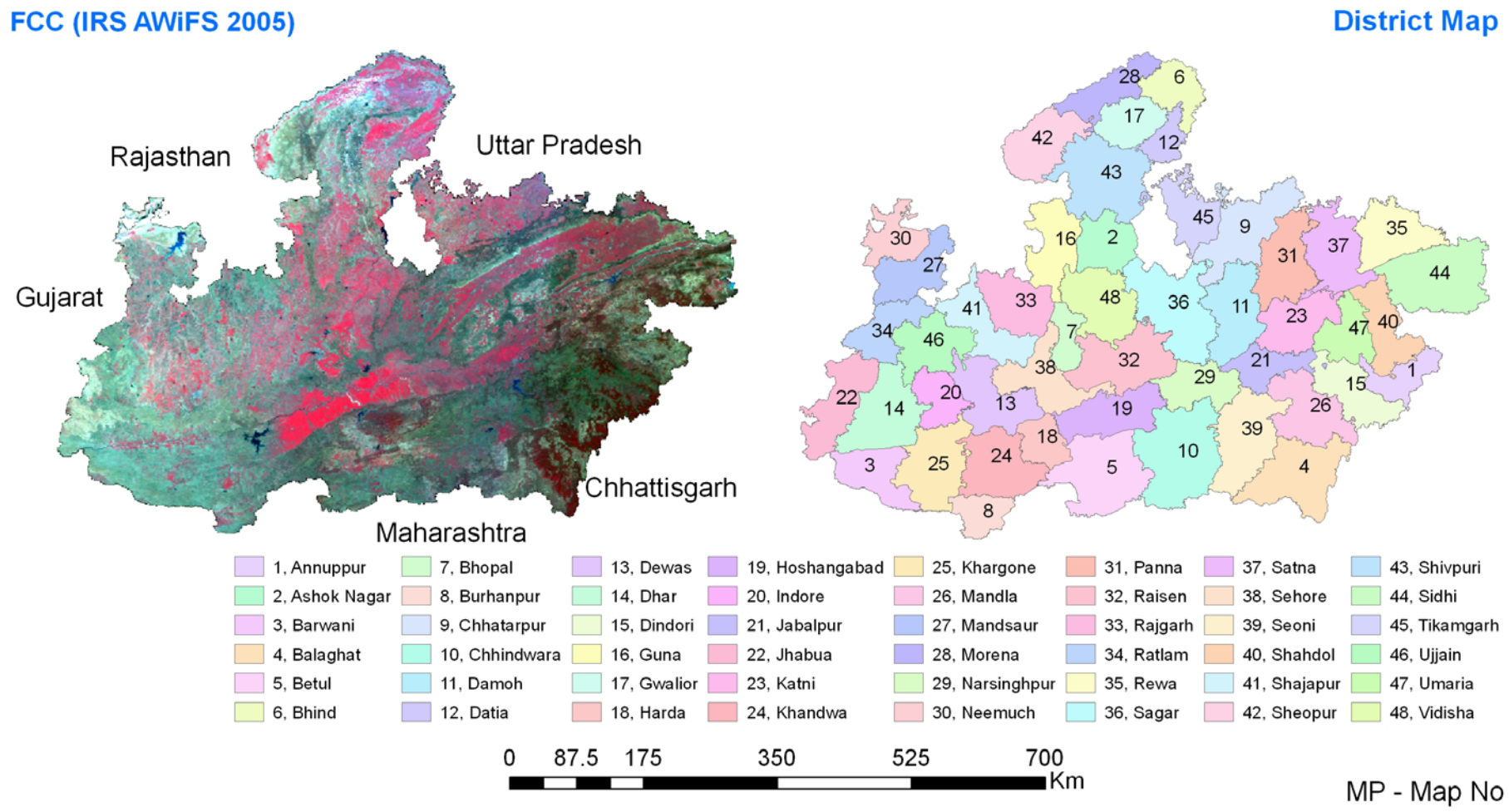
MADHYA PRADESH

INTRODUCTION

Location and Administrative Setup: Madhya Pradesh situated in the central part of India is the second largest state and occupies pivotal position in the country. It is land-locked state with Rajasthan and Uttar Pradesh in the North, Gujarat and Rajasthan in West, Maharashtra in the South and recently carved out Chattisgarh in the East. It is located between 21° 05' to 26° 55' N latitude and 74° 00' to 82° 55' E longitude covering an area of about 30825.400 Th ha (308254 sq. km). The state is divided into 9 divisions (Indore, Ujjain, Gwalior, Chambal, Rewa, Sagar, Bhopal, Hoshangabad and Jabalpur) covering 48 districts (Map No 1), 313 subdivisions and 55393 villages. Madhya Pradesh is the seventh most populous state in the country. Bhopal is the state capital.

