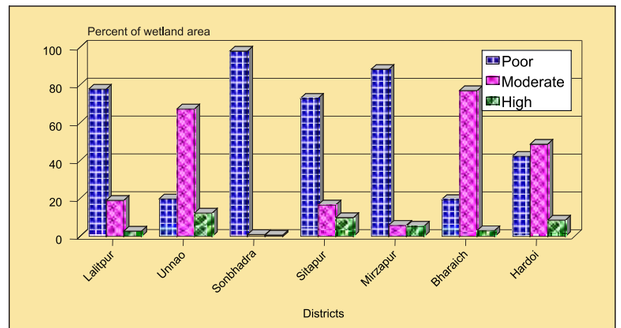
Turbidity pattern in select Districts

Turbidity

Wetlands of Bahraich, Hardoi , Lalitpur, Unnao and Sitapur have low levels of turbidity. High turbidity is found in Sonbhadra district followed by Mirzapur .



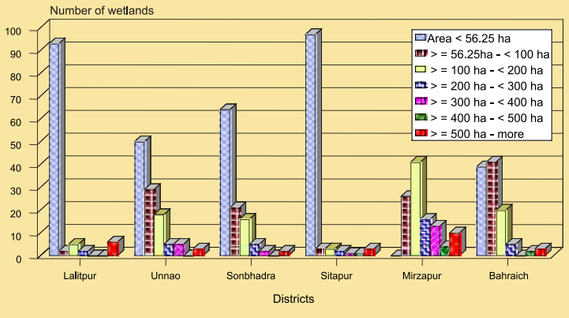
Area under different wetland classes in select Districts



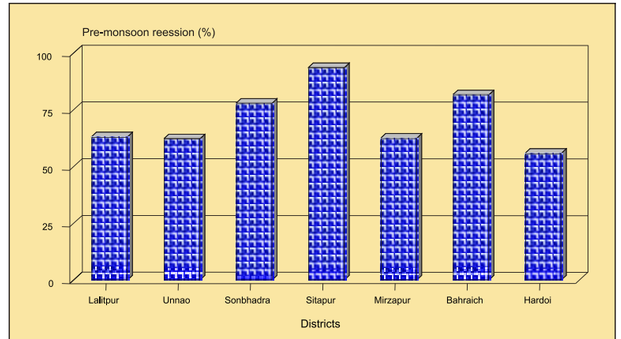
Aquatic vegetation in wetlands in select Districts

Summer recession of water

The summer season recession is found to be highest in the case of wetlands of Sonbhadra, Sitapur and Bahraich districts. The minimum recession is found in Hardoi district.



Size class distribution in select Districts



Average summer recession in select Districts

Ameen Ahamed

Maps not to scale

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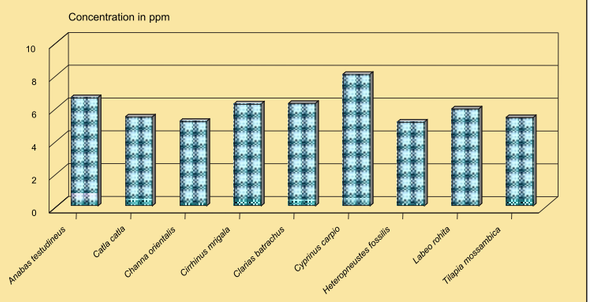


Lead contamination in select species of fishes

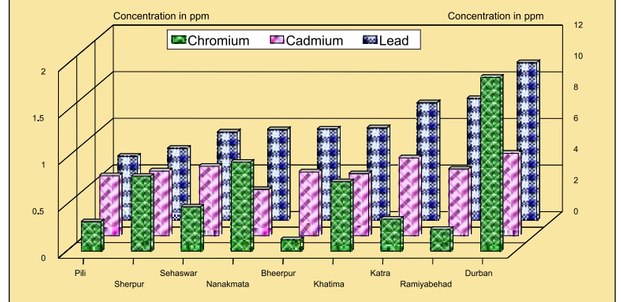
Attributes of wetlands and environmental contamination

Heavy metals

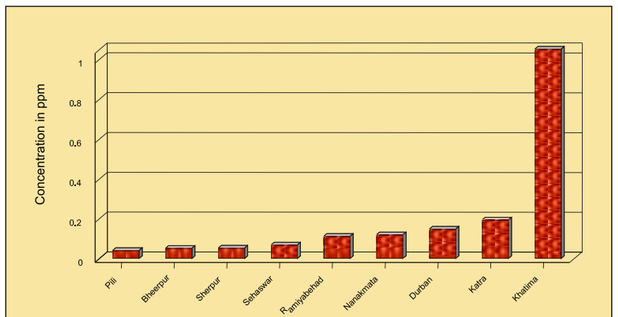
On an average, among the wetlands, Durban of Ambdekar Nagar has high concentrations of lead, cadmium and chromium. Zinc and copper are within the permissible limits. Variation in contamination for copper, lead, zinc and cadmium level is significant among wetlands. Among the fishes, surface dwellers have maximum concentrations of all metals. *Cyprinus carpio* has high lead concentration, followed by *Anabas testudineus*, *Clarias batrachus* and *Cirrhinus mrigala*. About 90% of the fishes have chromium below detectable limits. Levels of copper, zinc and cadmium are also within the permissible limits. The concentrations of lead, zinc and copper varied significantly among the species.

Pesticide data

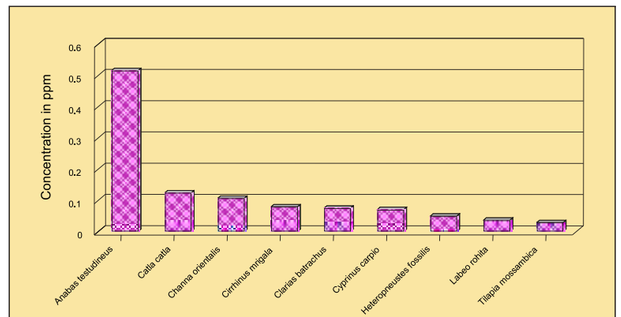
Quantification of organochlorine residues in Uttar Pradesh wetlands reveal that Khatima of Udhamsingh Nagar has the highest load while Haripura of Udhamsingh Nagar, the least. Levels recorded in Pili are also comparatively low.



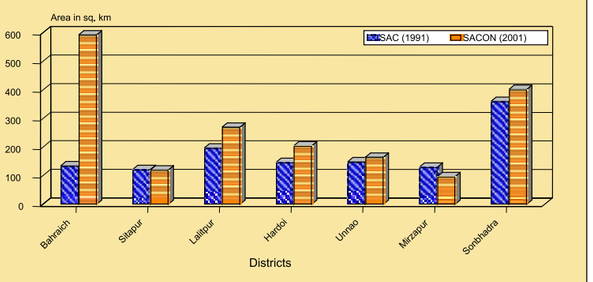
Heavy metal contamination in select wetlands



Total organochlorine residues among various Wetlands



Total Organochlorine residues among various species of fishes



Difference in total wetland area (sq. km)



Parasaraya

E. Bharucha

Maps not to scale

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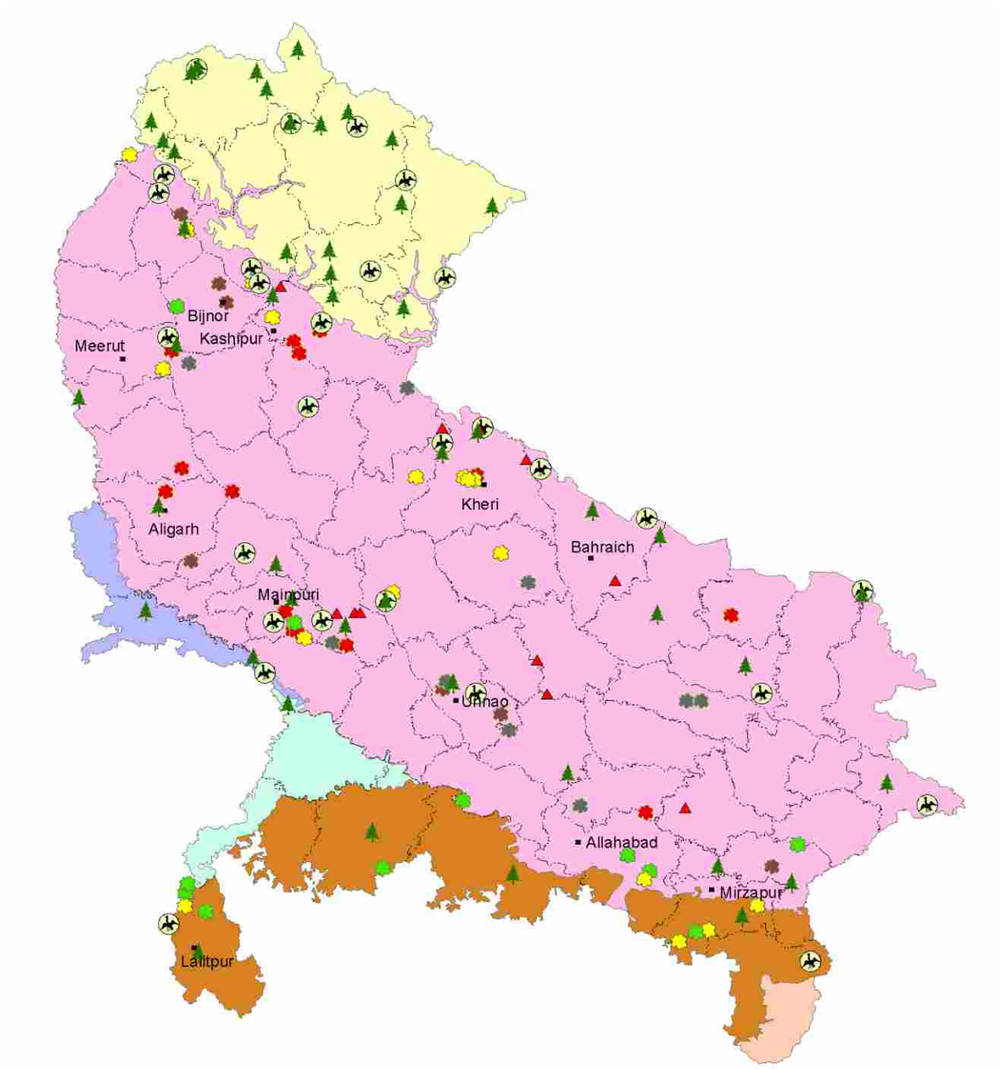
Prioritized inland wetlands of Uttar Pradesh and Uttaranchal



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*

Biogeographic Provinces

- *2B, Himalaya West Himalaya*
- *4A, Semi Arid Punjab Plains*
- *4B, Semi Arid Gujarat Rajputana*
- *6A, Deccan Peninsula-Central Highlands*
- *6B, Deccan Peninsula-Chotta Nagpur*
- *7A, Gangetic Plain-Upper Gangetic Plain*
- *7B, Gangetic Plain-Lower Gangetic Plain*
- *District Boundaries*

Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in Uttar Pradesh and Uttaranchal

PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ASAN RESERVIOR	DEHRADUN	30 14 24	77 24 00	PAONTA SAHEB	2	L	7A
ASHPAN	ALIGARH	28 01 02	78 05 05	ALIGARH	1	L	7A
BAKHARPUR (DHARIWAL)	BIJNOR	29 25 00	78 33 00	BIJNOR	4	L	7A
BHANWANT	MAINPURI	27 10 00	79 05 30	BHANWANT	1	M	7A
BHEEMGODA BARRAGE	HARIDWAR	29 56 00	78 12 00	HARIDWAR	2	M	7A
BHEERPUR	ALLAHABAD	25 13 30	82 02 25	ALLAHABAD	2	L	7A
CHAPHARIA-DAUREHARA	KHERI	28 09 00	80 37 59	DHURAHAR	2	L	7A
CHATURBHUJA	MIRZAPUR	24 46 00	82 19 00	CHATURBHUJA	2	M	6A
DAHRAON	VARANASI	25 28 30	83 17 00	RAMNAGAR	3	H	7A
FATTEPUR	SIDDARTHNAGAR	27 09 30	82 45 00	DOMARIAGANJ	1	L	7A
GANGA BARRAGE	BIJNOR	29 22 30	78 08 10	BIJNOR	3	L	7A
GANGA YAMUNA RIVER STRATCHES	ALLAHABAD	25 24 05	81 54 15	ALLAHABAD	3	H	7A
GOLATAPPAR-LALTAPPAR	DEHRADUN	30 03 00	78 09 00	HARIDWAR	4	N.A.	7A
GOOMCHINI (JAMITHA TAAL)	KHERI	28 10 00	80 09 00	LAKHIMPUR-KHERI	2	N.A.	7A
GUNDERA	LALITPUR	25 08 45	78 21 00	BAJPUR	3	H	6A
HANDIA	ALLAHABAD	25 17 00	82 05 00	HANDIA	3	M	7A
HARIPURA DAM & BOR DAM	UDHAM SINGH NAGAR	29 13 30	79 20 00	BAJPUR	1	M	7A
IBRAHIMPUR	BIJNOR	29 03 00	78 06 00	DHANORA	1	M	7A
KALAGARH	UDHAM SINGH NAGAR	29 33 50	78 45 50	AFZALGARH	2	L	7A
KATRA	FARRUKHABAD	26 56 30	79 29 00	FARRUKHABAD	1	M	7A
LAKH-BAHUSI LAKE	KANNUAJ	26 55 30	79 36 00	KANNUAJ	1	L	7A
LALAULI	FATEHPUR	25 48 00	80 34 00	LALAULI	3	L	7A
MATATILA	LALITPUR	24 59 00	78 20 00	MATATILA	2	H	4B
NANAKMATA	UDHAM SINGH NAGAR	29 08 36	79 06 56	BAJPUR	1	L	7A
NARAYANPUR KALAN	ALLAHABAD	25 43 00	82 03 00	ALLAHABAD	1	H	7A
PATNA BIRD SANCTUARY	ETAH	27 31 00	78 18 30	GANESHPUR	4	M	7A
PILEE DAM	BIJNOR	29 33 00	78 29 00	JASPUR	4	H	7A
PURWA	UNNAO	26 26 00	80 52 00	MAURAWN	4	M	7A
PYAREPUR	UNNAO	26 37 00	80 23 30	PYAREPUR	4	L	7A
RAMIABEHAD (BHAGEHAR TAAL)	KHERI	28 09 00	80 35 00	KHERI	2	H	7A
RAMNAGAR	VARANASI	25 19 00	83 04 00	VARANASI	4	H	7A
RAZAWAN	LALITPUR	25 05 00	78 20 00	TALBEHAT	3	H	4B
SAHASWAN	UDHAM SINGH NAGAR	28 02 00	78 38 00	BAJPUR	1	M	7A
SAMAN	MAINPURI	27 01 00	79 11 30	SAMAN	1	M	7A
SANDI LAKE	HARDOI	27 19 00	79 58 15	ADAMPUR	2	L	7A
SARANG NAGLA	MAINPURI	27 05 00	79 10 02	MAINPURI	3	L	7A
SARELI TAAL	KHERI	28 11 00	80 39 00	LAKHIMPUR-KHERI	1	L	7A
SARSAI NAWAR	MAINPURI	26 58 12	79 15 20	MAINPURI	2	L	7A
SAUJ	MAINPURI	27 01 30	79 09 30	SAUJ	1	M	7A
SEMARAI	KHERI	28 10 00	80 33 00	KHERI	2	H	7A
SHAIKHA	ALIGARH	28 11 44	78 12 42	ALIGARH	1	H	7A
SHERPUR	MEERUT	28 55 00	78 02 00	MAWANA	2	M	7A
SHERWASKALAN	LALITPUR	24 57 00	78 30 00	TALBEHAT	3	H	6A
SIRSI (LALGANJ)	MIRZAPUR	24 50 13	82 27 00	SIRSI	3	H	6A
SIRSI (MARIHAN)	MIRZAPUR	24 51 00	82 33 00	SIRSI	2	H	6A
SUKWA DUKWA DAM	LALITPUR	25 08 45	78 21 00	BABINA	3	H	6A
TAALGAON	KHERI	27 36 45	80 51 20	LAHARPUR	2	H	7A
TUMARIA DAM	UDHAM SINGH NAGAR	29 19 00	78 56 00	KASHIPUR	2	H	7A
VIJAY SAGAR	MAHOBA	25 17 45	79 55 15	BAJPUR	3	L	6A
VISHWANATHPUR	MIRZAPUR	25 02 00	82 57 00	CHUNAR	2	L	7A

V.S. Vijayan

Note:-N.A.-Not Available/Data Deficient; L-Low,M-Medium,H-High.

Maps not to scale

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B. Sinha

WEST BENGAL

WEST BENGAL

Habitat features

According to the data of IWMED (2000), West Bengal has 6049 wetlands of size 2.25 ha and above covering a total area of 1438.56 km^2, constituting 1.59% of the total geographic area of the state.

Nine types of wetlands occur in West Bengal, of which tanks are the highest in number followed by oxbow lakes and waterlogged areas.

Biodiversity

	Endemics	Critically Endangered	Endangered	Vulnerable	Threatened	Near Threatened	Least Concerned
Aquatic Plants	5	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fishes	N.A.	1	8	21	30	N.A.	N.A.
Turtles	N.A.	1	4	5	N.A.	4	1
Birds	N.A.	N.A.	N.A.	N.A.	6	6	N.A.

Prioritized Sites

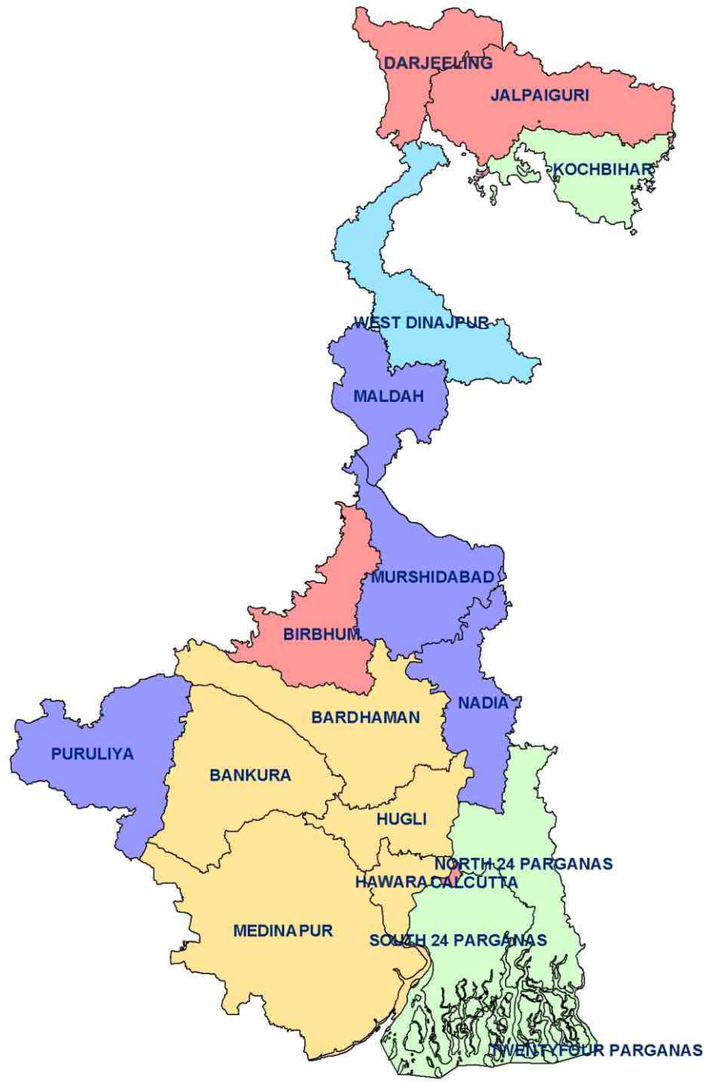
Number of Prioritized Wetlands	Rank 1	Rank 2	Rank 3	Rank 4
25	7	8	6	4

Thirteen wetlands are qualified to be declared as Ramsar sites (page 215).

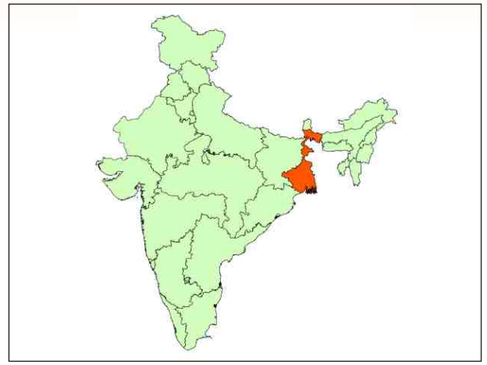


Pratap Singh

A profile of wetlands in West Bengal



Aerial extent of wetland cover



Per cent geographic area under wetlands

- 0.0-0.5
- 0.5-1.0
- 1.0-1.5
- 1.5-2.0
- >2.0

DISTRICT	GEOGRAPHICAL AREA (Km^2)	WETLAND EXTENT (Km^2)	PER CENT OF GEOGRAPHICAL AREA UNDER WETLANDS
BANKURA	6882.00	69.13	1.00
BARDHAMAN	7024.00	64.41	0.92
BIRBHUM	4545.00	17.41	0.38
CALCUTTA	185.00	N.A.	0.00
DARJEELING	3149.00	2.72	0.09
HAWARA	1467.00	12.23	0.83
HUGLI	3149.00	16.31	0.52
JALPAIGURI	6227.00	10.9	0.18
KOCHBIHAR	3387.00	49.3	1.46
MALDAH	3733.00	269.32	7.21
MEDINAPUR	14081.00	120.69	0.86
MURSHIDABAD	5324.00	220.76	4.15
NADIA	3927.00	122.98	3.13
NORTH 24 PARGANAS	4094.00	47.08	1.15
PURULIYA	6259.00	168.04	2.68
SOUTH 24 PARGANAS	9960.00	114.54	1.15
WEST DINAJPUR	5359.00	106.99	2.00

Maps not to scale

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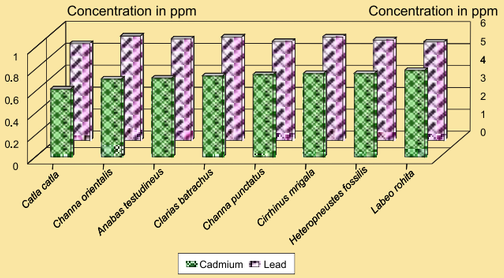
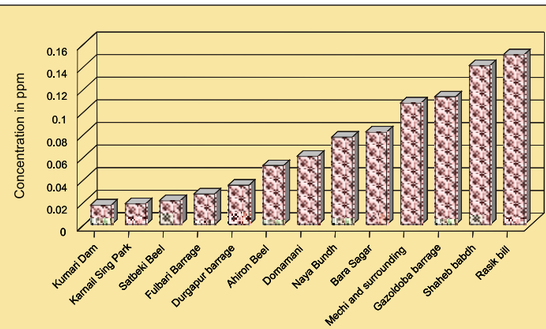
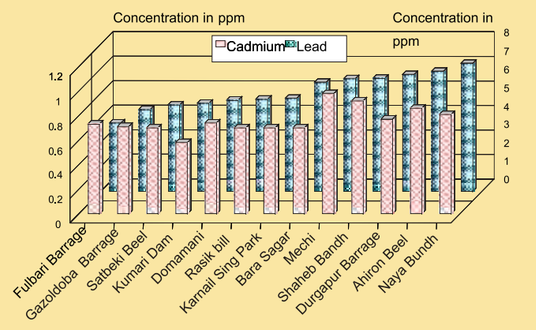
Sálim Ali Centre for Ornithology and Natural History, Coimbatore



Lead and Cadmium contamination in select species of fishes



Total organochlorine residues among various wetlands



Lead and Cadmium contamination in select wetlands

Attributes of wetlands and environmental contamination

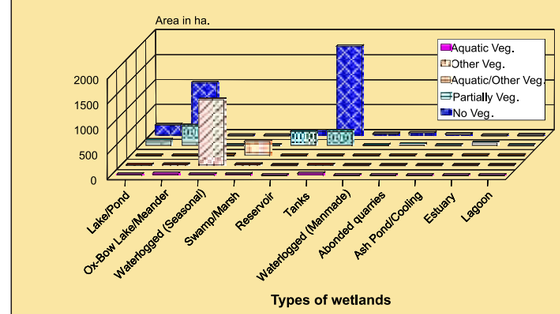
Heavy metals

Among the wetlands Mechi of Darjiling has the maximum concentrations of cadmium and Naya Bundh of Maldah, has the highest concentrations of lead. The concentrations of zinc, copper and chromium are within the permissible limits. The variation in contamination of copper, lead, zinc and cadmium is significant among wetlands. Copper, zinc and chromium are found to be within the permissible limits. While the contamination levels particularly of lead, zinc and copper among the species are significantly different; the surface dwellers appear to be accumulating more than the other species.

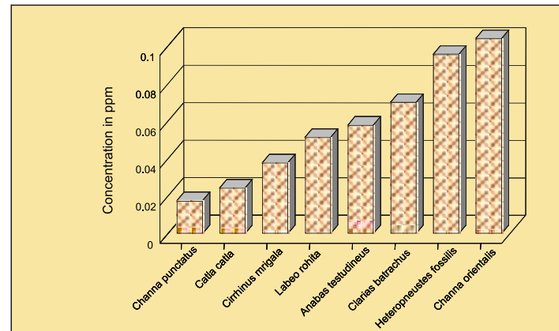
Pesticide data

Among the various wetlands studied, Rasik beel of Koch- Behar district recorded the highest concentrations of total organochlorine residues. Shaheb Bandh of Puruliya district and Gazoldoba Barrage of Darjiling also had comparable levels. Least concentrations are recorded in Fulbari barrage of Darjiling district followed by Satbeki beel of Jalpaiguri district, Karnail Sing Park of Barddhaman district and Kumari dam of Puruliya district. It is also observed that the variation in organochlorine residues among the wetlands is significant.

E. Bharucha



Type-wise aquatic vegetation status of wetlands



Total Organochlorine residues among various species of fishes



B. C. Choudhary

Maps not to scale

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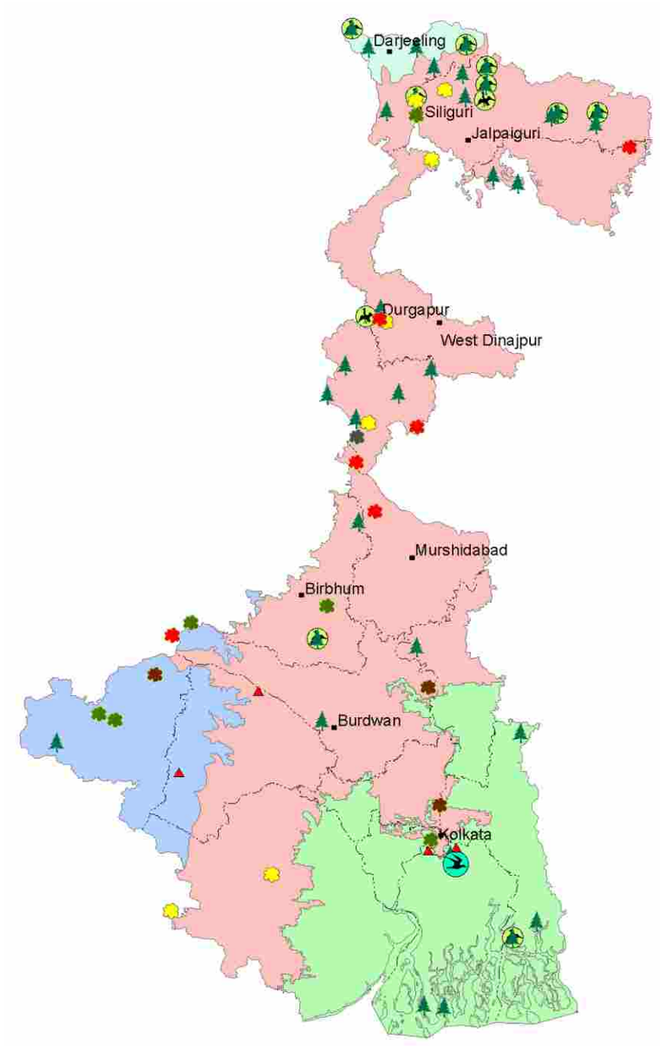
Prioritized inland wetlands of West Bengal



Prioritized Wetland

- *Rank 1*
- *Rank 2*
- *Rank 3*
- *Rank 4*
- *Data Not Available*
- *Important Bird Areas*
- *BCPP Sites*
- *Wildlife Sanctuaries & National Parks*
- *Ramsar Site*

Biogeographic Provinces

- *8B, Coasts-East Coast*
- *2C, Himalaya-Central Himalaya*
- *6B, Deccan Peninsula - Chotta Nagpur*
- *7B, Gangetic Plain-Lower Gangetic Plain*
- *9A, North East-Brahmaputra Valley*
- *District Boundaries*

Maps not to scale

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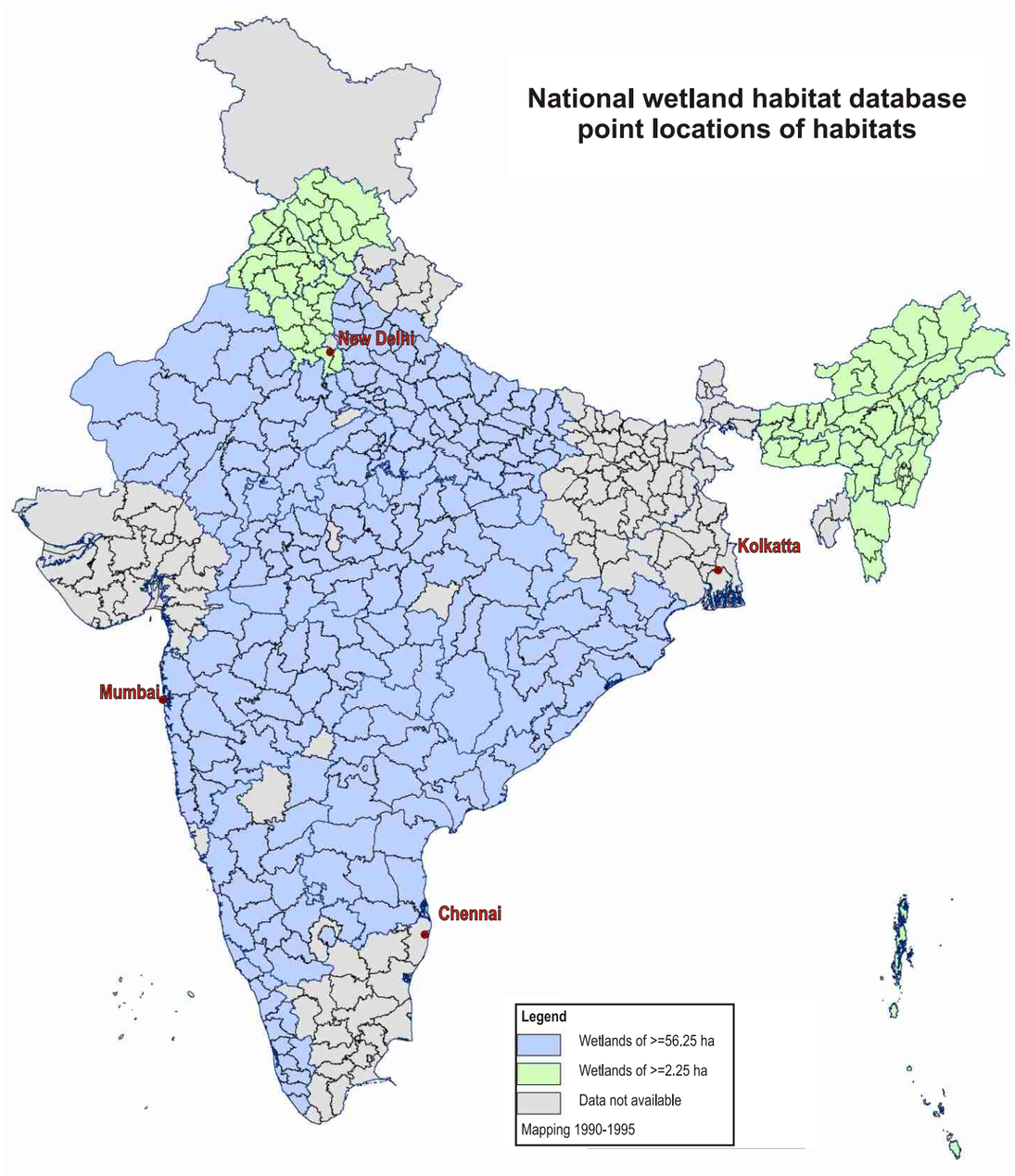
Prioritized wetlands, Important Bird Areas, Biodiversity conservation prioritization project sites, Wildlife sanctuaries, National Parks and Ramsar sites in West Bengal

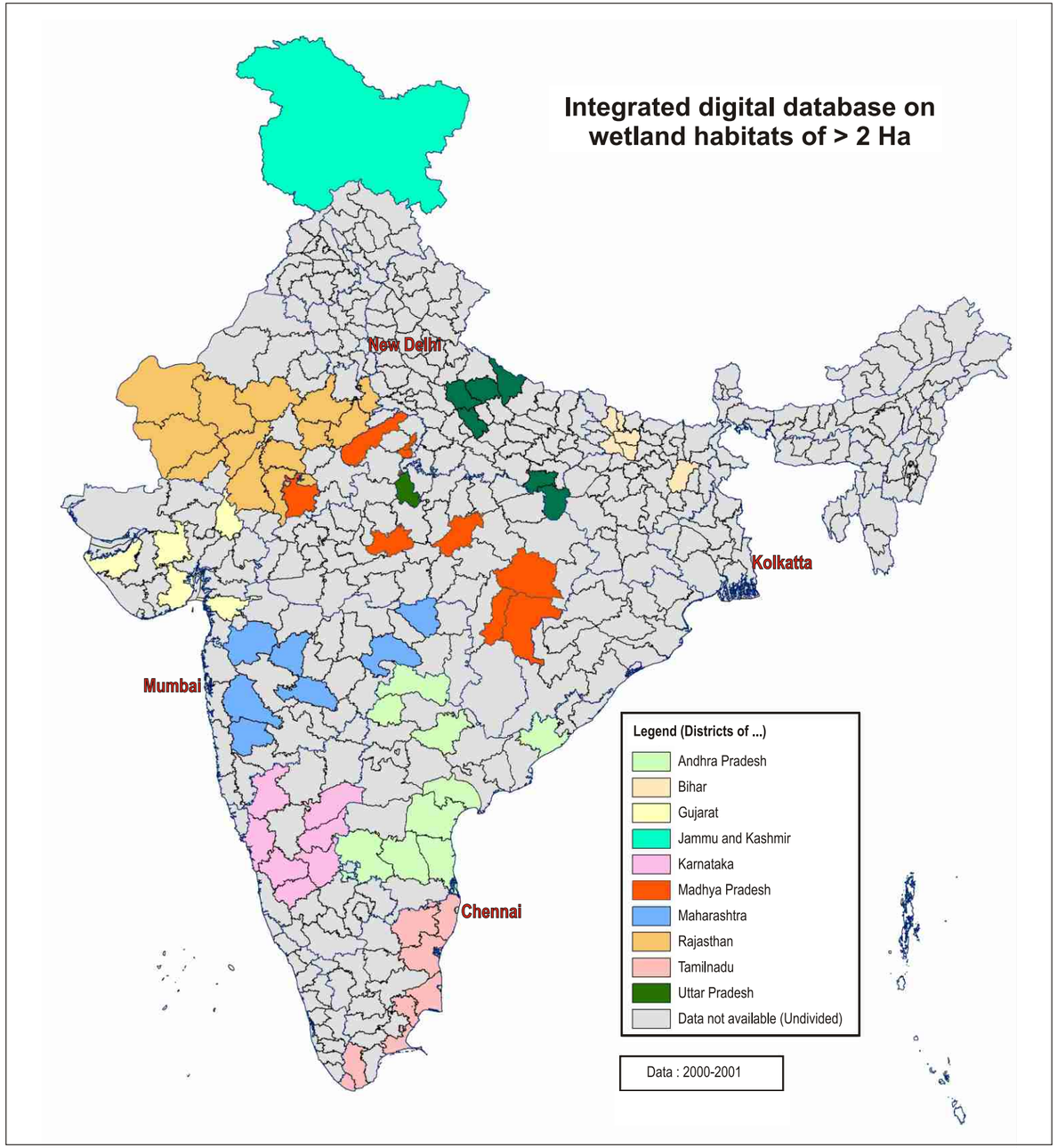
PRIORITIZED SITE	DISTRICT	LATITUDE	LONGITUDE	NEAREST TOWN	BIODIVERSITY RANK	SOCIO-ECONOMIC USE GRADE	BIO-GEOGRAPHIC PROVINCE
ADINA DEER PARK	MALDA	253100	881000	MALDA	2	H	7B
AHIRAN,FARRAKA	MURSHIDABAD	244400	875700	NEW FARAKKA	2	M	7B
BAGHAR BEEL	MURSHIDABAD	242700	880300	OMALPUR	1	H	7B
BARA SAGARDIGHI	MALDA	245700	880200	MALDA TOWN	1	M	7B
DOMOHINI	JALPAIGURI	262500	883000	JALPAIGURI	2	L	7B
DURGAPUR BARRAGE	BARDDHAMAN	253200	880800	DURGAPUR	4	L	7B
FARAKKA BARRAGE	MALDA	244800	875500	MALDA TOWN	1	H	7B
FARRAKA ASH DYKES	MURSHIDABAD	245500	875500	NEW FARAKKA	2	L	7B
FULBARI-MAHANANDA BARRAGE	JALPAIGURI	264000	882500	SILIGURI	2	H	7B
GAJOLDOBA BARRAGE	JALPAIGURI	264800	883600	OODLABARI	2	H	7B
KANSABATI RIVER	MEDINIPUR	222600	872000	MIDNAPORE TOWN	2	L	7B
KARNAIL SINGH PARK	BARDDHAMAN	235200	865400	CHITTARANJAN	1	L	7B
KUMARI DAM,PURULIA	PURULIYA	232000	862500	PURULIA	3	M	6B
MAITHON RESERVOIR	BARDDHAMAN	234800	865000	KUMARDHUBI	3	L	6B
MAITYBANDH	MEDINIPUR	222700	871600	MONASOL	2	L	7B
MECHI RIVER	DARJEELING	264500	882500	SILIGURI	3	H	7B
NAYABANDH	MALDA	245500	882000	MALDA TOWN	1	H	7B
PALTA WATERWORKS	NORTH 24 PARGANAS	224700	882200	BARRACKPORE	4	L	7B
PANCHET DAM,PURULIA	PURULIYA	235700	864200	MAITHON	3	L	6B
PURBASTHALI GANGETIC ISLANDS	BARDDHAMAN	232700	881945	NABADWIP TOWN	1	H	6B
RASIK BEEL	KOCH-BEHAR	262540	894410	ALIPURDUAR	1	L	7B
SAHEB BANDH- PURULIA	PURULIYA	232212	861915	PURULLA TOWN	4	M	6B
SAHEB BANDH-ADRA	PURULIYA	233500	864000	ADRA	4	L	6B
SANTRAGACHHI	HAORA	223500	881700	SANTRAGACHHI	3	L	7B
TILPARA BARRAGE	BIRBHUM	235600	874400	SURI	3	L	7B

S.A. Hussain

Note:- L-Low, M-Medium, H-High.