According to 2001 census, total population of the state is 6,03,85,118 out of which 3,14,56,873 (52.09%) are male. Decadal growth in population is 24.34%. The state has population density of 196 persons/sq km. The overall sex ratio is 920 i.e. 920 females per 1000 males showing an increase from previous census. Sex ratio for the age 0 – 6 years is 929. The state has population growth of 24.3% in the last decade (1991-2001). The state has overall literacy rate of 64.11 %, with male literacy rate as 76.80% and female literacy rate as 50.28%.

Satellite Image of Madhya Pradesh and the Districts



Climate: The state has a tropical climate. The lowest temperature during the cooler months of December and January is 10°C, and in the summer months of May and June the temperature reaches 29°C. Most parts of the state in summer are hot and humid. State of Madhya Pradesh receives most of the rainfall from southwest monsoon, in the months of June to October. Average rainfall varies from 600 to 1600 mm in different parts of state with state average as 917 mm. High rainfalls in the range of 1500 mm and above occurs in Balaghat, Mandla and Dindori districts. Majority of state comes in the rainfall range of 1000 mm to 1500 mm. Low average rainfall below 750 mm occurs in Barwani, Gwalior, Morena, Bhind and Datia districts.

Land use: Land use statistics for the year 2003–'04 and 2004–'05 is given in Table 1.

Table 1: Major Land Use (Th ha)

PARTICULARS	2003-'04	2004-'05
Forest	8580.000	8585.000
Not Available for Cultivation		
A-Land put to Non Agriculture Uses	1925.000	1924.000
B-Barren and Uncultivable Land	1425.000	1440.000
Other Uncultivable Land Excluding Fallow Land		
A-Permanent Pastures & Grazing Land	1360.000	1341.000
B-Land under Misc. Tree Crops & Groves	19.000	20.000
C-Cultivable Wastelands	1178.000	1175.000
Fallow Land		
A-Current Fallow	621.000	596.000
B-Old Fallow	599.000	596.000
Cropped Area		
A-Net Area Sown	15048.000	15078.000
B-Area Sown More Then Once	4843.000	5228.000
Gross Cropped Area	19891.000	20306.000
Cropping Intensity (%)	132.18	134.67

(Source: www.indiastat.com)

Satellite Data: IRS 1D LISS III data of two different seasons namely, pre monsoon (April, 2004) and post monsoon (November-December, 2003) were used for delineation of waterlogged and salt affected areas of various commands of Madhya Pradesh.

WATER RESOURCES AND COMMAND AREAS

Water Resources: Madhya Pradesh state is rich in water resources. Three rivers viz, Narmada, Tapi, Mahi and major tributaries of Ganga basin like Chambal, Sindh, Betwa, Ken. Tons and Son have their origin in Madhya Pradesh. The northern part of the state is drained by the rivers Chambal, Betwa, Ken and their tributaries, which flow northerly through Bundelkhand region and ultimately join river Yamuna. The Son river flows East – North - East. The Narmada river flowing in a westerly course is a major river between Satpura and Vindhayan ranges draining to Arabian sea. Tapi is also westerly flowing river debouching its water in Arabian sea. Wainganga, and Waraha are tributaries of Godavari river draining in southern eastern part of the state.

The estimated annual runoff from all the basins in the state is about 14141.9 Th ha meter. It is estimated that about 5685.7 Th ha meter can be harnessed for irrigation. It is possible to irrigate about 6090 Th ha of land from surface water while 5200 Th ha of land can be irrigated with the use of ground water. Thus the ultimate irrigation potential for state is 11290 Th ha which when fully utilised can irrigate 74.8% of the present sown area (15078 Th ha) in the state.

Command Areas: There are 144 irrigation commands in Madhya Pradesh. Number of major and medium irrigation commands are 30 and 114, respectively (Map 2).