National database on wetlands





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Meta data on inland wetlands

ThematicClass	Layer ID	Basic Resolution	GIS Data Structure	Output Scale Range	Pixel Resolution	Vintage
Digital Image Processing						
(DIP) Feature	Land use	1.50 K	Raster	1.50 K to 1.500 K	23.5 m	2000
DIP Feature	Wetland types	1.50 K	Raster	1.50 K to 1.500 K	23.5 m	2000
DIP Feature	Turbidity	1.50 K	Raster	1.50 K to 1.500 K	23.5 m	2000
DIP Feature	Aquatic vegetation	1.50 K	Raster	1.50 K to 1.500 K	23.5 m	2000
DIP Outputs	FCC	1.50 K	Raster	1.50 K to 1.500 K	23.5 m	2000
Borders	District boundaries	1.250 K	Vector	1.50 K to 1.500 K	Not applciable	1991
Borders	Tehsil / Taluk boundaries	1.250 K	Vector	1.50 K to 1.500 K	Not applciable	2000
Borders	State boundaries	1.250 K	Vector	1.50 K to 1.500 K	Not applciable	2000
Transportation	Road boundaries	1.250 K	Vector	1.50 K to 1.500 K	Not applciable	2000
Hydrology	Drainage	1.1000 K	Vector	1.1000 K to 1.50 K	Not applciable	2000
Habitation	Place	1.250 K	Vector (Point)	1.100 K to 1.50 K	Not applciable	2000
Geo-referenced point location	Wetlands > 56 ha	1.50 K	Vector (Point)	1.250 K to 1.50 K	Not applciable	1992-93
Geo-referenced point location	Wetland < 56 ha	1.50 K	Vector (Point)	1.250 K to 1.50 K	Not applciable	1992-93
Geo-referenced point location	Birds/National	1.50 K	Vector (Point)	1.250 K to 1.50 K	Not applciable	2004
Geo-referenced point location	Plants/National	1.50 K	Vector (Point)	1.250 K to 1.50 K	Not applciable	2004
Geo-referenced point location	Prioritized sites	1.50 K	Vector (Point)	1.250 K to 1.50 K	Not applciable	2004
	National/State level	1.50 K	Vector (Point)	1.250 K to 1.50 K	Not applciable	2004

S.K. Srivastva

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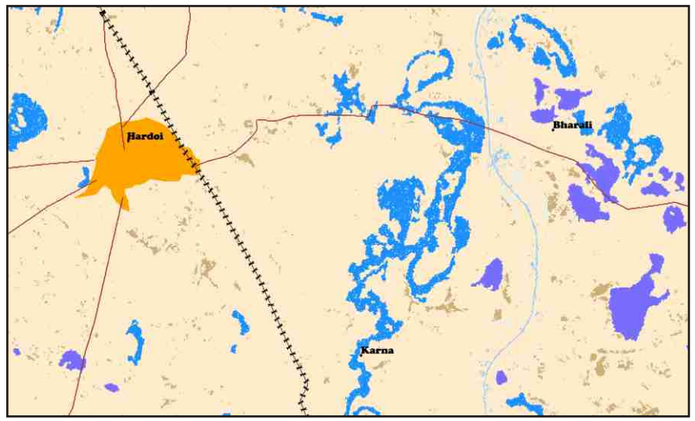
Spatial database of select wetland themes at full map resolution, District Hardoi, Uttar Pradesh

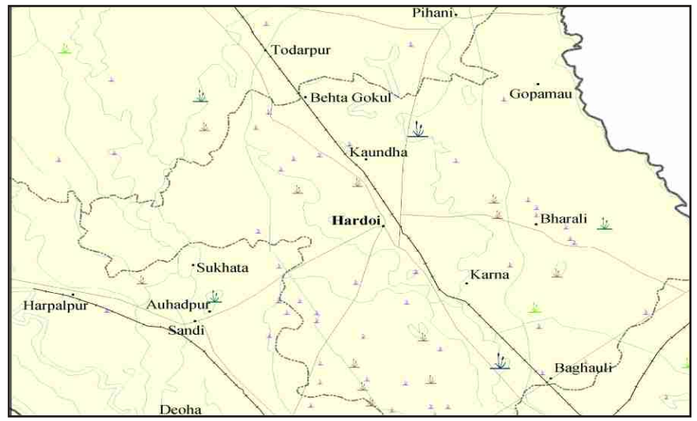
A segment of integrated wetland and land use map at 1:50000 scale resolution



Integrated wetland type and land-use

NP Dense Forest	Waste Land	NP Pond/Tank	Water-logged	Sand	Railways
NP Open Forest	River	NP Reservoir	NP Coastal-water	NP Others	District Boundary
Arable Land	Township	Oxbow Lake/Cut-off	NP Marsh/Mud	Roads	Tehsil Boundary

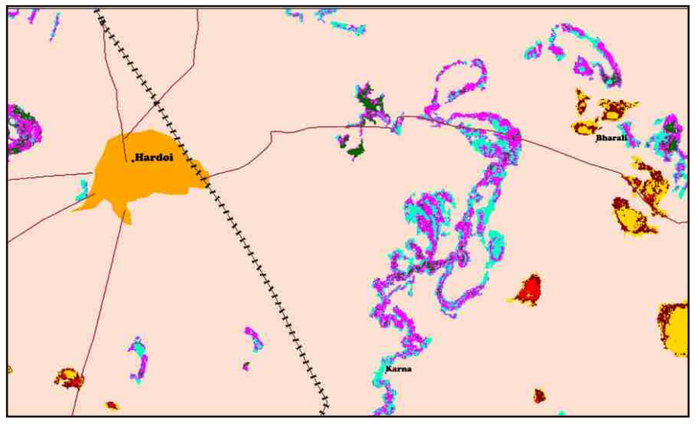
A segment of integrated wetland and land use map at 1:50000 scale resolution



Distribution of wetlands

Area >= 500 ha; Area >= 400 ha and <500 ha; Area >= 300 ha and < 400 ha; Area >= 200 ha and < 300 ha; Area >= 100 ha and < 200 ha; Area >= 56 ha and < 100 ha; Area <= 56 ha; Rivers/Streams; Cities/Towns/Villages; Railways; Roads; International Boundary; State Boundary; District Boundary; Taluk Boundaries

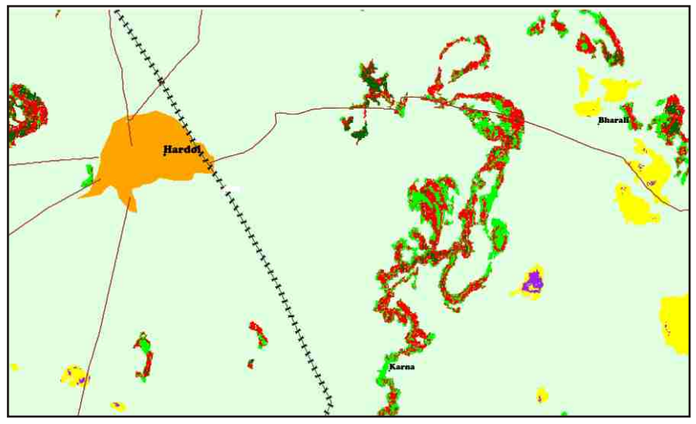
A segment of integrated wetland type and turbidity map at 1:50000 scale resolution



Turbidity

Wetland	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged			
Oxbow Lake/Cut-off			

A segment of integrated wetland type and aquatic vegetation map at 1:50000 scale resolution



Aquatic vegetation

Wetland	Low	Medium	High
Pond/Tank	NP	NP	NP
Reservoir	NP	NP	NP
Water-logged		NP	
Oxbow Lake/Cut-off			

Maps not to scale

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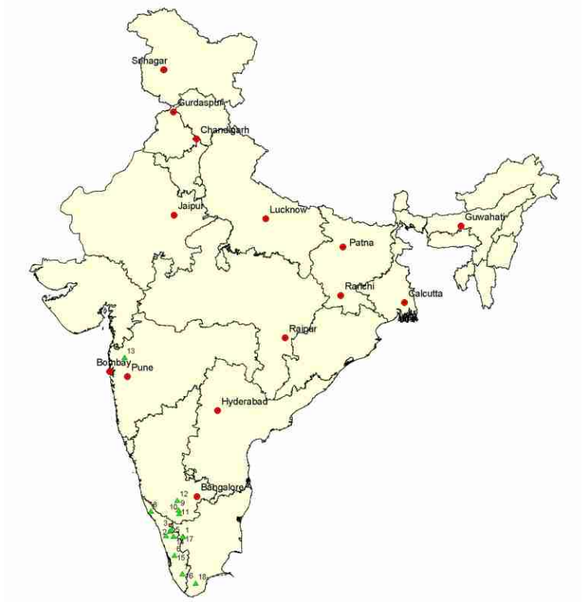
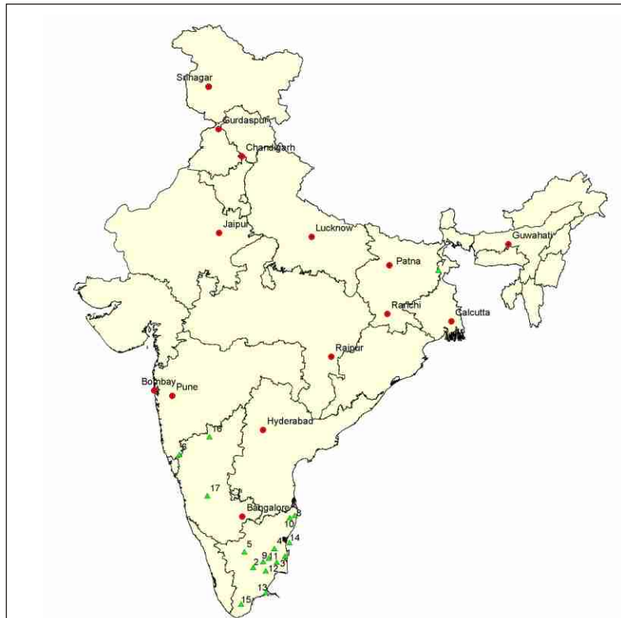
Georeferenced distribution map of aqautic plants in India



Dalzellia zeylanica
Podostemaceae

Sites

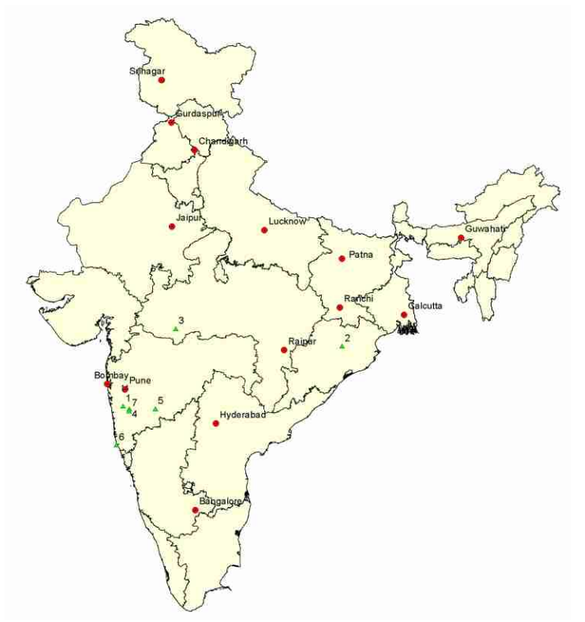
1 Mount Street, Thunakadavu
2 Nilambur
3 Nedumkayam
4 Kanjirakadavu
5 Mukkali Forest
6 Pothundy to Kaikatty
7 Pamba Valley
8 Panathu
9 Karapur
10 Kabini River at Nanjangud
11 Kakankote
12 South Kanara
13 Igatpuri
14 Matheran
15 Sanagaon forests
16 Warra Ghat
17 Coimbatore
18 Tirunelveli



Dopatrium lobelioides
Scrophulariaceae

Sites

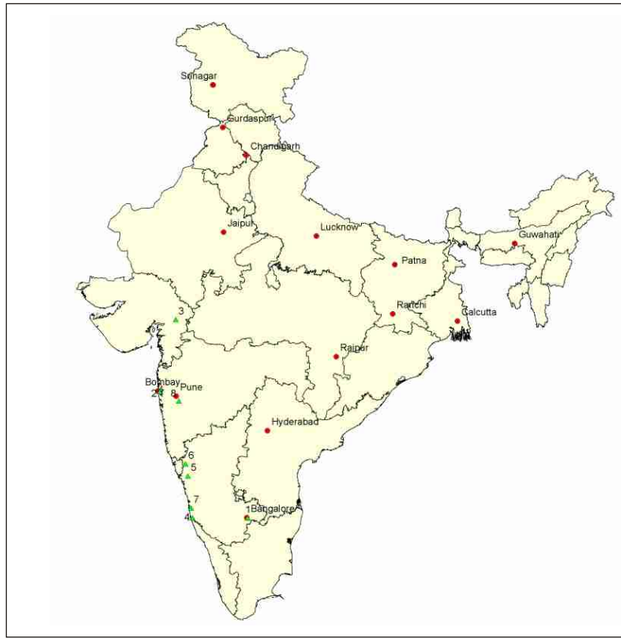
1 Mannargudi
2 Comatchiculam
3 Ammapettai
4 Avadi
5 Calicut University Campus
6 Badami hills
7 Rajmahal
8 Peravellur Lake
9 Trichirapally
10 Sri Perambudur
11 Pullam Padi
12 Puddukottai
13 Ramanathapuram
14 Near Bahur
15 Tirunelveli
16 Bijapur
17 Bhadravati



Eriocaulon duthiei
Eriocaulaceae

Sites

1 Mahabaleshwar
2 Bhimkand
3 Khandwa
4 Near Nimb
5 Asti
6 Venglura Rocks
7 Near Vena River



Eriocaulon lanceolatum
Eriocaulaceae

Sites

1 Near Bangalore
2 Mumbai
3 Kune Plateau
4 Mangalore
5 North Kannara
6 Tinai Ghat
7 Manipal
8 Hadapsar

Maps not to scale

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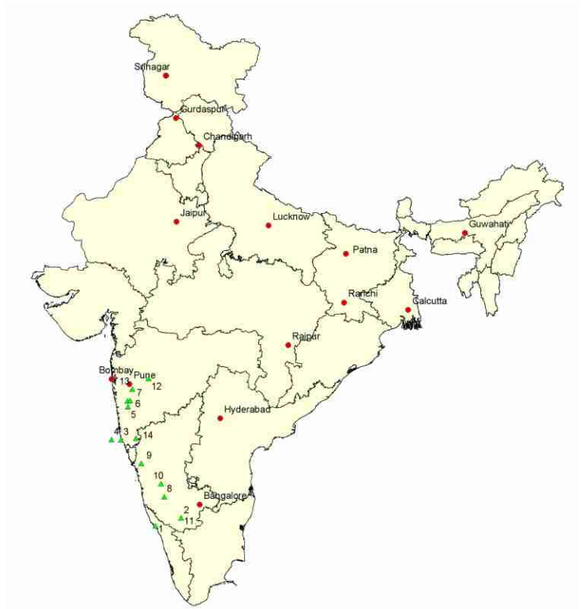
Georeferenced distribution map of aqautic plants in India



Eriocaulon stellulatum
Eriocaulaceae

Sites

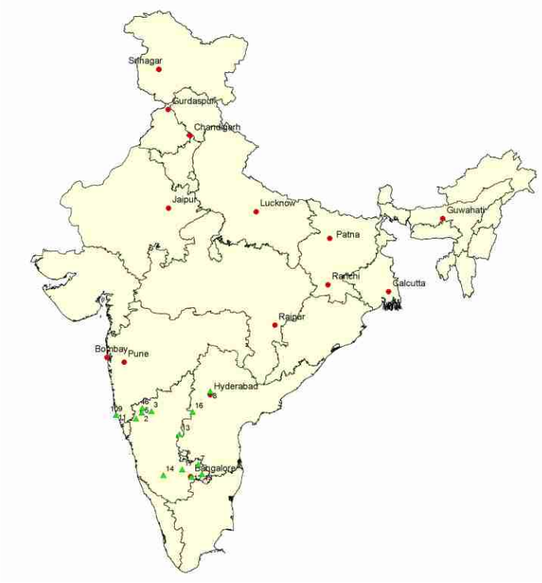
1 Kannoth River Beds
2 Tirthahalli
3 Ramghat
4 Amboli
5 Koyna
6 Mahabaleshwar
7 Panchgani
8 Chikmagalur
9 North Kannara
10 Bidare
11 Doddakere Reservoir
12 Ahmednagar
13 Hadapsar
14 Ajra



Fuirena capitata
Cyperaceae

Sites

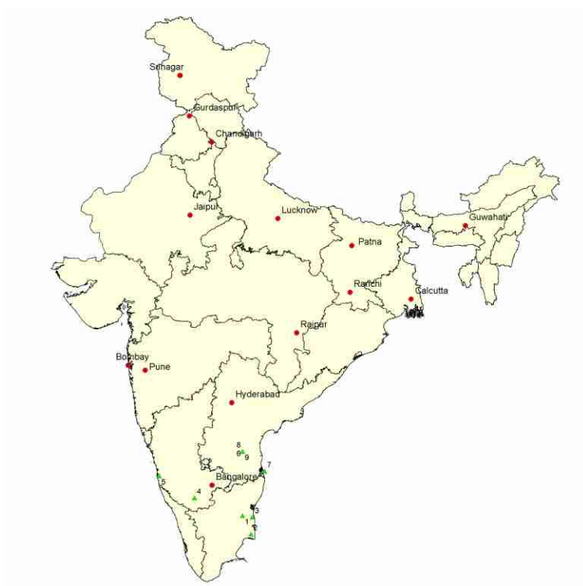
1 Veerambakkam
2 Marakkanam to Kurumapuram
3 Vedanthangal Bird Sanctuary
4 Vandalur RF
5 Hogenakal
6 Sivasamudram
7 Thalainagar
8 Poodi
9 Siddannavasal
10 Vadapuram
11 Manantoddy
12 Varahi Falls, Hulical
13 Kanwar
14 Balapalle
15 Tada
16 Nilali, Near Chafeli
17 Bhadgaon
18 Tiruchirapally
19 Vengurla Rocks
20 Ratnagiri



Fuirena trilobites
Cyperaceae

Sites

1 Dandiganahalli
2 Gohak
3 Belgam-Gokak Road
4 Ittikaldurga SFI
5 Uchangidurga
6 Sidlaghata-Chintamani Road
7 Bangalore
8 Secundrabad
9 Aronda
10 Vetye
11 Virdi
12 Belandur Tank
13 Bellary
14 Hassan
15 Kolar
16 Patapalem
17 Devaraipatna



Hygrophila balsamica
Acanthaceae

Sites

1 Pandrj
2 Thiruthuraipundi
3 Annamalainagar
4 Mysore
5 South Kannara
6 Ootachettu
7 Sriharikota
8 Perumbakkam
9 Kiliveedu

Maps not to scale

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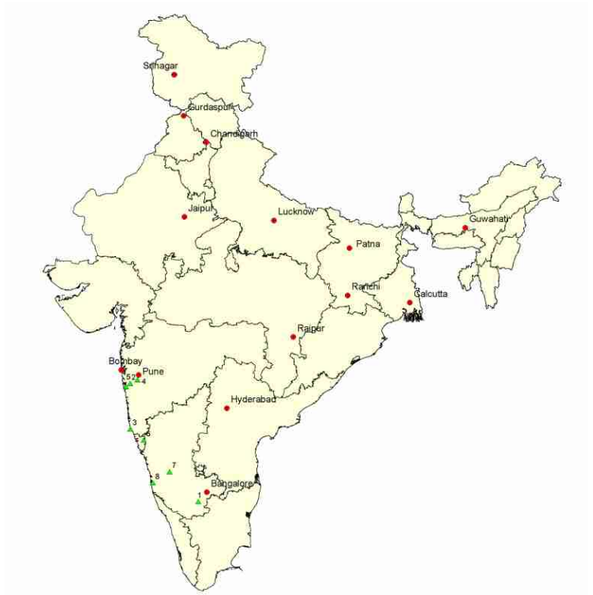
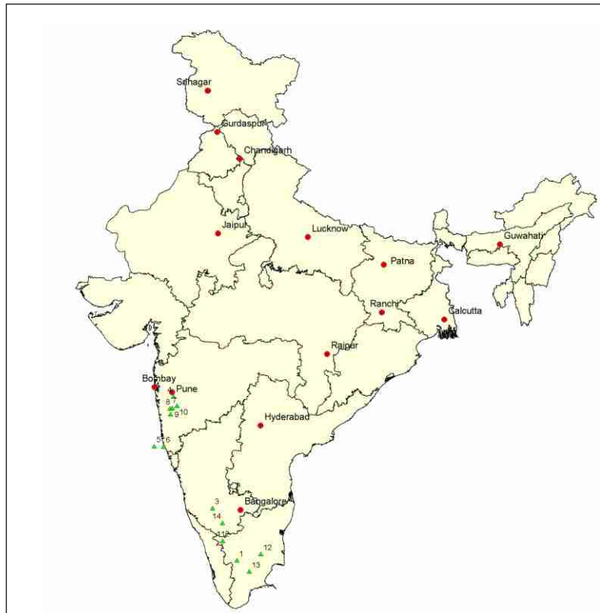
Georeferenced distribution map of aqautic plants in India



Hygrophila pinnatifida
Acanthaceae

Sites

1 Deccan
2 Danoli
3 Bhedsi
4 Dahen Forests
5 Mhasla
6 Toldem
7 Bidare
8 Manipal



Isachne elegans
Poaceae

Sites

1 Palni Hills
2 Ootacamund
3 Genkalbetta
4 Pune
5 Amboli
6 Mordongri
7 Koyna
8 Mahabaleshwar
9 Panchgani
10 Khandala
11 Doddabetta
12 Tiruchirapally
13 Madurai
14 Doddakere Reservoir