WATER LOGGING AND SALT AFFECTED AREAS IN MAJOR AND MEDIUM IRRIGATION COMMANDS BASED ON SATELLITE REMOTE SENSING

Total waterlogged area in the state is 0.543 Th ha which is perennial in nature. Out of 144 irrigation commands, 3 commands have area under waterlogging category with highest in Tawa command. Salt affected area covers 4.410 Th ha. Total 840 soil samples were collected to check the salinity / alkalinity in the command. State has salt affected area under Chambal command. Table 2 and Map 3 show the salt affected area and waterlogged areas in major and medium irrigation commands in Madhya Pradesh state.

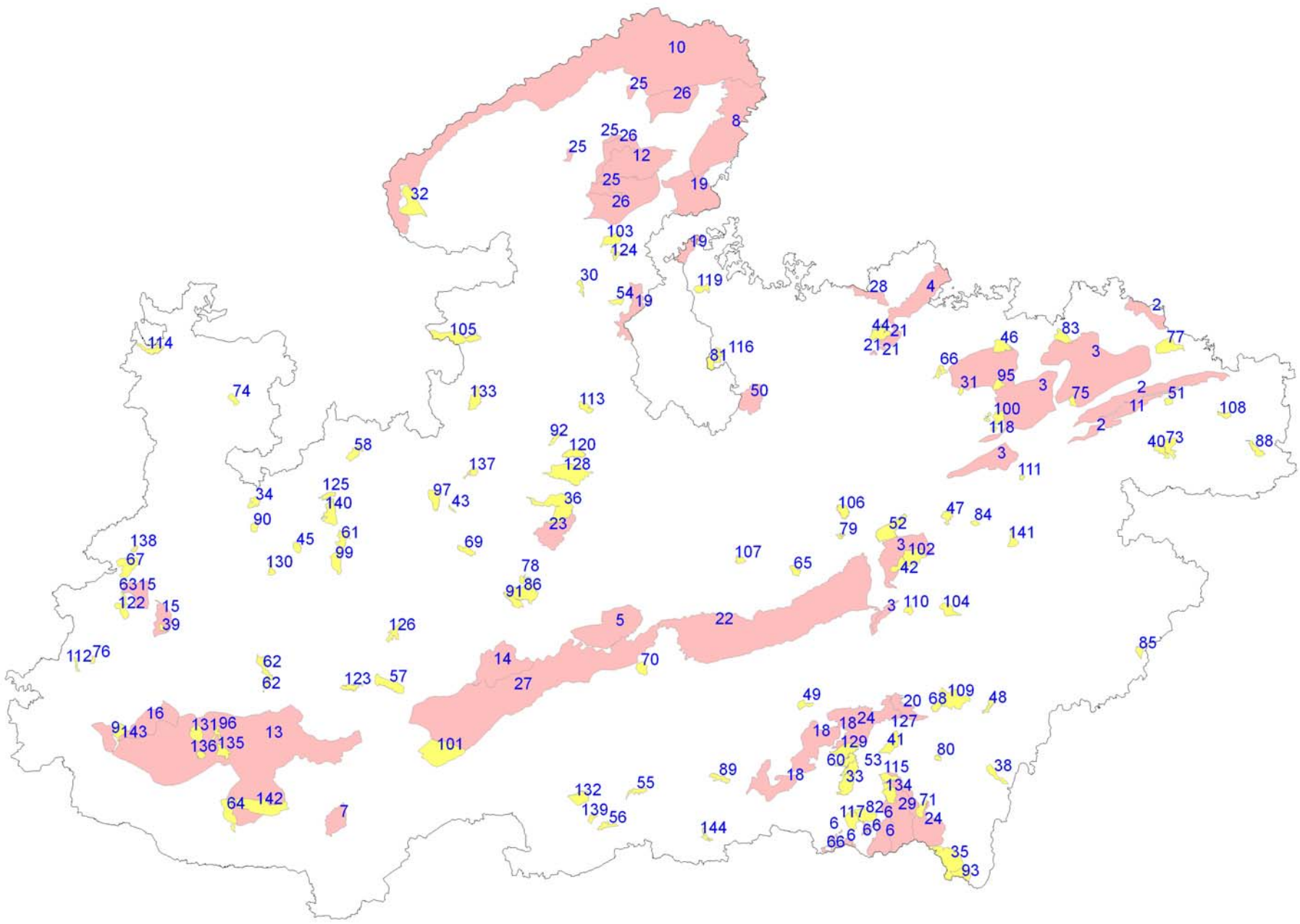
Table 2: Salt Affected and Waterlogged areas in major and medium irrigation commands of state