Lagenandra meeboldii
Araceae

Sites

1 Paddy Fields Mukkali
2 Thalichola
3 Sholayar
4 Mukkali
5 Mandampatty
6 Chandanathodu
7 Chalakayam-Pambar
8 Way to Mannarghat from Mukkali
9 Agalhatti
10 Athihalli
11 Maranahalli
12 Devarunde
13 Agalhatti
14 Agastyamala
15 Dam Site, Palghat
16 Hassan
17 Doddakere Reservoir
18 Bidare
19 Harchalli
20 Shimoga



Myriophyllum indicum
Haloragaceae

Sites

1 Thamaraikulam Pond
2 Karapara River Padagiri
3 Lower Periyar
4 Nasignate-Hosur
5 Gopalram Tank
6 Ganjem
7 Kujang
8 Mourigram
9 Dhulian
10 Motijhil
11 Bengal
12 Imphal

Maps not to scale

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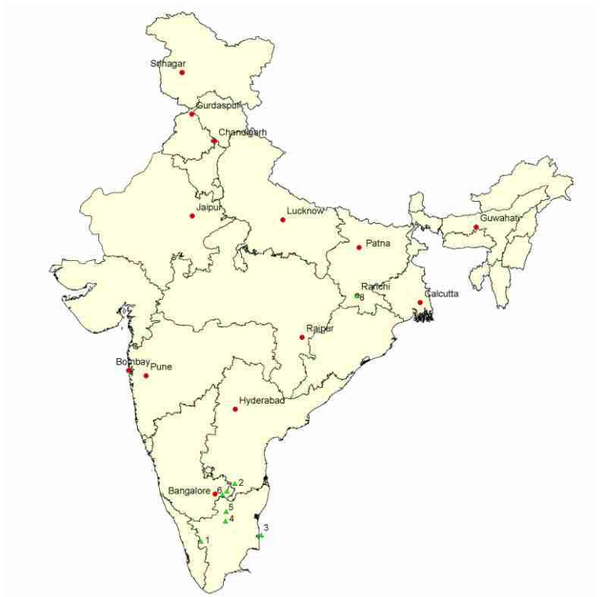
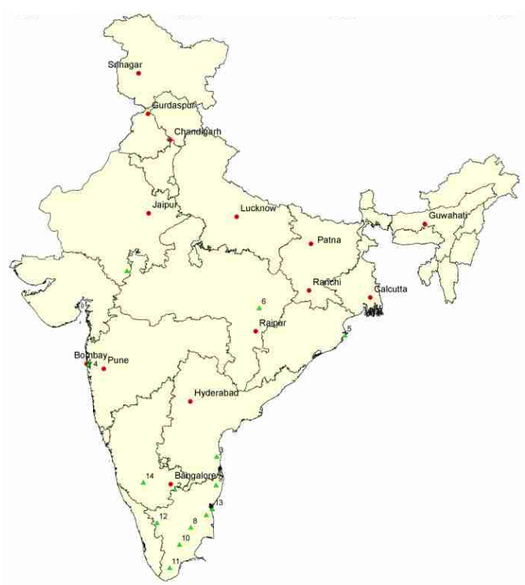
Georeferenced distribution map of aqautic plants in India



Rotala illecebroides
Lythraceae

Sites
1 Anaimalai Hills
2 Royal Pad
3 Pariyar
4 Salem
5 Dharmapuri
6 Malur
7 Kolar
8 Chotanagpur



Rotala verticillaris
Lythraceae

Sites
1 Ilayangudi
2 Hosur
3 Nellore
4 Mumbai
5 Satavya
6 Marwahi
7 Bhongra
8 Tiruchirapally
9 Sriperumbudur
10 Madurai
11 Tirunelveli
12 Coimbatore
13 Panaai
14 Hassan



Sesbania procumbens
Fabaceae

Sites
1 Kumuthakudi, Sundhananthal
2 Sethupathinagar
3 Sozhandur
4 Thirukhostiyur, Thirupattur
5 Reddipalli Farm
6 Ooruchintala
7 Sone
8 Reddippalli farm
9 Ooruchintala
10 Maddileti Stream
11 Rangapuram
12 Mumbai
13 Mumbai
14 Vastara
15 Ratnagiri
16 Uran Mud flat



Sphaeranthus amaranthoides
Asteraceae

Sites
1 Vannathiparai
2 Muniappaneri
3 Deccan
4 Mysore Ghat
5 Munradaippu
6 Doddakere Reservoir

Maps not to scale

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Georeferenced distribution map of aqautic plants in India



Utricularia albocaerulea
Lentibulariaceae

Sites

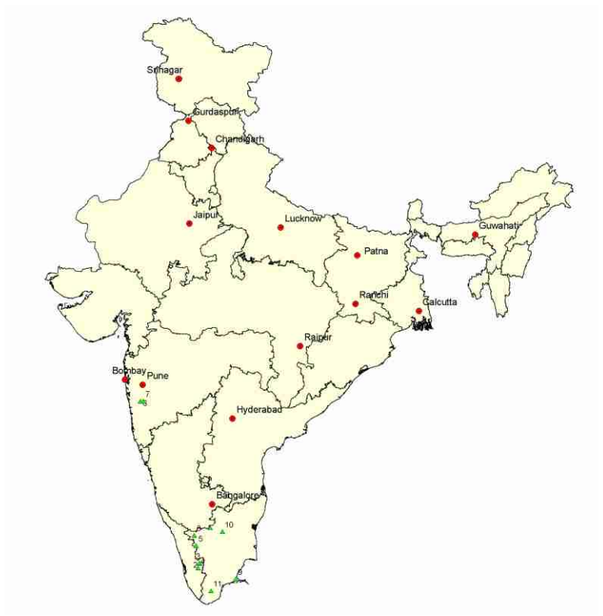
1 Anaimalai Hills 7,500feet
2 Malabar Concan
3 Silent Valley-Aruvampara Slopes
4 Vengurla
5 Panchgani
6 Mahabaleshwar
7 Coimbatore
8 Mirya Bay



Utricularia hirta
Lentibulariaceae

Sites

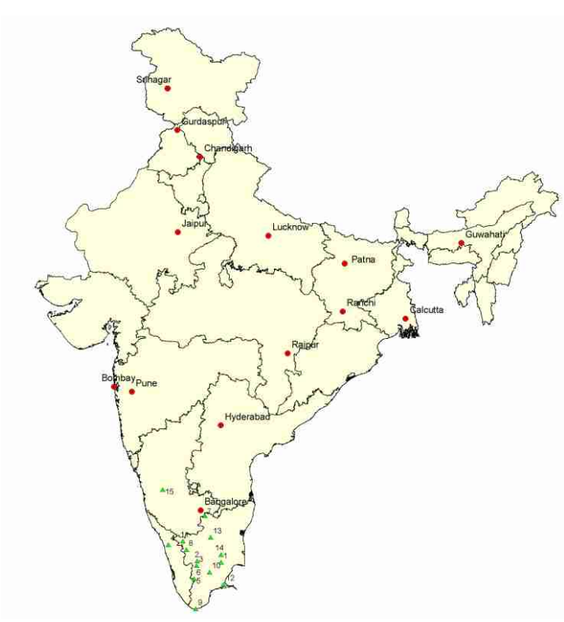
1 Gingee RF
2 Narthamalai Forest
3 Deccan
4 Pannai
5 Tirunelveli
6 Rajpuri
7 Balaghat
8 Burwa
9 Hazaribagh
10 Chota Nagpur



Utricularia praeterita
Lentibulariaceae

Sites

1 View Point, Kodanad
2 Lockhert Gap, Devicolam
3 Pachakanam
4 Painavu
5 Water Tank Hillock, Malampuzha
6 Mahableshwar
7 Panchgani
8 Doddabetta
9 Ramanathapuram
10 Salem
11 Tirunelveli



Utricularia smithiana
Lentibulariaceae

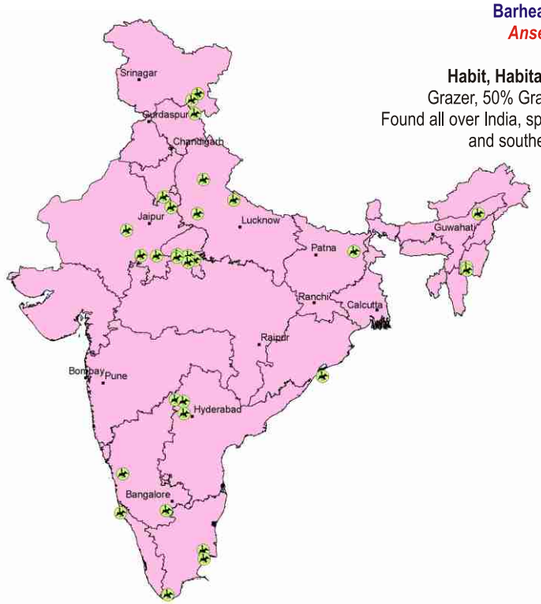
Sites

1 Siddanavasal
2 Palni Hills
3 Near Kodaikanal
4 Aruvampara Slopes
5 Manantoddy
6 Manantoddy, Periyar
7 North Kanara
8 Coimbatore
9 Agastiswaram
10 Madurai
11 Doddabetta
12 Ramanathapuram
13 Salem
14 Tiruchirapally
15 Shimoga

Maps not to scale

©SACON 2004

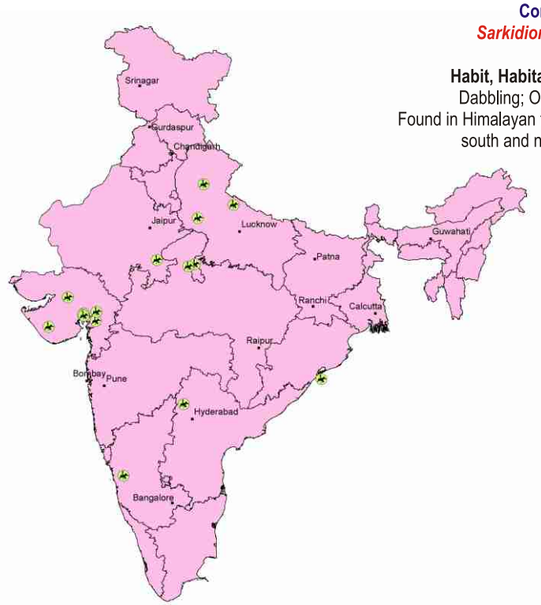
Georeferenced distribution map of aqautic birds in India



Barheaded Goose
Anser indicus

Habit, Habitat and Distribution
Grazer, 50% Grass; 0-20 cm of Water;
Found all over India, specially in north, northeastern and southern part of India.

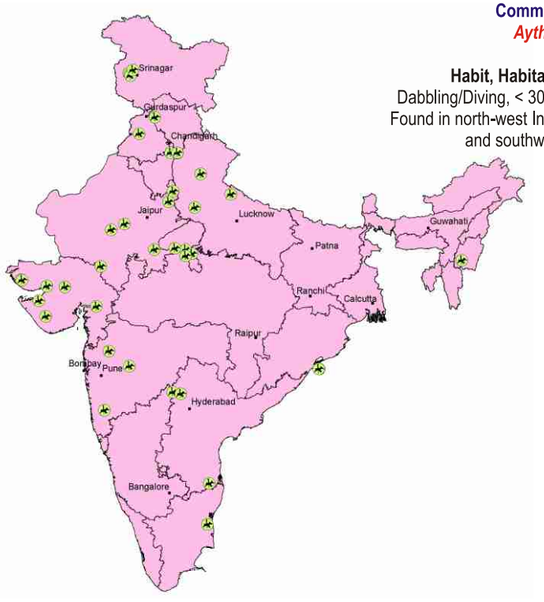
Sites
Akkialurkere Tank, Karnataka
Bardha Dam, Bundi Rajasthan
Bijnor, Uttar Pradesh
Chandpata Lake
Chilka Lake; Dharwad, Karnataka
Dihalia Jheel; ICRISAT Campus, Medak, A.P.
Karaivetti Bird Sanctuary
Karera Bustard Sanctuary and Dihalia
Karnataka Tanks; Karungulam and Sengulam Tanks
Keoladeo National Park
Loktak Lake, Bisenpur, Manipur
Madhav National Park
Manjira Barrage; Morena District, M.P.
Naregalkere Tank, Karnataka
National Chambal Sanctuary
Pangong Tso
Panidihing, Sibsagar, Assam
Patna Bird Sanctuary
Pocharam Reservoir
Point Callimere & Vedaranayam Salt Swamp
Sambhar Lake; Sultanpur Jheels
Tilpara Barrage Birbhum; Tso Kar Basin
Tso Morari; Valley School, Anantpur, A.P.
Wetlands in Dudhwa National Park



Comb Duck
Sarkidiornis melanotos

Habit, Habitat and Distribution
Dabbling; Open Water, Grass;
Found in Himalayan terai region to Karnataka in south and northeastern India.

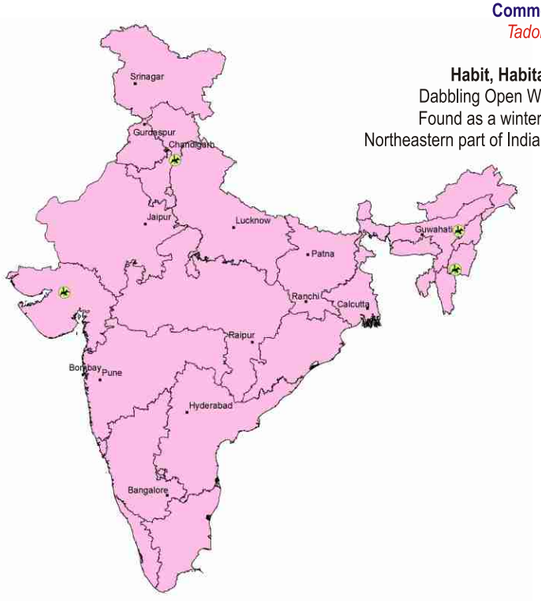
Sites
Bhanderaj, Kheda, Gurarat
Bijnor, Uttar Pradesh
Chilka Lake
Daloli Reservoir, Kheda, Gujarat
Dharwad, Karnataka
ICRISAT, Campus, Medak, A.P.
Karera Bustard Sanctuary and Dihalia
Morena District, M.P.
Naghrama, Khedu, Gujarat
National Chambal Sanctuary
NavataTala -Dasada-Surendernagar,Gujarat
Patna Bird Sanctuary
Saiyant Reservoir, Kheda, Gujarat
Very Tala-Gondal-Rajkot, Gujarat
Wadhwana, Dabhoi, Vadodra, Gujarat
Wetlands in Dudhwa National Park



Common Pochard
Aythya ferina

Habit, Habitat and Distribution
Dabbling/Diving, < 30% Grass, 30-80 cm Water;
Found in north-west India, also in Assam, Manipur and southward to Karnataka.

Sites
Ajwa, Vadhwana and Pavagadh Lakes, Asan Reservoir, Dehradun,
Bijnor, Uttar Pradesh, Chhari-Dhand, Nakhatrana, Kutch,
Chilka Lake, Delhi Zoological Gardens
Dihaila Jheel , Haigam Rakh,
Harike Lake, Hokarsar,
ICRISAT Campus, Medak, A.P,
Jamuna River near Delhi , Jayakwadi Reservoir,
Kailana-Bijolai Area, Jodhpur, Karera Bustard Sanctuary,
Keoladeo National Park, Khijadia Lakes,
Lakes of Central Rajasthan,
Loktak Lake, Bisenpur, Manipur,
Madhav National Park, Mirgund Lake,
Morena District, M.P,
Nandurmadhameshr, Niphad, Nashik,
National Chambal Sanctuary,
NavataTalao-Dasada-Surendernagar,
Nelapattu and Vedurupattu,
Ousteri Lake, Pondicherry,
Patna Bird Sanctuary,
Pocharam Reservoir, Pong Dam Lake,
Pune-Solapur Reservoir, Pong Dam Lake,
Sambhar Lake, Shallabugh Lake and Marshes,
Very Tala-Gondal-Rajkot, Gujarat,
Wetlands in Dudhwa National Park,
Wild Ass Sanctuary,Little Rann of Kutch,
Wular Lake.



Common Shelduck
Tadoma tadorna

Habit, Habitat and Distribution
Dabbling Open Water, < 20 cms of Water;
Found as a winter migrant up to 15°N and
Northeastern part of India, also in the Deccan and Orissa.

Sites
Asan Reservoir, Dehradun
Jamuguri Beel of Assam
Loktak Lake,Bisenpur, Manipur
Navata Talao-Dasada-Surendernagar, Gujarat

Maps not to scale

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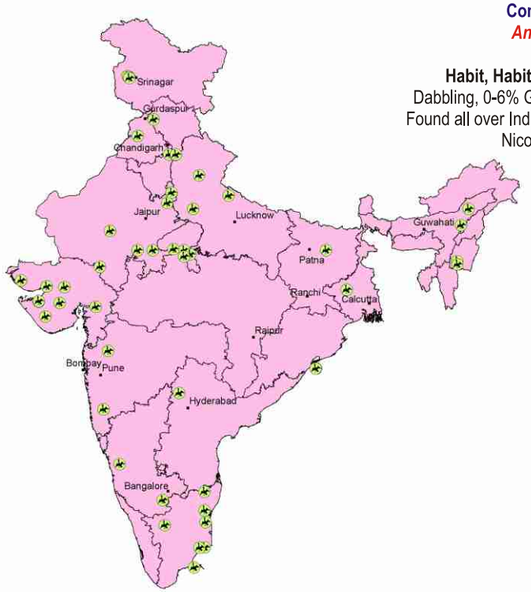
Georeferenced distribution map of aqautic birds in India

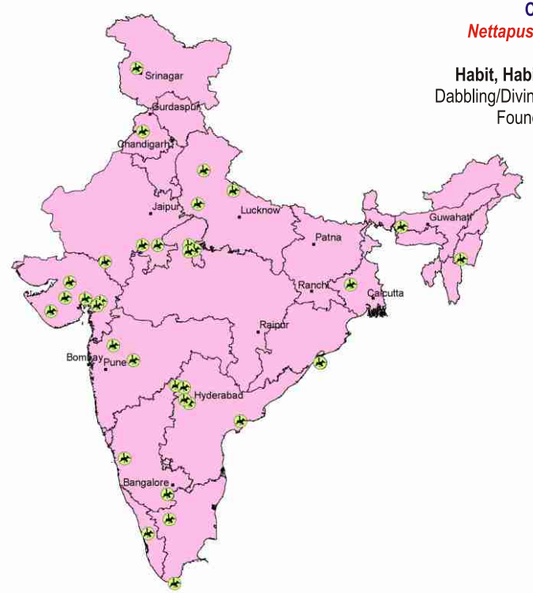
Common Teal
Anas crecca



Habit, Habitat and Distribution
Dabbling, 0-6% Grass, 0-40 cm. of Water;
Found all over India including Andaman and Nicobar Islands.

Sites
Ajwa, Vadhwana & Pavagadh Lakes
Asan Reservoir, Dehra Dun
Bardha dam, Bundi, Rajasthan
Bijnor, Uttar Pradesh; Charri-Dhand; Chilka Lake
Delhi Zoological Gardens; Dharwad, Karnataka
Dihalia Jheel; Durgapur Barrage
Haigam Rakh; Hanke Lake; Hokarsar
ICRISAT Campus, Medak, A.P.
INS Rajali Naval Air Station
Jamuguri Beel of Assam; Lakes of Central Rajasthan
Kailana-Bijolai Area, Jodhpur
Kaliveli Tank, Yedayanthitu Estuary
Karera Bustard Sanctuary; Keoladeo National Park
Little Rann of Kutch; Loktak Lake, Bisenpur, Manipur
Madhav National Park; Mandapam; Mirgund Lake
Morena District, M.P.; National Chambal Sanctuary
Nalsarovar Lake,Surendranagar Reservoir
Nandurmadhameshr, Niphad, Nashik
Navata Talao- Dasada-Sundernag; Ousteri Lake, Pondichery
Panidihing, Sibsagar, Assam; Patna Bird Sanctuary
Point Callimere & Vedaranayam Salt Swamp
Pong Dam Lake; Pune-Solapur Reservoir
Shallabugh Lake and Marshes;Valley School, Anantpur, A.P.
Vellode, Erode; Very Tala-Gondal-Rajkot, Gujarat
Wetlands in Dudhwa National Park

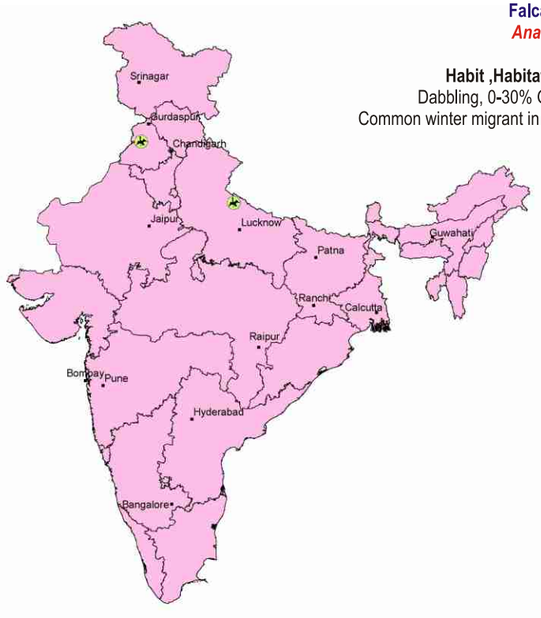
Cotton Teal
Nettapus coromandelianus



Habit, Habitat and Distribution
Dabbling/Diving, Open Water, >20 cm;
Found all over India.

Sites
Ajwa, Vadhwana & Pavagadh Lakes
Bardha Dam, Bundi, Rajasthan; Bijnor, Uttar Pradesh
Chakrasila WLS; Chilka Lake
Dharwad, Karnataka
Dihaila Lake; Durgapur Barrage
Durgamma, Bramhananda Reddy National Park
Harike Lake; ICRISAT Campus, Medak, A.P.
INS-Erode, Tamilnadu; Jayakwadi Reservoir
Karera Bustard Sanctuary & Dihalia
Kolleru Lake, Nellore, Andhra Pradesh
Lakes of Central Rajasthan; Loktak Lake, Bisenpur, Manipur
Manjira Barrage; Manjira Reservoir, Medak, A.P.
Morena District, Madhya Pradesh
Nalsarovar Lake & Surendranagar Reservoir
Nandurmadhmeshr, Niphad, Nasik
National Chambal Sanctuary
Navata Talao-Dasada-Surendernagar, Gujarat
Palakkad Hills; Pariej & Kaneval Reservoirs
Patna Bird Sanctuary; Pocharam Reservoir
Suchindram Kulam, Kanniyakumari, Tamilnadu
Valley School, Anatpur, A.P.
Very Tala-Gondal-Rajkot, Gujarat
Wadhwana, Dabhoi, Vadodara, Gujarat
Wetlands in Dudhwa National Park; Wular Lake

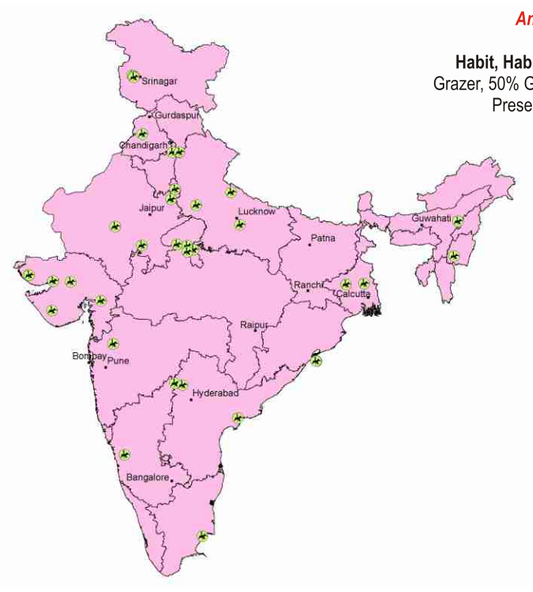
Falcated Teal
Anas falcata



Habit ,Habitat and Distribution
Dabbling, 0-30% Grass, 0-60 cm. Water;
Common winter migrant in northern and northeast India,

Sites
Harike Lake
Wetlands in Dudhwa National Park

Gadwall
Anas strepera



Habit, Habitat and Distribution
Grazer, 50% Grass, 0-20 cm. of Water;
Present all over India.

Sites
Ajwa, Vadhwana and Pavagadh Lakes
Asan Barrage Reservoir, Dehra Dun
Bardha dam, Bundi, Rajasthan
Charri-Dhand; Chilka Lake
Chhari-Dhand, Nakhatrana, Kutch
Delhi Zoological Gardens
Dharwad, Karnataka; Dihalia Jheel
Durgapur Barrage
Haigam Rakh; Harike Lake; Hokarsar
ICRISAT Campus, Medak, A.P.
Jamuguri Beel of Assam
Kailana-Bijolai Area, Jodhpur
Karera Bustard Sanctuary and Dihalia
Keoladeo National Park
Kolleru Lake, Nellore, A.P.
Loktak Lake, Bisenpur, Manipur
Madhav National Park
Mirgund Lake; Morena District, M.P.
Nandurmadhameshr, Niphad, Nasik
Navata Talao - Dasada-Surendernagar, Gujarat
Nawabganj Priyadarshani Bird Sanctuary
Patna Bird Sanctuary; Pocharam Reservoir
Point Callimere & Vedaranayam Salt Swamp
Rasar Chaar-Krishnanagar, Nadia
Shallabugh Lake and Marshes
Very Tala-Gondal-Rajkot, Gujarat
Wetlands in Dudhwa National Park
Wild Ass Sanctuary, Little Rann of Kutch
Yamuna River near Delhi

Maps not to scale

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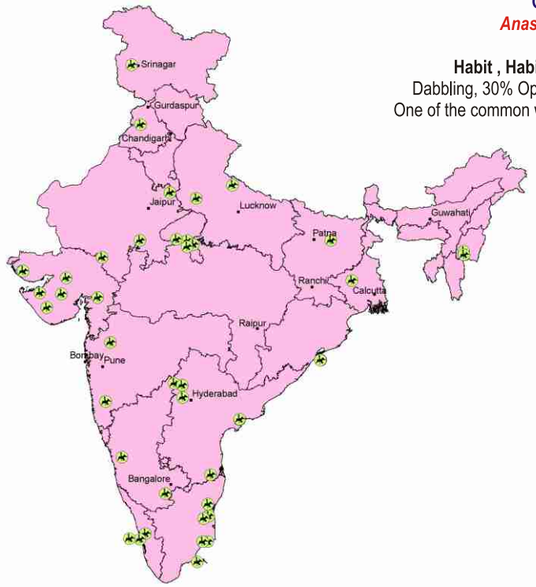
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

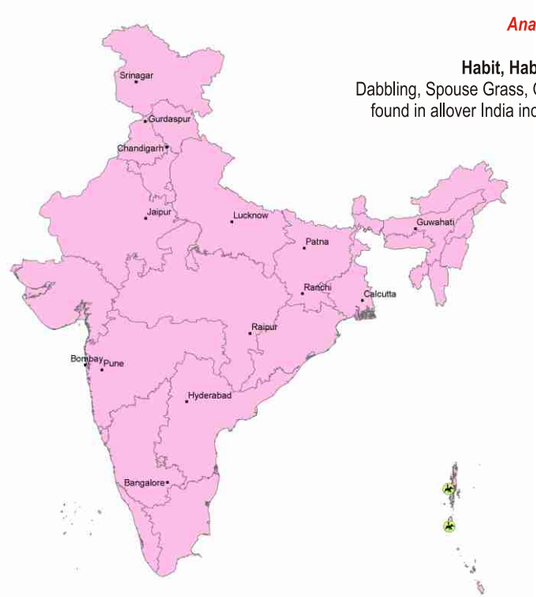
Georeferenced distribution map of aqautic birds in India



Garganey
Anas querquedula

Habit , Habitat and Distribution
Dabbling, 30% Open Water, 20-80 cm Water;
One of the common winter migrants, found all over India.

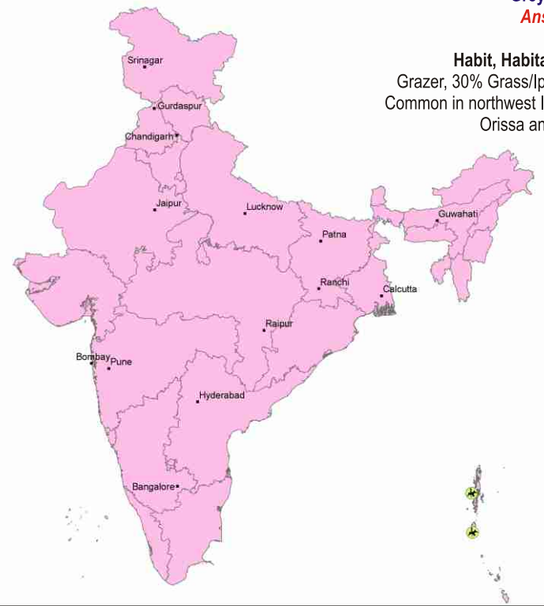
Sites
Ajwa, Vadhwana and Pavagadh Lakes
Bardha Dam, Bundi, Rajasthan
Chhari-Dhand, Nakhatrana, Kutch
Chilka Lake
Dharwad, Karnataka
Dihaila Jheel
Dihalia Jheel
Durgapur Barrage
Harike Lake
ICRISAT Campus, Medak, A.P.
Kaliveli Tank & Yedayanthittu Estuary
Karera Bustard Sanctuary and Dihalia
Keoladeo National Park
Khabartal
Khijadia
Kole Wetlands, Thrissur, Kerala
Kolleru Lake
Lakes of Central Rajasthan
Loktak Lake, Bisenpur, Manipur
Madhav National Park
Mandapam
Manjira Reservoir, Medak, A.P.
Morena District, M.P.
Nalsarovar Lake & Surendranagar Reservoir
Nandurmadhameshr, Niphad, Nasik
NavataTalao -Dasada-Surendernagar,Gujarat
Nelapattu and Vedurupattu
Neyveli Lignite Corporation, TN
Ousteri Lake, Pondicherry
Palakkad Hills
Patna Bird Sanctuary
Pocharam Reservoir
Point Callimere & Vedaranayam Salt Swamp
Pune-Solapur Reservoir
Shallabugh Lake and Marshes
Valley School, Anantpur, A.P.
Very Tala-Gondal-Rajkot, Gujarat
Wetlands in Dudhwa National Park



Grey Teal
Anas gibberifrons

Habit, Habitat and Distribution
Dabbling, Spouse Grass, Open Water, 0-40 cms Water (<20...); found in allover India including Andaman & Nicobar Islands

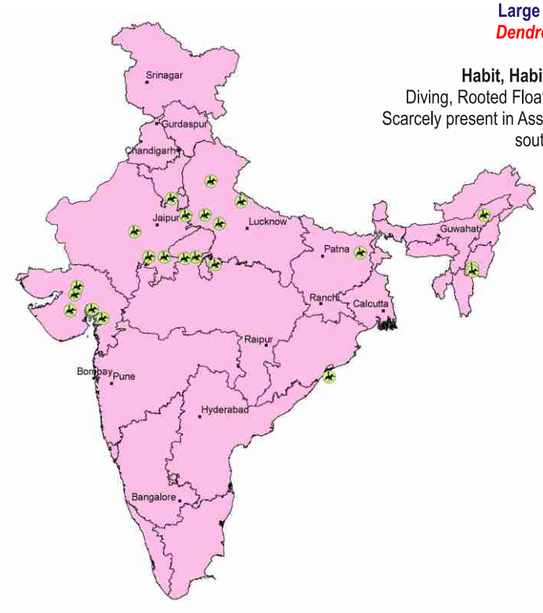
Sites
Betapur, Middle Andaman
Jackson Creek, Little Andaman



Greyleg Goose
Anser anser

Habit, Habitat and Distribution
Grazer, 30% Grass/Ipomoea, 20-60 cm of Water;
Common in northwest India, rare in Manipur, Assam, Orissa and in Karnataka.

Sites
Bardha Dam, Bundi, Rajasthan
Bijnor, Uttar Pradesh
Chandpata Lake
Chhata Lake
Chilka Lake
Dasada-Surendernagar, Gujarat
Dihalia Jheel
Heranj, Kheda, Gujarat
Keoladeo National Park
Loktak Lake
Naghrama, Khedu, Gujarat
Nalsarovar Lake & Surendernagar Reservoir
National Chambal (Gharial) WS
Navata Talao
Panidihing Sibsagar, Assam
Pariej and Kaneval Reserviors
Patna Bird Santuary
Raghuvanaj, Kheda, Gujarat
Sambhar Lake
Sultanpur Jheels
Thol Bird Sanctuary
Tilpara Barage - Birbhum
Tranja, Kheda, Gujarat
Wadhwana, Dabhoi, Vadodra, Gujarat
Wetlands in Dudhwa National Park



Large Whistling Teal
Dendrocygna bicolor

Habit, Habitat and Distribution
Diving, Rooted Floating Vegetation 50 cm Water;
Scarcely present in Assam, Manipur, also in north India, south to Deccan.

Sites
Bordoibam Wetland, Assam
Dipor (Deepar) Beel
Jamuguri Beel of Assam
Kolleru Lake, Nellore, A.P.
Loktak Lake, Bisenpur, Manipur
Panidihing, Sibasagar, Assam
Wetlands-Dudhwa National Park

Maps not to scale

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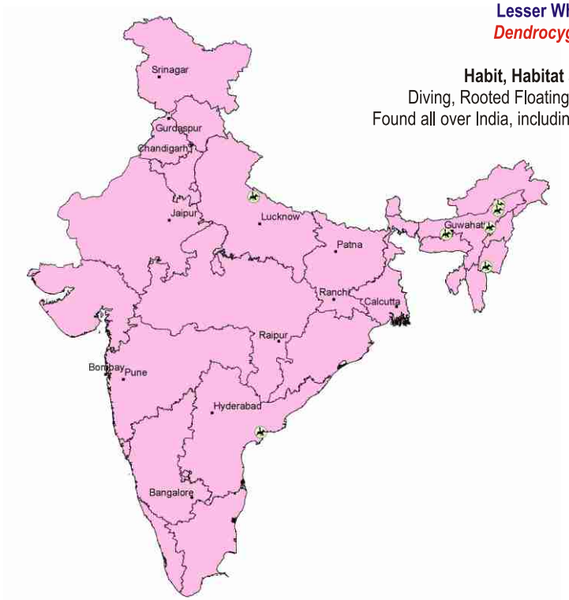
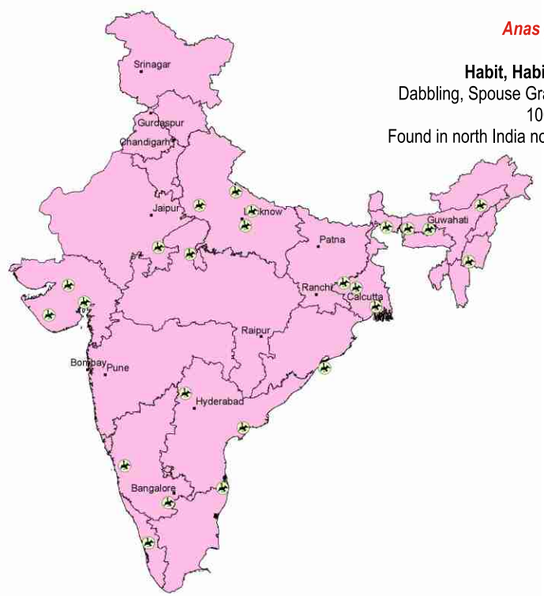
Georeferenced distribution map of aqautic birds in India



Lesser Whistling Teal
Dendrocygna javanica

Habit, Habitat and Distribution
Diving, Rooted Floating Vegetation 50 cm Water;
Found all over India, including Andaman & Nicobar Islands.

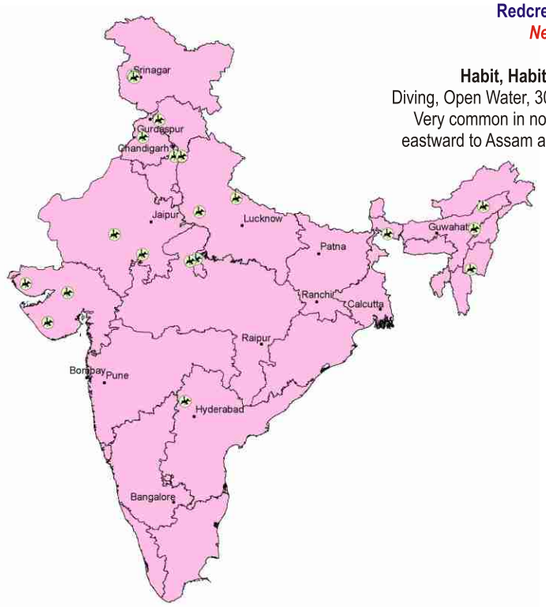
Sites
Chakrasila WLS
Chilka Lake
Dharwad, Karnataka
Dipor (Deepar) Beel
Doloni, Bongaigaon, Assam
Durgapur Barrage
ICRISAT Campus, Medak, A.P.
Karera Bustard Sanctuary and Dihalia
Karnal Singh Park, Chitranjan, Bhibhab, W.B.
Koller Lake
Kolleru Lake, Nellore, A.P.
Konora, Bongaigaon, Assam
Loktak Lake, Bisenpur, Manipur
National Chambal Sanctuary
Navata Talao-Dasada-Surendernagar, Gujarat
Nawabganj Priyadarshani Bird Sanctuary
Palakkad Hills
Panidihing, Sibasagr, Assam
Paraputa, Bongaigaon, Assam
Pariej and Kaneval Reserviors
Patna Bird Santuary
Pulicat Bird Sanctuary, Nellore, A.P.
Pyagpur and Sitadwar Jheel
Southern Railway Centenary Sanctuary
Tamrang, Bongaigaon, Assam
Vally School, Anantpur, A.P.
Very Talao-Gondal-Rajkot, Gujarat
Wetlands in Dudhwa National Park



Mallard
Anas platyrhynchos

Habit, Habitat and Distribution
Dabbling, Spouse Grass, Open Water Vegetation 0-100 cm Water;
Found in north India northeast, and north Maharashtra.

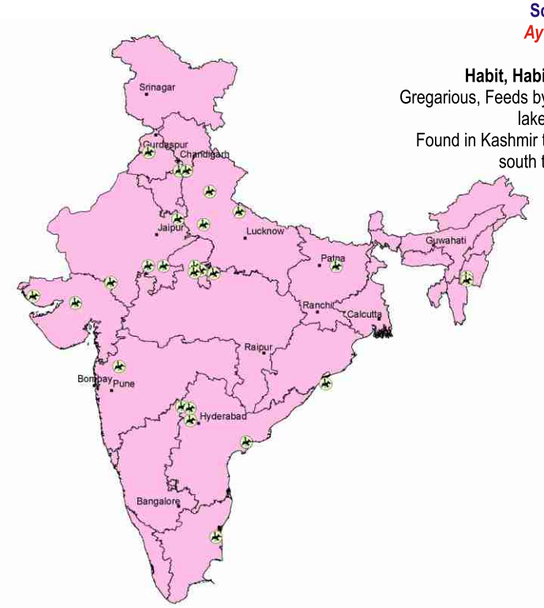
Sites
Asan Reservoir, Dehra Dun
Bardha Dam, Bundi, Rajasthan
Bordoibam Wetland, Assam
Doloni, Bongaigaon, Assam
Haigam Rakh
Harike Lake
Hokarsar
ICRISAT Campus, Medak, A.P.
Jamuguri Beel of Assam
Kailana-Bijolai Area, Jodhpur
Karera Bustard Sanctuary & Dihalia
Khirjog & Vakario, Kutch
Konora, Bongaigaon, Assam
Loktak Lake, Bisenpur, Manipur
Mirgund Lake
Morena District, MP
NavataTalao-Dasada-Surendernagar
Paraputa, Bongaigaon, Assam
Patna Bird Sanctuary
Pong Dam Lake
Shallabugh Lakeand Marshes
Tamrang, Bongaigaon, Assam
Very Tala-Gondal-Rajkot, Gujarat
Wetlands in Dudhwa National Park



Redcrested Pochard
Netta rufina

Habit, Habitat and Distribution
Diving, Open Water, 30-60% Grass 30-80 cm Water;
Very common in northwest India, decreasingly eastward to Assam and southward to Tamil Nadu.

Sites
Asan Reservoir, Dehradun
Bardha Dam, Bundi, Rajasthan
Bijnor, Uttar Pradesh
Charri-Dhand, Nakhatrana, Kutch
Chilka Lake
Dihaila Jheel
Harike Lake
ICRISAT Campus, Medak, AP
Karera Bustard Sanctuary and Dihalia
Keoladeo National Park
Khabartal
Koller Lake
Kolleru Lake, Nellore, A.P.
Lakes of Central Rajasthan
Loktak Lake, Bisenpur, Manipur
Manjira Reservoir, Medak, A.P.
Morena District, M.P.
Nandurmadhameshr, Niphad, Nasik
National Chambal (Gharial) WS
National Chambal Sanctuary
Navata Talao-Dasada-Surendernagar, Gujarat
Ousteri Lake, Pondicherry
Patna Bird Sanctuary
Pocharam Rerservoir
Wetlands in Dudhwa National Park



Scaup Duck
Aythya marila

Habit, Habitat and Distribution
Gregarious, Feeds by diving, moves in open water, lakes and rivers;
Found in Kashmir to northwest and east India, south to Maharashtra.