Code	Command name	Type	Waterlogged area (Th ha)	Salt affected area (Th ha)
1	Bansagar Canal (In C2)	Major	0.000	0.000
2	Bansagar Dam	Major	0.000	0.000
22	Bargi (Rani Avanti Bai Sagar)	Major	0.000	0.000
3	Bargi Diversion	Major	0.110	0.000
4	Bariarpur Left Bank Canal	Major	0.000	0.000
5	Barna	Major	0.000	0.000
7	Bhagwant Sagar (Sukta)	Major	0.000	0.000
8	Bhander Canal	Major	0.000	0.000
50	Bilanadi	Major	0.000	0.000
9	Chandra Shekhar Azad (Jobat)	Major	0.000	0.000
10	Gandhi Sagar (Chambal Project)	Major	0.007	4.410
11	Gulab Sagar (Mahan)	Major	0.000	0.000
12	Harsi	Major	0.000	0.000
13	Indira Sagar	Major	0.000	0.000
14	Kolar	Major	0.000	0.000
15	Mahi	Major	0.000	0.000
16	Man	Major	0.000	0.000
17	Omkareshwar	Major	0.000	0.000
18	Pench Diversion	Major	0.000	0.000
6	Rajeev Sagar (Bawanthadi)	Major	0.000	0.000
19	Rajghat Canal	Major	0.000	0.000
20	Rajiv Gandhi Pariyojna (Thanwar)	Major	0.000	0.000
21	Rangwan High Level Canal	Major	0.000	0.000
23	Samrat Ashok Sagar (Halali)	Major	0.000	0.000
24	Sanjay Sarovar (Upper Wainganga)	Major	0.000	0.000
25	Sindh - I	Major	0.000	0.000
26	Sindh - II	Major	0.000	0.000
27	Tawa	Major	0.426	0.000
28	Urmil Right Bank Canal	Major	0.000	0.000
29	Wainganga Canal	Major	0.000	0.000
30	Akhajhiri	Medium	0.000	0.000
31	Amkoi	Medium	0.000	0.000
33	Ari Tank	Medium	0.000	0.000
34	Arnia Bahadurpur	Medium	0.000	0.000
32	Awda Dam	Medium	0.000	0.000
35	Bagh Right Bank Canal	Medium	0.000	0.000
36	Bah	Medium	0.000	0.000
52	Bahuri Bund	Medium	0.000	0.000
37	Bandia Nalla	Medium	0.000	0.000
38	Banjar	Medium	0.000	0.000
39	Baramandal	Medium	0.000	0.000
40	Barchar	Medium	0.000	0.000
41	Bargoor	Medium	0.000	0.000
42	Barnoo	Medium	0.000	0.000
43	Barodia	Medium	0.000	0.000
44	Benisagar	Medium	0.000	0.000
45	Bhainsakhedi	Medium	0.000	0.000
46	Bhainswar	Medium	0.000	0.000
47	Bhitrigarh	Medium	0.000	0.000
48	Bichhiya	Medium	0.000	0.000
49	Bijna	Medium	0.000	0.000
51	Bisandha	Medium	0.000	0.000
53	Bori Tank	Medium	0.000	0.000
54	Budhna Nalla	Medium	0.000	0.000
55	Bundala	Medium	0.000	0.000
56	Chandora	Medium	0.000	0.000
57	Chandrakeshar	Medium	0.000	0.000
58	Chappi	Medium	0.000	0.000
59	Chawarpani	Medium	0.000	0.000
60	Chhich Bund	Medium	0.000	0.000
61	Chillar	Medium	0.000	0.000
62	Choral	Medium	0.000	0.000
63	Chorborali	Medium	0.000	0.000
64	Dejladewada	Medium	0.000	0.000
65	Deroli	Medium	0.000	0.000
66	Devendranagar	Medium	0.000	0.000
67	Dholawad	Medium	0.000	0.000
68	Dhuandhar	Medium	0.000	0.000
69	Doraha	Medium	0.000	0.000
70	Dukrikheda	Medium	0.000	0.000
71	Gangulpara	Medium	0.000	0.000
72	Ghorapachar	Medium	0.000	0.000
73	Gopad Lift	Medium	0.000	0.000
74	Gopalpura	Medium	0.000	0.000