Sites
Karera Bustard Sanctuary & Dihalia
Very Tala-Gondal-Rajkot, Gujarat

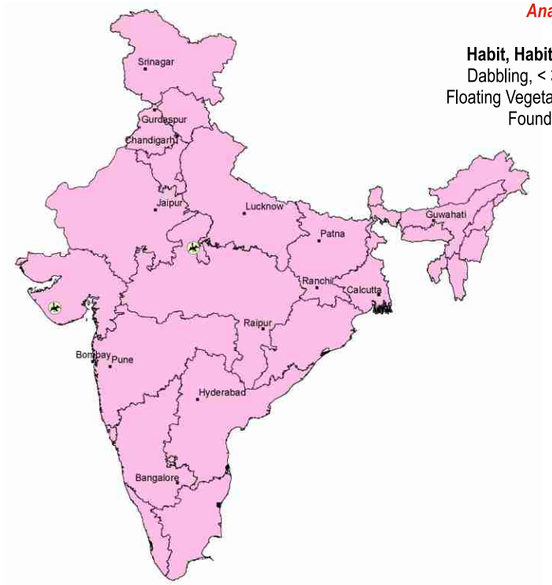
Maps not to scale

©SACON 2004

Georeferenced distribution map of aqautic birds in India

Shoveller
Anas clypeata

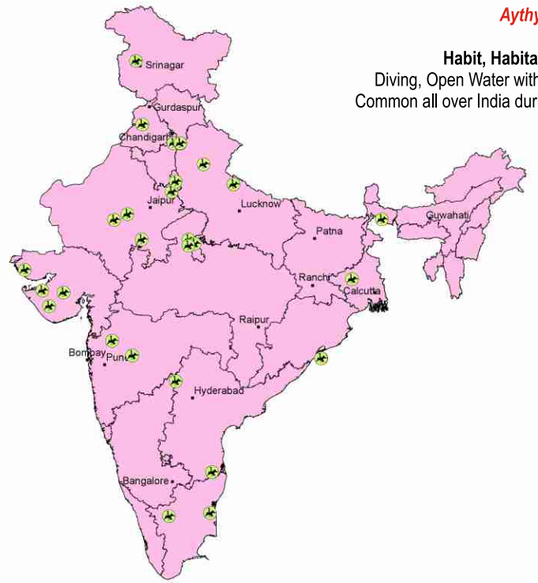
Habit, Habitat and Distribution
Dabbling, < 30%, 30-60% Grass Floating Vegetation, 0-80 cm of Water; Found all over India.



Sites
Ajwa Vadhwana and Pavagadh Lakes
Asan Reservoir, Dehra Dun
Bardha dam, Bundi, Rajasthan
Bijnor, Uttar Pradesh
Bordoibam Wetland, Assam
Chhri-Dhand, Nakhatrana, Kutch
Chilka Lake
Delhi Zoological Gardens
Dharwad, Karnataka
Dihaila Jheel
Dihalia Jheel
Harike Lake
Higam Rakh
Hokarsar
ICRISAT Campus, Medak, A.P.
Kailana-Bijolai Area, Jodhpur
Kaliveli Tank & Yedayanthittu Estruary
Karera Bustard Sanctuary and Dihalia
Keoladeo National Park
Keolleru Lake, Nellore, A.P.
Khijadia
Khijadia Lakes
Khirjog & Vakario, Kutch
Kolleru Lake
Lakes of Central Rajasthan
Loktak Lake, Bisenpur, Manipur
Madhav National Park
Mirgund Lake
Morena District, M.P.
Nalsarovar Lake & Surendranagar Reservoir
Nandurmadhameshr, Niphad, Nasik
Naregalkere Tank, Karnataka
National Chambal Sanctuary
NavataTalao-Dasada-Surendernagar,Gujarat
Nawabganj Priyadarshani Bird Sanctuary
Nelapattu and Vedurupattu
Neyveli Lignite Corporation, TN
Ousteri Lake, Pondicherry
Panidihing, Sibsagar, Assam
Patna Bird Sanctuary
Phulera Lake, Jaipur, Rajasthan
Pocharam Reservoir
Point Calimere & Vedaranayam Salt Swamp
Pulicat Bird Sanctuary, Nellore, A.P.
Pune-Solapur Reservoir
Revasa, Sikar, Rajasthan
Sambhar Lake
Shallabugh Lake and Marshes
Thol Bird Sanctuary
Valley School, Anantpur, A.P.
Very Tala-Gondal-Rajkot, Gujarat
Wadhwana, Dabhoi, Vadodra, Gujarat
Wetlands in Dudhwa National Park
Wild Ass Sanctuary, Little Rann of Kutch
Yamuna River near Delhi

Tufted Duck
Aythya fuligula

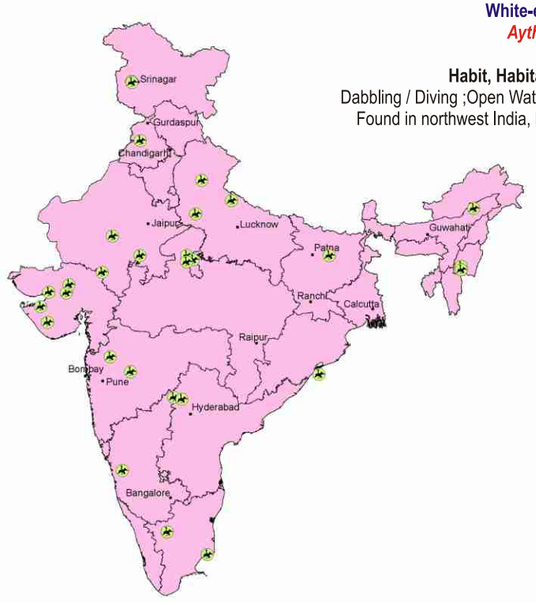
Habit, Habitat and Distribution
Diving, Open Water with Spouse Vegetation (<20%); Common all over India during winters, but rare in Kashmir.



Sites
Asan Reservoir, Dehradun
Bardha Dam, Bundi, Rajasthan
Bijnor, Uttar Pradesh
Chilka Lake
Delhi Zoological Gardens
Dihaila Jheel
Dihalia Jheel
Durgapur Barrage
Harike Lake
INS-Erode, Tamilnadu
Jayakwadi Reservoir
Kailana-Bijolai Area
Karera Bustard Sanctuary & Dihalia
Keoladeo National Park
Khijadia Lakes
Konora, Bongaigaon, Assam
Morena District, Madhya Pradesh
Nalsarovar Lake & Surendranagar Reservoir
Nandurmadhmeshr, Niphad, Nashik
Nelapattu and Vedurupattu
Ousteri Lake, Pondicherry
Paraputa, Bongaigaon, Assam
Pocharam Reservoir
Sambhar Lake
Tamrang, Bongaigaon, Assam
Very Tala-Gondal-Rajkot, Gujarat
Wetlands in Dudhwa National Park
Wular Lake
Yamuna River near Delhi

White-eyed Pochard
Aythya nyroca

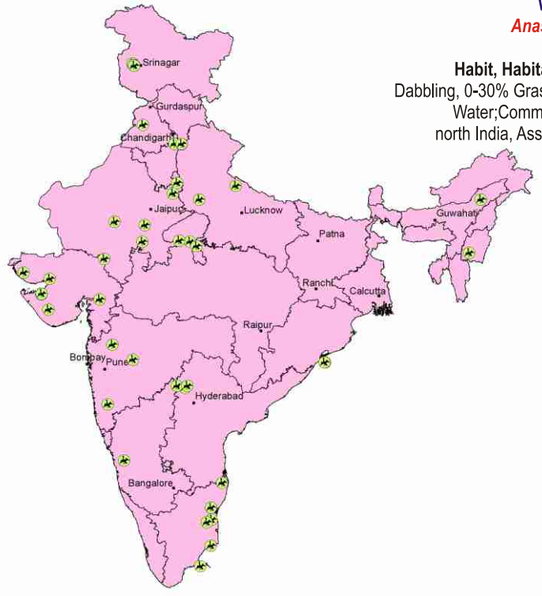
Habit, Habitat and Distribution
Dabbling / Diving ;Open Water with Spouse Vegetation (< 20%); Found in northwest India, breeding at Kashmir and Ladakh.



Sites
Bardha Dam, Bundi, Rajasthan
Bijnor, Uttar Pradesh
Bordoibam Wetland, Assam
Chilka Lake
Dihaila Jheel
Godavi Bird Sanct, Karnataka
Harike Lake
Hokarsar
ICRISAT Campus, Medak, AP
INS-Erode, TN
Jayakwadi Reservoir
Kailana-Bijolari Area, Jodhpur
Karera Bustard Sanct & Dihalia
Khabartal
Khijadia Lakes
Lakes of Central Rajasthan
Loktak Lake, Bisenpur, Manipur
Morena District, MP
Nandurmadhameshr,Niphad,Nashik
Navata-Talao-Dasada-Surendernagar Gujarat
Patna Bird Sanctuary
Pocharam Reservoir
Point Calimere
Shallbabugh Lake and Marshes
Thol Bird Sanctuary
Very Tala-Gondal-Rajkot, Gujarat
Wetlands-Dudhwa National Park
Wild Ass Sanctuary, Little Rann of Kutch

Wigeon
Anas penelope

Habit, Habitat and Distribution
Dabbling, 0-30% Grass / Rooted Floating;0-40 cm Water;Common winter migrant in north India, Assam, Manipur & Orissa.



Sites
Ajwa, Vadhwana and Pavagadh Lakes
Asan Barrage Reservoir, Dehradun
Bardha Dam Bundi, Rajasthan
Charri-Dhand
Chilka Lake
Dihalia Jheel
Haigam Rakh
Harike Lake
Hokarsar
ICRISAT Campus, Medak, AP
Jamuna River near Delhi
Jayakwadi Reservoir
Jodhpur Newai, Tonk, Rajasthan
Kailana-Bijolai Area, Jodhpur
Kaliveli Tank & Yedayanthittu Estuary
Keoladeo National Park
Khijadia
Khijadia Lakes
Lakes of Central Rajasthan
Loktak Lake, Bisenpur, Manipur
Madhav National Park
Mandapam
Mirgund Lake
Morena District, MP
Nandurmadhameshr,Niphad,Nashik
Naregalkere Tank, Karnataka
Neyveli Lignite Corporation,TN
Ousteri Lake, Pondicherry
Panidihing, Sibsagar, Assam
Patna Bird Sanctuary
Pocharam Lake, Medak, AP
Pocharam Reservoir
Point Calimere
Pulicat Bird Sanctuary, Nellore
Pune-Solapur Reservoir
Shallabugh Lake and Marshes
Very Tala-Gondal-Rajko, Gujarat
Wetlands-Dudhwa National Park
Wild Ass Sanctuary, Little Rann of Kutch

Maps not to scale

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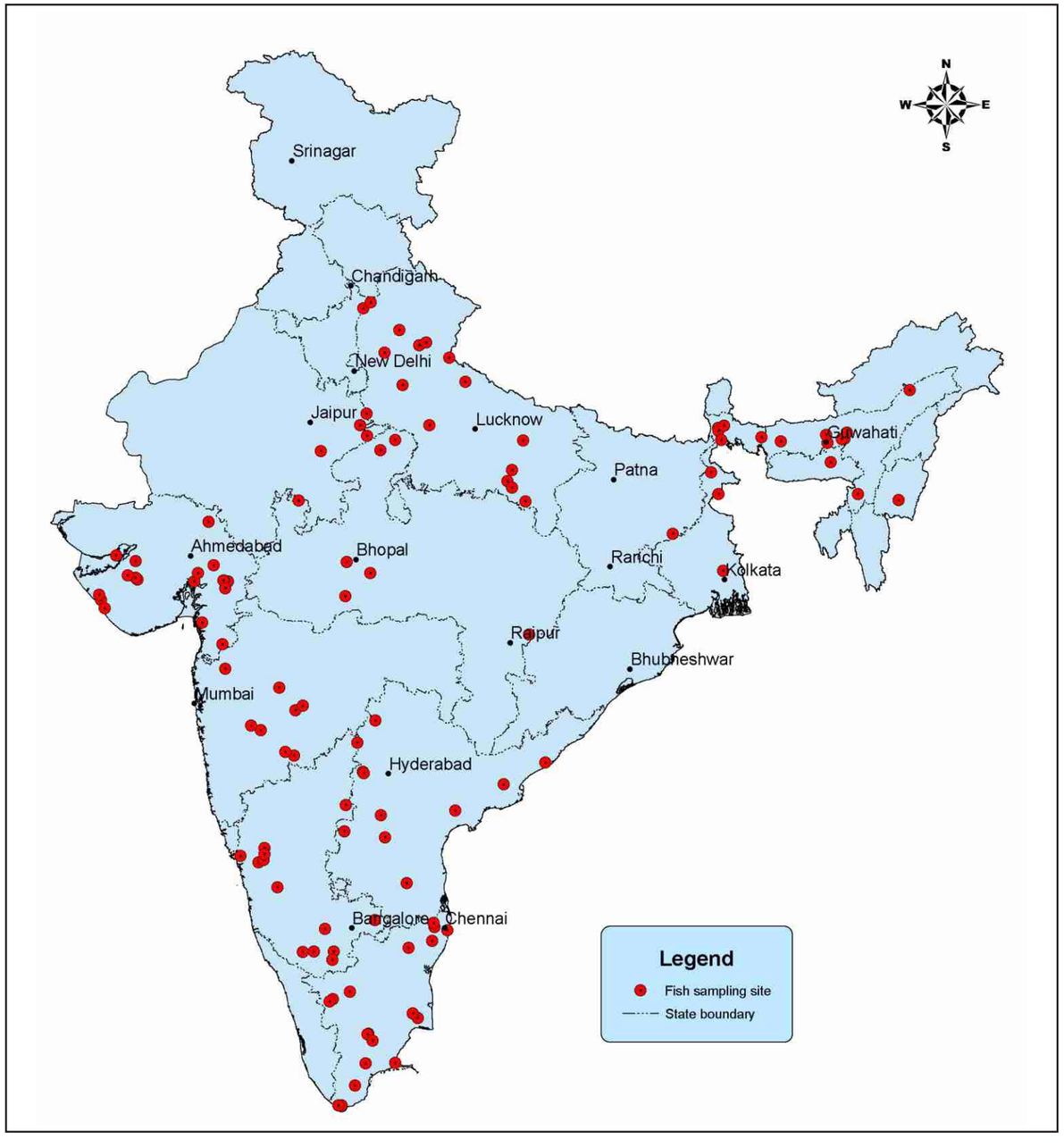
Map of fish sample collection sites



SITE	DISTRICT	STATE	LATITUDE	LONGITUDE	SITE	DISTRICT	STATE	LATITUDE	LONGITUDE
NANDALUR TANK	CUDDAPAH	ANDHRA PRADESH	141500	790500	BINDUSARA DAM	BID	MAHARASHTRA	185430	754400
GODAVARI RIVER	EAST GODAVARI	ANDHRA PRADESH	170000	814800	PIMPALWADI	BID	MAHARASHTRA	190300	755700
UPPALAPADU	GUNTUR	ANDHRA PRADESH	161600	802500	HIPPARGA	SOLAPUR	MAHARASHTRA	174000	754500
CHINNA THUMBALAM TANK	KURNOOL	ANDHRA PRADESH	153800	771700	KAMBAL	SOLAPUR	MAHARASHTRA	174500	753000
NANDYAL TANK	KURNOOL	ANDHRA PRADESH	153000	782600	GAJGIDHNI TANK	MAHASAMUND	MADHYA PRADESH	210900	823300
POCHARAM	MEDAK	ANDHRA PRADESH	180448	773412	GOHAD TALAB	BHIND	MADHYA PRADESH	263000	782630
JATAPROLE	MAHBUBNAGAR	ANDHRA PRADESH	160600	781800	TIGHRA	GWALIOR	MADHYA PRADESH	261300	780000
JANKAMPET CHERUVU	NIZAMABAD	ANDHRA PRADESH	184300	780400	GANDHISAGAR DAM	MANDSAUR	MADHYA PRADESH	244400	753300
IBRAHIMPUR	RANGAREDDI	ANDHRA PRADESH	171700	774500	HALALI DAM	BHOPAL	MADHYA PRADESH	230500	770500
MITTAKDURU TANK	RANGAREDDI	ANDHRA PRADESH	171500	774700	KOLAR BARRAGE	SEHORE	MADHYA PRADESH	220800	770400
KOLLERU LAKE	WEST GODAVARI	ANDHRA PRADESH	173600	830000	TAWA RESERVOIR	HOSANGABAD	MADHYA PRADESH	224800	774800
DIPLAI BEEL	KOKRAJHAR	ASSAM	261715	901911	UMIAM LAKE	N.A.	MEGHALAYA	253700	914900
BHOTA BEEL	KAMRUP	ASSAM	261000	914500	LOKTAK LAKE	N.A.	MANIPUR	242542	934655
VEREKI BEEL	KAMALABARI	ASSAM	262300	914400	BHARATPUR	BHARATPUR	RAJASTHAN	271300	773200
DANDUWA BEEL	MARIGAON	ASSAM	261500	921700	BANDH BARETHA	BHARATPUR	RAJASTHAN	260800	761000
MONOHA BEEL	MARIGAON	ASSAM	261400	921230	RAMSAGAR LAKE	DHOLPUR	RAJASTHAN	265300	772100
KUZI BEEL COMPLEX	NAGAON	ASSAM	262430	922231	TALABESHAHI	DHOLPUR	RAJASTHAN	263600	773400
MISAMARI BEEL	JORHAT	ASSAM	272625	942500	MAPEDU PERIA ERI	THIRUVELLUR	TAMIL NADU	130400	795300
SON BEEL	HAILAKANDI	ASSAM	244100	923400	POONDI RESERVOIR	THIRUVELLUR	TAMIL NADU	131100	795100
BRAHMANI DAM	SURENDRANAGAR	GUJARAT	225300	701000	PALLIKARNAI	KANCHEEPURAM	TAMIL NADU	125900	801400
DHAROI DAM	MAHESANA	GUJARAT	240000	725200	MAGAREL	KANCHEEPURAM	TAMIL NADU	124100	794900
AJI1	RAJKOT	GUJARAT	221600	705100	CHEMABARAMBAKKAM	KANCHEEPURAM	TAMIL NADU	125900	801400
KAJ	JUNAGADH	GUJARAT	224600	704500	KAPPALUR	TIRUVANNAMALAI	TAMIL NADU	122900	791000
NAYARI1	RAJKOT	GUJARAT	221900	704800	AVAL POONDURAI	ERODE	TAMIL NADU	111500	773500
SUKHBHADAR DAM	BHAVNAGAR	GUJARAT	222100	703300	SULUR	COIMBATORE	TAMIL NADU	110200	770700
KUCHADI-JAWAR	PORBANDAR	GUJARAT	213700	694900	SINGANALLUR	COIMBATORE	TAMIL NADU	105800	770200
AMIPUR TANK	PORBANDAR	GUJARAT	212400	695700	GUNDUR BIG TANK	TIRUCHIRAPALLI	TAMIL NADU	100800	780700
BARDA SAGAR	PORBANDAR	GUJARAT	214500	694500	KOOTHAPAR BIG TANK	TIRUCHIRAPALLI	TAMIL NADU	100700	780600
KANEWAL	ANAND	GUJARAT	222000	723300	KUNNATHUR	MADURAI	TAMIL NADU	095700	781400
PARIEJ	ANAND	GUJARAT	223330	723830	R S MANGALAM	RAMANATHAPURAM	TAMIL NADU	092200	785200
SAYANT	KHEDA	GUJARAT	224900	730600	UTHIRAKOSAMANGAI	RAMANATHAPURAM	TAMIL NADU	092000	780400
DEO DAM	PANCH MAHALS	GUJARAT	222300	733300	ARIYAKULAM	TRIUNELVELLI	TAMIL NADU	084317	774758
AJWA	VADODARA	GUJARAT	222430	732530	SUCHINDRAM KULAM	KANNIYAKUMARI	TAMIL NADU	080900	772705
TIMBI TANK	VADODARA	GUJARAT	222400	732500	THEROOR WETLANDS	KANNIYAKUMARI	TAMIL NADU	081100	772700
VADHAVANA	VADODARA	GUJARAT	221100	732900	KHATIMA	U. SINGH NAGAR	UTTAR PRADESH	284900	800400
TAPI BARRAGE	SURAT	GUJARAT	211200	725200	NANAKMATA	U. SINGH NAGAR	UTTAR PRADESH	290836	790656
WESTERN YAMUNA CANAL	YAMUNANAGAR	HARYANA	300741	771930	SAHASWAN	U. SINGH NAGAR	UTTAR PRADESH	280200	783800
YAMUNARIVER	YAMUNANAGAR	HARYANA	301800	773300	HARIPURA DAM	U. SINGH NAGAR	UTTAR PRADESH	291330	792000
SAMUNDER TALAB	RAICHUR	KARNATAKA	162100	771800	PILI DAM	BIJNOR	UTTAR PRADESH	293300	782900
ATTIVERY BIRD SANCTUARY	UTTAR KANNADA	KARNATAKA	150500	750200	SHERPUR	MEERUT	UTTAR PRADESH	285500	780200
ISLOOR VILLAGE TANK	UTTAR KANNADA	KARNATAKA	144100	745300	RAMIABEHAD	KHERI	UTTAR PRADESH	280900	803500
MALAGI RESERVIOR	UTTAR KANNADA	KARNATAKA	144500	750200	KATRA	FARRUKHABAD	UTTAR PRADESH	265630	792900
SALAGAON VILLAGE TANK	UTTAR KANNADA	KARNATAKA	145500	750300	NARAYANPUR KALAN	ALLAHABAD	UTTAR PRADESH	254300	820300
GUDAVI BIRD SANCTUARY	SHIMOGA	KARNATAKA	140100	752700	GANGA YAMUNA RIVER	ALLAHABAD	UTTAR PRADESH	252405	815415
HECHE TANK	SHIMOGA	KARNATAKA	145000	742200	BHEERPUR (TONES RIVER)	ALLAHABAD	UTTAR PRADESH	251330	820225
BADANE KERE	KOLAR	KARNATAKA	131300	781300	DURBAN LAKE	AMBEDKAR NAGAR	UTTAR PRADESH	263200	822300
MAREHALLI LAKE	MANDYA	KARNATAKA	125600	765000	SIRSI (LALGANJ)	MIRZAPUR	UTTAR PRADESH	245013	822700
TAILUR	MYSORE	KARNATAKA	121940	770556	MECHI RIVER	DARJILING	WEST BENGAL	264500	882500
KARIGALA KERE	MYSORE	KARNATAKA	121700	761435	PHULBARI	JALPAIGURI	WEST BENGAL	264000	882500
KRISHNARAJA SAGAR	MYSORE	KARNATAKA	121818	763300	GAJOLDOBA BARRAGE	JALPAIGURI	WEST BENGAL	264800	883600
RAVANDUR	CHAMARAJANAGAR	KARNATAKA	120600	770400	DOMOHINI	JALPAIGURI	WEST BENGAL	262500	883000
JAIKWADI	AURANGABAD	MAHARASHTRA	193130	751350	RASIK BEEL	KOCH-BEHAR	WEST BENGAL	262540	894410
GANGAPUR DAM	NASHIK	MAHARASHTRA	203830	733000	NAYABANDH BEEL	MALDAH	WEST BENGAL	245500	882000
KHAMBALA	NASHIK	MAHARASHTRA	195730	733730	KARNAIL SINGH PARK	BARDDHAMAN	WEST BENGAL	235200	865400
BHIGWON	PUNE	MAHARASHTRA	181900	744600	DURGAPUR BARRAGE	BARDDHAMAN	WEST BENGAL	253200	880800
PATAS	PUNE	MAHARASHTRA	182600	742800	PALTA WATER WORKS	N. 24-PARGANAS	WEST BENGAL	224700	882200

Ameen Ahmed

Note: N.A. Not available

Maps not to scale

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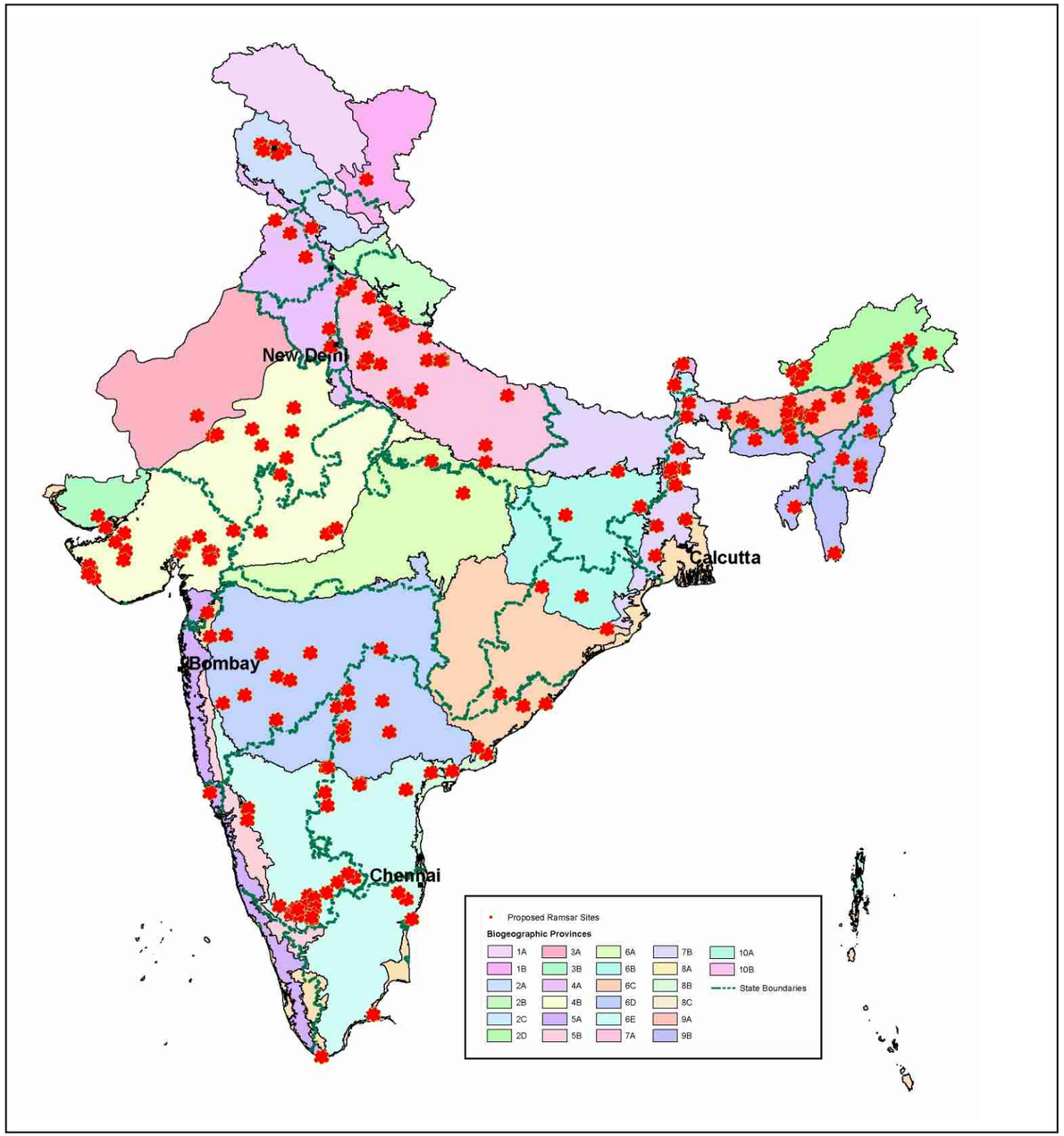
Sálim Ali Centre for Ornithology and Natural History, Coimbatore

Proposed inland wetland Ramsar sites & their distribution in respective Biogeographic Provinces



ANDHRA PRADESH
ANANTARAM
CHIKKADPALLI
CHINNA THUMBALAM TANK
DRAKSHARAMA: GOWTHAMI
GODAVARI RIVER
JAMUKULADINNE
KONDAKARLA
KOTPALLI
LAKNAPUR
MITTAKODURU TANK
NIZAMSAGAR RESERVOIR
PAVUMANCHALA
PATHA-KOTHA CHERUVU
POCHARAM
RUDRUR
SANGAMESHWARA BACK WATERS
TELINEELAPURAM
THATTIPUDI
THUMMALAGUDA
UPPALAPADU

ARUNACHAL PRADESH
DHONCHANG TSO
DUNGPIN TSO
GLAO LAKE
JAPANG BEEL
LAMCHUER TSO
MANDELA PHUDUNG WETLANDS
MEHAO LAKE
SANGTI MARSHES

ASSAM
BEEDOROU
BHEKERI BEEL
BHOTA BEEL
BORDOIBAM BEELMUKH BS
DANDUWA BEEL
DEOBALI BEEL
DHEER BEEL
DIBRU-SOWKHOA
DIGHALI BEEL
DIPLAI BEEL
HARIBHANGA BEEL
KAPLA BEEL
KAZIRANGA NP- WETLAND
KHAMTI GUWALI BEEL
KURUA BEEL
MAGURI BEEL
MISAMARI BEEL
PANIDIHING PHOKOLOI
POTAKALANG BEEL
SALMARI BEEL
SARIYANI BEEL
SATARYAJAN BEEL
SOLMARI BEEL
URPOD BEEL

BIHAR AND JHARKHAND
GOGA BEEL
JAGATPUR LAKE
KHARAGPUR JHEEL

GOA
CARAMBOLIM

GUJARAT
AJI1
AJWA
AMIPUR TANK
BARDA SAGAR
BRAHMANI DAM
CHHARI-DHANDH
DALOLI
DEO DAM
GOSA
KAJ WETLAND
KANEWAL
KUCHADI-JAWAR
LUNIVAV
MACHHAN NALA
NAGHRMA TANK
NARDA
PARIEJ
SAYANT
SUDAMDA DAM
VADHAVANA
VERI DAM

HARYANA
BASAI
MOHMEDABAD MARSHES
WESTERN YAMUNA CANAL WETLANDS
YAMUNA RIVER ASSOCIATED WETLANDS

JAMMU & KASHMIR
ANCHAR LAKE
HOKERA
HYGAM
MIRGUND
NARKARA
PANGONG TSO
TSOKAR TSO

KARNATAKA
ATTIVERY BIRD SANCTUARY
BADANE KERE
BYRAMANGALA RESERVOIR
GENDE HOSALLI
HIREKERETANK (YELANDUR CLASTER)
HOSKOTE TANK
IRASWADI TANK (YELANDUR CLUSTER)
KARANJI TANK
KESTHUR LAKE(YELANDUR CLUSTER)
KRISHNARAJASAGAR DAM
KUKKARAHALLI TANK
LINGAMBUDHI TANK
MALAGI DHARMA RESEVIOR
MANSALAPUR TANK

KARNATAKA
NARASAMBUDI TANK
SAMUNDER TALAB
SHIDLAGHATA AMMANIKERE
SULEKERE
TAILUR TANK
TUNGABADRA RIVER-ELE-BICHALI POINT
YELANDUR TANK (YELANDUR CLUSTER)

MADHYA PRADESH & CHHATTISGARH
GANDHISAGAR DAM
GOVINDGARH
HALALI DAM
MOD SAGAR
UPPER LAKE

MAHARASHTRA
BHIGWAN
BINDUSAR
GANGAPUR TANK
HIPPERGA TANK
JAYAKWADI
KHAMBALA TANK
KUNDALIKA DAM
MUKUTBAN
NANDUR-MEDHMESHWAR
NIVALI
VEER

MANIPUR
IKOP PAT
KHARUNG PAT
PUMLEN PAT
ZEILAD LAKE COMPLEX

MEGHALAYA
BIRBAH LAKE
TASEK LAKE COMPLEX
UMIAM LAKE

MIZORAM
PALAK DIL

NAGALAND
DOYANG RESERVOIR
DZUDU (ZANIBU) LAKE
SHILLOI LAKE

ORISSA
HIRAKUD RESERVOIR
KUMARKUNTHI RESERVOIR
MACHAKUND RESERVOIR
RENGALI RESERVOIR

PUNJAB
MARU BUCHIA
SHIKAR MACHIA
TAJPUR KHOJE

RAJASTHAN
ALNIYA DAM
BARDHA BANDH (TALERA)
CHANDLAI LAKE
JAWAI DAM
KHARDA DAM

RAJASTHAN
RANAKPUR DAM
SARDAR SAMAND
UMMED SAGAR (SHAHPURA)

SIKKIM
KHECHIPERI
THEPLEY TSO

TAMILNADU
KALIVELI
PERIAKANMOI AND SAKKARAKOTTAI
SUCHINDRAKULAM COMPLEX
THENNAMPATTU
UTHIRAMERUR

TRIPURA
GUMTI RESERVOIR (DUMBUR LAKE)
RUDRASAGAR (NIRMAHAL)

UTTAR PRADESH & UTTARANCHAL
ASPAN
BHANWANT
BHEEMGODA BARRAGE
BHEERPUR
CHAPHARIA-DAUREHARA
FATTEPUR
HARIPURA DAM & BOR DAM
IBRAHIMPUR
GOOMCHINI (JAMAITHA TAAL)
KALAGARH
KATRA
LAKH-BAHUSI LAKE
NANAKMATA
NARAYANPUR KALAN
RAMIABEHAD (BHAGEHAR TAAL)
SAHASWAN
SAMAN
SANDI LAKE
SARELI TAAL
SARSAI NAWAR
SAUJ
SEMARAILAKE
SHAIKHA
SHERPUR
TUMARIA DAM

WEST BENGAL
ADINA DEER PARK
ASH DYKES OF FARRAKA
BAGHAR BEEL
BARA SAGARDIGHI
DOMOHINI
FARAKKA BARRAGE
GAJOLDOBA BARRAGE
KANSABATI RIVER
KARNAIL SINGH PARK
MAITY BANDH
NAYABANDH
PURBASTHALI GANGETIC ISLAND
RASIK BEEL

Sujoy & Amit

Maps not to scale

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Appendix : 1 Administrative name changes of various districts in India from 1991-2001

Name of the State	Name of the new district(s) as in 2001	Name of the changed/carved out of district(s)as in 1991
Andhra pradesh	No change	
Arunachal Pradesh	Papum Pare	Lower Sabansiri
	Upper Siang	East Siang
Assam	No change	
Bihar & Jharkhand	Sheohar	Sitamarhi
	Supaul	Saharsa
	Banka	Bhagalpur
	Lakhisarai	Munger
	Sheikhpura	Munger
		Nalanda
	Buxar	Bhojpur
	Kaimur	Rohtas
	Jamui	Munger
	Garhwa	Palamu
	Chatra	Hazaribagh
	Kodarma	Hazaribagh
	Pakaur	Sahibganj
	Bokaro	Dhanbad
		Giridih
Gujarat	Patan	Mahesana
		Banas Kantha
	Porbandar	Junagadh
Gujarat	Anand	Kheda
	Dohad	Panch Mahals
	Narmada	Bharuch
		Vadodara
	Navasari	Valsad
Haryana	Panchkula	Ambala
	Fatehabad	Hisar
	Jhajjar	Rohtak
Himachal Pradesh	No change	
Jammu & Kashmir	No change	
Karnataka	Bagalkot	Bijapur
	Koppal	Raichur
	Gadag	Dharwad
	Haveri	Dharwad
	Davanagere	Chittradurga
		Shimoga
		Bellary
	Udupi	Dakshina Kannada
	Chamarajanagar	Mysore
Kerala	No change	
M. Pradesh & Chhattisgarh	Sheopur	Morena
	Umaria	Shahdol
	Neemuch	Mandsaur
	Barwani	West Nimar
	Harda	Hoshangabad
	Katni	Jabalpur
	Dindori	Mandla
	Koriya	Surguja
	Jashpur	Rajgarh
	Korba	Bilaspur
	Janjgir Champa	Bilaspur
	Kawardha	Rajnandgaon
		Bilaspur
	Mahasamund	Raipur
	Dhamtari	Raipur
	Kanker	Bastar
	Dantewada	Bastar
Maharashtra	Nandurbar	Dhule
	Washim	Akola
	Gondiya	Bhandara
	Hingoli	Parbhani
	Mumbai (Suburban)	Greater Bombay
	Mumbai	Greater Bombay
Manipur	Imphal East	Imphal
	Imphal West	Imphal
Meghalaya	South Garo Hills	West Garo Hills
	Ri Bhoi	East Kshsi Hills
Mizoram	Mamit	Aizawl
	Kolasib	Aizawl
	Champi	Aizawl
	Serchhip	Aizawl
	Saiha	Chhimtuipui
	Lawngtlai	Chhimtuipui
Nagaland	Dimapur	Kohima
Orissa	Bargarh	Sambalpur
	Jharsuguda	Sambalpur
	Debagarh	Baleshwar
	Bhadrak	Baleshwar
	Kendrapara	
	Jagatsinghapur	Cuttack
	Jajapur	
	Anugul	Dhenkanal
	Nayagarh	Puri
	Khordha	
	Gajapati	Ganjam
	Kandhamal	Phulabani
	Baudh	
	Sonapur	Balangir
	Nuapada	Kalahandi
	Rayagada	Koraput
	Nabaranagapur	Koraput
	Malkangiri	Koraput
Punjab	Nawanshahr	Jalandhar
		Hoshiarpur
	Fatehgarh Sahib	Patiala
		Rupnagar
		Ludhiana
	Moga	Faridkot
		Firozpur
	Muktsar	Faridkot
Rajasthan	Mansa	Bathinda
	Hanumangarh	Ganganagar
	Karauli	Sawai Madhopur
	Dausa	Jaipur
		Sawai Madhopur
	Rajasmand	Udaipur
	Baran	Kota
Sikkim	No change	
Tamil Nadu	Kancheepuram	Chengalpattu
	Thiruvallur	MGR
	Cuddalore	South Arcot
	Viluppuram	
	Namakkal	Salem
	Karur	
	Perambalur	Tiruchirappalli
	Ariyalur	
	Nagapatinam	Thanjavur
	Thiruvarur	
	Theni	Madurai
Tripura	Dhalai	North Tripura
		South Tripura
U.P. & Uttaranchal	Rudraprayag	Chamoli
		Tehri Garhwal
		Garhwal
	Champawat	Pithoragarh
	Bageshwar	Almora
	Joytiba Phule Nagar	Moradabad
	Baghpat	Meerut
	Gautam Buddha Nagar	Ghaziabad
	Hatharas	Mathura
		Aligarh
	Kannauj	Farrukhabad
	Auraiya	Etawah
	Mahoba	Hamirpur
	Chitrakoot	Banda
	Kaushambi	Allahabad
	Ambedkar Nagar	Faizabad
		Azamgarh
	Shravasti	Bahraich
	Balrampur	Gonda
	Sant Kabir Nagar	Basti
		Siddharthnagar
	Kushinagar	Deoria
	Chandauli	Varanasi
	Sant Ravidas Nagar (Bhadoi)	Varanasi
	Udhamsingh Nagar	Nainital
West Bengal	Uttar Dinajpur	West Dinajpur
	Dakshin Dinajpur	

S.K. Srivastava

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Appendix 2 State-wise distribution of freshwater turtles in India

S.No.	Species	States																								
		TN	KL	KA	GA	AP	OA	MP	MH	GJ	RJ	HY	PU	JK	HP	UP	BH	WB	SK	MG	AM	AR	NG	MN	MZ	TR
	Critically Endangered																									
1	*Kachuga kachuga*							■			■		■			■	■	■								
	Endangered																									
2	*Chitra indica*	■				■	■	■	■		■		■			■	■	■			■					
3	*Geoemyda silvatica*	■		■																						
4	*Pyxidea mouhotii*																			■	■	■		■	■	
5	*Pelochelys cantorii*	■	■				■											■								
6	*Kachuga dhongoka*							■			■					■	■	■			■					
7	*Kachuga sylhetensis*																	■		■	■	■	■		■	
	Vulnerable																									
8	*Amyda cartilaginea*																								■	
9	*Aspideretus gangeticus*						■	■		■	■	■	■	■		■	■				■			■		
10	*Aspideretus hurum*						■	■	■		■					■	■	■			■	■		■		
11	*Aspideretes leithii*	■	■	■		■	■	■	■							■										
12	*Geoclemys hamiltonii*		■								■		■	■		■	■	■		■	■					
13	*Hardella thurjii*							■			■		■			■	■	■		■	■					
14	*Melanochelys tricarinata*															■	■	■	■		■	■				
15	*Morenia petersi*															■	■	■			■					
	Near Threatened																									
16	*Cuora amboinensis*																				■	■	■	■		
17	*Cyclemys oldhami*																	■		■	■	■		■	■	
18	*Kachuga tecta*						■	■	■	■	■		■	■		■	■	■		■	■	■			■	
19	*Kachuga tentoria*					■	■	■	■	■	■					■	■	■			■	■		■	■	
20	*Lissemys punctata*	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■				
	Least Concern																									
21	*Kachuga smithi*												■	■		■	■				■					
22	*Melanochelys trijuga*	■	■	■		■			■	■					■	■	■	■	■	■	■				■	

States: -TN-Tamil Nadu; KL-Kerala; KA-Karnataka; GA-Goa; AP-Andhra Pradesh; OA-Orissa; MP-Madhya Pradesh (Undivided) ; MH-Maharashtra; GJ-Gujarat; RJ-Rajasathan; HY-Haryana; PU-Punjab; JK-Jammu & Kashmir; HP-Himachal Pradesh; UP-Uttar Pradesh (Undivided); BH-Bihar (Undivided); WB-West Bengal; SK-Sikkim; MG-Meghalaya; AM-Assam; AR-Arunachal Pradesh; NG-Nagaland; MN-Manipur; MZ-Mizoram; TR-Tripura

■ Species Present
□ Species absent/ data deficient

Source: Choudhury et al., 2000, Bhupathy & Menon, 2003

Appendix 3 State-wisedistribution of endemic aquatic angiosperms in India

Sl.No.	Species	States														
		TN	KL	KA	GA	AP	OA	MP	MH	GJ	RJ	JK	UP	BH	WB	AM	AR
1	*Aponogeton appendiculatus*	■	■						■						■		
2	*Aponogeton bruggenii*								■								
3	*Aponogeton satarensis*								■								
4	*Cladopus hookerianus*		■	■	■				■								
5	*Coelachne minuta*								■								
6	*Cryptocoryne cognata*			■					■								
7	*Cryptocoryne cognatoides*		■	■					■								
8	*Cryptocoryne consobrina*	■	■	■													
9	*Lagenandra meeboldii*	■	■	■													
10	*Cryptocoryne spiralis*	■	■	■					■					■			
11	*Cyanotis papilionacea*	■	■	■					■								
12	*Cyathocline jacquemontii*							■									
13	*Cyathocline lutea*		■	■					■								
14	*Eleocharis swamyii*	■				■											
15	*Eriocaulon barbeyanum*			■													
16	*Eriocaulon bolei*								■								
17	*Eriocaulon breviscapum*			■			■	■	■								
18	*Eriocaulon cuspidatum*		■	■	■			■	■								
19	*Eriocaulon dalzellii*			■	■				■								
20	*Eriocaulon duthiei*						■	■	■								
21	*Eriocaulon echinulatum*																■
22	*Eriocaulon eurypeplon*		■	■	■				■								
23	*Eriocaulon fysonii*		■	■					■								
24	*Eriocaulon heterolepis*		■	■	■				■		■						
25	*Eriocaulon lanceolatum*		■	■					■								
26	*Eriocaulon martianum*							■							■		
27	*Eriocaulon parviflorum*		■	■				■	■								
28	*Eriocaulon ratnagiricus*								■								
29	*Eriocaulon richardiana*	■	■	■					■		■						
30	*Eriocaulon ritchieanum*	■		■		■			■								
31	*Eriocaulon robusto-brownianum*	■	■	■	■				■							■	
32	*Eriocaulon rouxianum*								■								
33	*Eriocaulon santapaui*								■								
34	*Eriocaulon sedgwickii*			■	■				■	■							
35	*Eriocaulon sharmae*								■								
36	*Eriocaulon sivarajanii*		■														
37	*Eriocaulon stellulatum*		■	■					■								
38	*Eriocaulon tuberiferum*								■								
39	*Farmeria indica*	■	■														
40	*Fimbristylis crystallina*	■															
41	*Fimbristylis dauciformis*		■														
42	*Fimbristylis hirsutifolia*		■														
43	*Fimbristylis woodrowii*	■		■	■				■	■	■						
44	*Fuirena swamyii*	■															

Continued....

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Appendix 3 State-wise distribution of endemic aquatic angiosperms in India

Sl.No.	Species	States															
		TN	KL	KA	GA	AP	OA	MP	MH	GJ	RJ	JK	UP	BH	WB	AM	AR
45	*Fuirena trilobites*	■		■		■			■	■							
46	*Fuirena tuwensis*			■					■	■							
47	*Fuirena wallichiana*	■	■	■	■	■		■	■		■		■				
48	*Geissaspis tenella*	■	■	■	■				■								
49	*Heliotropium keralense*		■														
50	*Hoppea dichotoma*	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■
51	*Hubbardia heptaneuron*			■													
52	*Hydrobryopsis sessilis*		■	■	■	■			■								
53	*Hygrophila pinnatifida*	■		■					■				■				
54	*Hygrophila serpylla*	■	■	■	■		■	■	■	■	■						
55	*Indotristicha ramosissima*	■	■	■													
56	*Indotristicha tirunelveliana*	■															
57	*Isachne bicolor*								■								
58	*Isachne elegans*	■		■					■								
59	*Isachne meeboldii*			■					■								
60	*Isachne veldkampii*			■													
61	*Ischaemum jayachandranii*		■														
62	*Ischaemum nilagiricum*	■	■	■										■			
63	*Ischaemum travancorense*		■						■								
64	*Ischaemum vembanadense*		■														
65	*Lagenandra nairii*		■														
66	*Limnophila glandulifera*		■														
67	*Limnophila polystachya*	■		■					■								
68	*Limnopoa meeboldii*		■	■													
69	*Lindernia estaminodiosa*		■	■					■					■			
70	*Lindernia manilaliana*		■														
71	*Lindernia minima*	■															
72	*Lindernia quinqueloba*								■								
73	*Lipocarpha raynaliana*	■	■														
74	*Murdannia lanuginosa*	■	■	■					■								
75	*Murdannia pauciflora*	■	■	■					■								
76	*Myriophyllum oliganthum*	■	■	■		■		■	■								
77	*Najas marina ssp*	■				■		■		■	■	■			■		■
78	*Najas kurziana*							■		■							
79	*Nymphoides krishnakesara*		■														
80	*Nymphoides macrosperma*		■														
81	*Nymphoides sivarajanii*		■														
82	*Paspalum canarae*	■	■	■				■	■								
83	*Podostemum barberi*	■	■	■				■									
84	*Podostemum munnarense*		■														
85	*Pogostemon erectum*		■	■					■								
86	*Pogostemon griffthii*					■	■										
87	*Pogostemon salicifolius*			■					■								
88	*Polypleurum dichotomum*	■	■						■								
89	*Polypleurum filifolium*		■														
90	*Ramphicarpa longiflora*	■	■	■	■			■	■	■							
91	*Rotala cookii*		■														
92	*Rotala fimbriata*	■	■	■	■	■	■		■								
93	*Rotala floribunda*								■								
94	*Rotala illecebroides*	■	■	■		■		■						■			
95	*Rotala macrandra*	■	■	■					■								
96	*Rotala malabarica*		■														
97	*Rotala malampuzhensis*		■	■					■								
98	*Rotala ritchei*	■		■					■								
99	*Scirpus naikianus*								■								
100	*Sesbania procumbens*	■		■		■		■	■	■	■				■		
101	*Tonningia cucullata*	■		■		■		■	■	■	■						■
102	*Trithuria konkanensis*			■	■				■								
103	*Utricularia albocaerulea*	■	■	■					■								
104	*Utricularia arcuata*	■		■	■				■								
105	*Utricularia cecilii*		■	■													
106	*Utricularia janarthanami*								■								
107	*Utricularia lazulina*			■													
108	*Utricularia naikii*								■								
109	*Utricularia praeterita*	■	■	■	■			■	■								
110	*Utricularia smithiana*	■	■	■													
111	*Utricularia wightiana*	■	■	■													
112	*Willisia selaginoides*	■	■														
113	*Wiesneria triandra*		■	■				■	■								■
114	*Zeylanidium maheshwarii*		■														

States: -TN-Tamil Nadu; KL-Kerala; KA-Karnataka; GA-Goa; AP-Andhra Pradesh; OA- Orissa; MP-Madhya Pradesh (Undivided) ; MH-Maharashtra; GJ-Gujarat; RJ-Rajasathan; JK-Jammu & Kashmir; UP-Uttar Pradesh (Undivided); BH-Bihar (Undivided); WB-West Bengal; AM-Assam; AR-Arunachal Pradesh;

■ Species Present
□ Species absent/ data deficient

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Appendix 4 State-wise distribution of Threatened and Near Threatened birds In India

Species	States																					
	TN	KA	AP	MP	MH	GJ	RJ	HY	PU	JK	HP	UP	BH	WB	SK	MG	AM	AR	NG	MN	MZ	TR
Threatened species																						
Baer's Pochard			■			■						■		■			■					
Baikal Teal												■										
Blacknecked Crane										■					■			■				
Bristled Grass Warbler								■	■													
Dalmatian Pelican	■					■	■					■										
Finn's Weaver																	■					
Adjutant Stork												■					■					
Greater Spotted Eagle		■																				
Imperial Eagle				■		■	■	■	■			■		■								
Indian Skimmer			■																			
Lesser Adjutant		■					■					■	■	■			■	■		■		
Lesser Kestrel						■		■					■									
Longbilled Vulture				■			■										■					
Marbled Teal					■							■										
Masked Finfoot			■																			
Pallas's Fishing Eagle											■	■	■	■	■		■	■		■		
Sarus Crane				■		■	■	■		■	■	■										
Sociable Lapwing												■					■					
Spoonbilled Sandpiper					■	■																
Spotbilled Pelican	■	■	■	■		■			■			■					■	■				
Spotted Greenshank	■	■	■									■		■			■					
Swamp Francolin																	■					
Whitebellied Heron																		■				
Whitebacked Vulture		■	■	■		■	■	■	■			■		■			■					
Whitewinged Wood Duck																		■		■	■	
Wood snipe																	■		■			
Near Threatened species																						
Blackbellied Tern	■	■	■	■			■	■				■					■					
White Ibis	■	■	■	■	■	■	■	■		■		■	■	■			■					
Blacknecked Stork		■			■	■	■	■				■	■	■			■					
Blyth's Kingfisher																■						
White-eyed Pochard			■	■	■	■	■	■	■	■		■	■	■			■			■		
Greyheaded Fishing Eagle		■	■									■		■			■					
Himalayan Greyheaded Fishing Eagle																		■				
Lesser Flamingo	■		■			■	■	■				■										
Darter	■	■	■	■	■	■	■	■	■			■		■		■	■			■	■	■
Painted Stork	■	■	■	■	■	■	■	■			■	■					■					
Pale Harrier		■	■		■	■		■				■		■			■					
King Vulture				■																		

Source: Compiled from various sources

Appendix 5 State-wise distribution of Threatened freshwater fishes in India

Sl.No.	Species	States																										
		TN	KL	KA	GA	AP	OA	MP	MH	GJ	RJ	HY	PU	JK	HP	UP	BH	WB	SK	MG	AM	AR	NG	MN	MZ	TR
	Critically Endangered																									
1	*Barilius dimorphicus*															■										
2	*Dayella malabarica*																									
3	*Erethistoides montana*																				■					
4	*Garra manipurensis*																									
5	*Glyptothorax davissinghi sp nov.*																									
6	*Lepidopygopsis typus*		■																							
7	*Osteochilichthys longidorsalis*		■																							
8	*Pangasius pangasius*	■				■	■									■		■			■					
9	*Pinniwallago kanpurensis sp.nov*															■										
10	*Proeutropiichthys taakree*	■		■		■																				
11	*Puntius arulius tambiraparniei*	■																								
12	*Puntius narayani*			■																						
13	*Silurus wynaadensis*		■	■																						
14	*Travancoria elongata*		■																							
	Endangered																									
15	*Anguilla bengalensis*	■	■	■		■	■	■	■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	■
16	*Barilius dogarsinghi*																						■			
17	*Barilius jayarami*																									
18	*Bhavania australis*	■	■	■																						
19	*Botia berdmorei*																						■			
20	*Botia lohachata*										■		■			■		■								
21	*Chitala chitala*						■									■	■	■			■		■			
22	*Eutropiichthys vacha*						■						■			■	■	■			■					
23	*Garra gotyla stenorhynchus*	■		■																						
24	*Garra hughi*	■	■																							
25	*Garra surendranathanii*		■																							
26	*Glyptothorax cavia*																	■			■					
27	*Hypselobarbus curmuca*			■		■		■																		
28	*Hypselobarbus dubius*	■																								
29	*Hypselobarbus jerdoni*			■																						
30	*Hypselobarbus kurali*	■	■	■																						
31	*Hypselobarbus thomasi*		■	■																						
32	*Lepidocephalus berdmorei*																									
33	*Mystus malabaricus*		■	■					■																	
34	*Nemacheilus keralensis*	■	■																							
35	*Nemacheilus monilis*	■																								
36	*Nemacheilus montanus*												■		■											
37	*Ompok bimaculatus*	■	■		■		■	■	■		■	■	■	■	■	■	■	■	■	■		■	■	■	■	

Continued....

■ Species Present
□ Species absent/ data deficient

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Appendix 5 State-wise distribution of Threatened freshwater fishes in India

S.No.	Species	States																										
		TN	KL	KA	GA	AP	OA	MP	MH	GJ	RJ	HY	PU	JK	HP	UP	BH	WB	SK	MG	AM	AR	NG	MN	MZ	TR
	Endangered																									
38	*Osteobrama bakeri*		■																							
39	*Pseudeutropius atherinoides*	■			■	■	■	■	■		■	■	■	■	■	■	■	■	■	■		■	■	■	■	■
40	*Psilorhynchus sucatio*															■				■	■					
41	*Puntius arulius*	■	■																							
42	*Puntius chilinoides*												■		■	■					■					
43	*Puntius clavatus clavatus*																		■				■			
44	*Puntius denisonii*		■																							
45	*Puntius dorsalis*	■		■		■	■		■																	
46	*Puntius melanampyx sp.nov.*	■	■	■	■																					
47	*Puntius melanostigma*	■	■																							
48	*Puntius parrah*		■																							
49	*Raiamas guttatus*																							■		
50	*Rita pavimentatus*			■		■			■																	
51	*Semiplotus modestus*																								■	
52	*Tetraodon travancoricus*		■	■																						
53	*Tor pitutora*													■		■		■			■					
	Vulnerable																									
54	*Ailia coila*						■					■			■	■										
55	*Anabas testudineus*	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■		■	■
56	*Bagarius bagarius*	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■
57	*Barbodes sarana*	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■
58	*Barilius bakeri*	■	■																							
59	*Barilius barila*									■			■		■	■					■		■	■		
60	*Barilius vagra*									■			■		■						■					
61	*Catla catla*	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■
62	*Channa orientalis*	■	■																							
63	*Cirrhinus cirrhosus*	■																								
64	*Cirrhinus reba*	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■
65	*Clarias batrachus*	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■
66	*Clupisoma garua*														■	■			■	■	■	■	■	■		■
67	*Crossocheilus burmanicus*																									
68	*Garra gotyla gotyla*							■					■			■					■					
69	*Garra lissorhyncus*																			■			■			
70	*Garra menoni*		■																							
71	*Glyptothorax brevipinnis*														■	■										
72	*Glyptothorax madraspatanum*	■																								
73	*Gonialosa manmina*																									
74	*Heteropneustes fossilis*	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
75	*Hilsa ilisha*																									
76	*Labeo dero*	■			■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
77	*Macrognathus guentheri*		■																							

S.No.	Species	States																										
		TN	KL	KA	GA	AP	OA	MP	MH	GJ	RJ	HY	PU	JK	HP	UP	BH	WB	SK	MG	AM	AR	NG	MN	MZ	TR
	Venerable																									
78	*Mystus bleekeri*						■											■			■		■			
79	*Mystus vittatus*	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
80	*Nemacheilus kangjupkhulensis*																							■		
81	*Nemacheilus manipurensis*																						■	■		
82	*Nemacheilus multifasciatus*																	■	■		■					
83	*Nemacheilus prashadi*																							■		
84	*Nemacheilus scaturigina*																	■	■		■					
85	*Nemacheilus semiarmatus*	■	■																							
86	*Neolissochilus hexagonolepis*																	■			■	■	■			
87	*Osteobrama cotio*				■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■
88	*Pangio pangio*																	■			■			■		
89	*Parambassis thomassi*		■																							
90	*Pseudecheneis sulcatus*																	■			■					
91	*Psilorhynchus homaloptera*																						■			
92	*Puntius chola*	■	■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
93	*Puntius conchonius*		■										■			■	■	■			■					
94	*Puntius vittatus*	■	■		■					■																
95	*Raiamas bola*						■						■			■		■			■					
96	*Rhinomugil corsula*	■					■						■			■	■	■								
97	*Schizothorax curvifrons*													■												
98	*Schizothorax niger*													■												
99	*Schizothorax richardsonii*													■		■			■		■					
100	*Semiplotus semiplotus*																	■		■	■	■				
101	*Sicamugil cascasia*						■									■										
102	*Tor khudree*	■				■			■																	

States: -TN-Tamil Nadu; KL-Kerala; KA-Karnataka; GA-Goa; AP-Andhra Pradesh; OA-Orissa; MP-Madhya Pradesh (Undivided) ; MH-Maharashtra; GJ-Gujarat; RJ-Rajasathan; HY-Haryana; PU-Punjab; JK-Jammu & Kashmir; HP-Himachal Pradesh; UP-Uttar Pradesh (Undivided); BH-Bihar (Undivided); WB-West Bengal; SK-Sikkim; MG-Meghalaya; AM-Assam; AR-Arunachal Pradesh; NG-Nagaland; MN-Manipur; MZ-Mizoram; TR-Tripura

■ Species Present
□ Species absent/ data deficient

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Appendix : 6 Wetland map legend and definitions

Legend

Wetland type and land use

Dense Forest		Oxbow Lake/Cut-off		River	
Open Forest		Coastal water		Others (Satellite Data Not Available)	
Arable Land		Marsh/Mud			
Pond/Lake		Waste Land			
Reservoir		Sand			
Water-logged		Township			

Other features

Taluk/Tehsil boundary		District boundary	
Road		Not present	NP

Wetland type and turbidity

Wetland type	Turbidity		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged			
Oxbow			

Wetland type and aquatic vegetation

Wetland type	Aquatic vegetation		
	Low	*Medium*	*High*
Pond/Tank			
Reservoir			
Water-logged			
Oxbow			

Definitions

Dense Forest : All lands with tree cover of canopy density of 40 percent and above.

Open Forest: All lands with tree cover of canopy density between 10 to 40 percent.

Arable Land : The land primarily used for farming and for production of food, fiber, other commercial and horticultural crops. It includes land under crops (irrigated and un-irrigated),fallow ,plantations etc.

Ponds\Lakes : Bodies of Standing water occupying distinct basins . The only difference between lake and pond is of size which is also not quantitative.

Reservoir: A pond or lake built for the storage of water, usually by the construction of a dam across a river.

Waterlogged :An area in which water stands near; at or above the land surface, so that the roots of all plants except hydrophytes are drowned and the plants die.

Ox bow Lake/Cut-off: A mendering stream may erode the outside shoresof its broad bends, and in time the loops may become cut-off, leaving basins. The resulting shallow crescent-shaped lakes are called oxbow lakes.

Marsh: A frequently or continually inundated wetland charactrised by emergent herbaceous vegetation adapted to saturated soil conditions.

Wastelands : Degraded land which can be brought under vegetation cover with reasonable effort, and which is currently under utilised and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes.

Turbidity

Turbidity patterns are best reflected by the band 2 of IRS LISS III image data.Higher the DN value in band 2,higher is the turbidity.
The image values are recoded to obtain three turbidity levels. the rcoded values are:

Low Turbidity : 10
Medium Turbidity : 20
high Turbidity :30

Vegetation

For aquatic vegetation classification band 4 of IRS LISS III data was used .The Normalised Differential Vegetation Index (NDVI) was obtained for water bodies.

The NDVI value of less than zero considered as negligible vegetation. The positive values sujectively are divided into three vegetation levels i.e. poor, moderate and high vegetation.

The positive values are sujectively divided into three vegetation levels i.e. poor,moderate and high vegetation.

Recoding of the NDVI image done to obtain a image classified in to four aquatic vegetation classes.

Negligible vegetation : 1
Poor vegetation : 2
Moderate vegetation : 3
High vegetation :4

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