Code	Command name	Type	Waterlogged area (Th ha)	Salt affected area (Th ha)
75	Govindgarh	Medium	0.000	0.000
76	Gulabpura	Medium	0.000	0.000
77	Gurma nalla	Medium	0.000	0.000
78	Hathai Kheda	Medium	0.000	0.000
79	Jabera	Medium	0.000	0.000
80	Jalgaon	Medium	0.000	0.000
81	Jamni RBC	Medium	0.000	0.000
82	Jamunia	Medium	0.000	0.000
83	Jarmora	Medium	0.000	0.000
84	Jhirgiri	Medium	0.000	0.000
85	Johilla	Medium	0.000	0.000
86	Kaliasote	Medium	0.000	0.000
87	Kalisarar	Medium	0.000	0.000
88	Kanchan	Medium	0.000	0.000
89	Kanhargaon	Medium	0.000	0.000
90	Kazikhedi	Medium	0.000	0.000
91	Kerwan	Medium	0.000	0.000
92	Kethan	Medium	0.000	0.000
93	Kharadi Tank	Medium	0.000	0.000
94	Koncha	Medium	0.000	0.000
95	Kulgarhi	Medium	0.000	0.000
96	Kunda	Medium	0.000	0.000
97	Kunwar Chain Sagar (Dudhi)	Medium	0.000	0.000
98	Kunwari Lift	Medium	0.000	0.000
99	Lakhunder	Medium	0.000	0.000
100	Lillji	Medium	0.000	0.000
101	Machak Distributary	Medium	0.000	0.000
102	Madai	Medium	0.000	0.000
103	Mahuar	Medium	0.000	0.000
104	Majhgaon	Medium	0.000	0.000
105	Makroda	Medium	0.000	0.000
106	Mala Tank	Medium	0.000	0.000
107	Mansurwari	Medium	0.000	0.000
108	Marhi	Medium	0.000	0.000
109	Matiyari	Medium	0.000	0.000
110	Mehgaontola	Medium	0.000	0.000
111	Mehroi	Medium	0.000	0.000
112	Modsagar	Medium	0.000	0.000
113	Mola	Medium	0.000	0.000
114	Morwan	Medium	0.000	0.000
115	Murrum Nalla	Medium	0.000	0.000
116	Nagda Nalla	Medium	0.000	0.000
117	Nahlesara	Medium	0.000	0.000
118	Naktara	Medium	0.000	0.000
119	Nandanwara	Medium	0.000	0.000
120	Naren	Medium	0.000	0.000
121	Pagara Dam	Medium	0.000	0.000
122	Pampavati	Medium	0.000	0.000
123	Paras	Medium	0.000	0.000
124	Paronch	Medium	0.000	0.000
125	Pipliakumar	Medium	0.000	0.000
126	Rampurakhurd	Medium	0.000	0.000
127	Roomal Tank	Medium	0.000	0.000
128	Sagar	Medium	0.000	0.000
129	Sagar Nadi	Medium	0.000	0.000
130	Sahibkhedi	Medium	0.000	0.000
131	Sakalda	Medium	0.000	0.000
132	Sampana	Medium	0.000	0.000
133	Sanjay Sagar (Gomukh)	Medium	0.000	0.000
134	Sarathi	Medium	0.000	0.000
135	Satak	Medium	0.000	0.000
136	Segwal	Medium	0.000	0.000
137	Shamsherpura	Medium	0.000	0.000
138	Shivgarh Bhadli	Medium	0.000	0.000
139	Sonkhedi	Medium	0.000	0.000
140	Tillar	Medium	0.000	0.000
141	Umrar	Medium	0.000	0.000
142	Upper Beda	Medium	0.000	0.000
143	Uri Bagh	Medium	0.000	0.000

Code	Command name	Type	Waterlogged area (Th ha)	Salt affected area (Th ha)
	Waghya Nalla	Medium	0.000	0.000
	TOTAL		**0.543**	**4.410**

Distribution of Major and Medium Irrigation Commands in Madhya Pradesh



1 Major comamnd areas with code

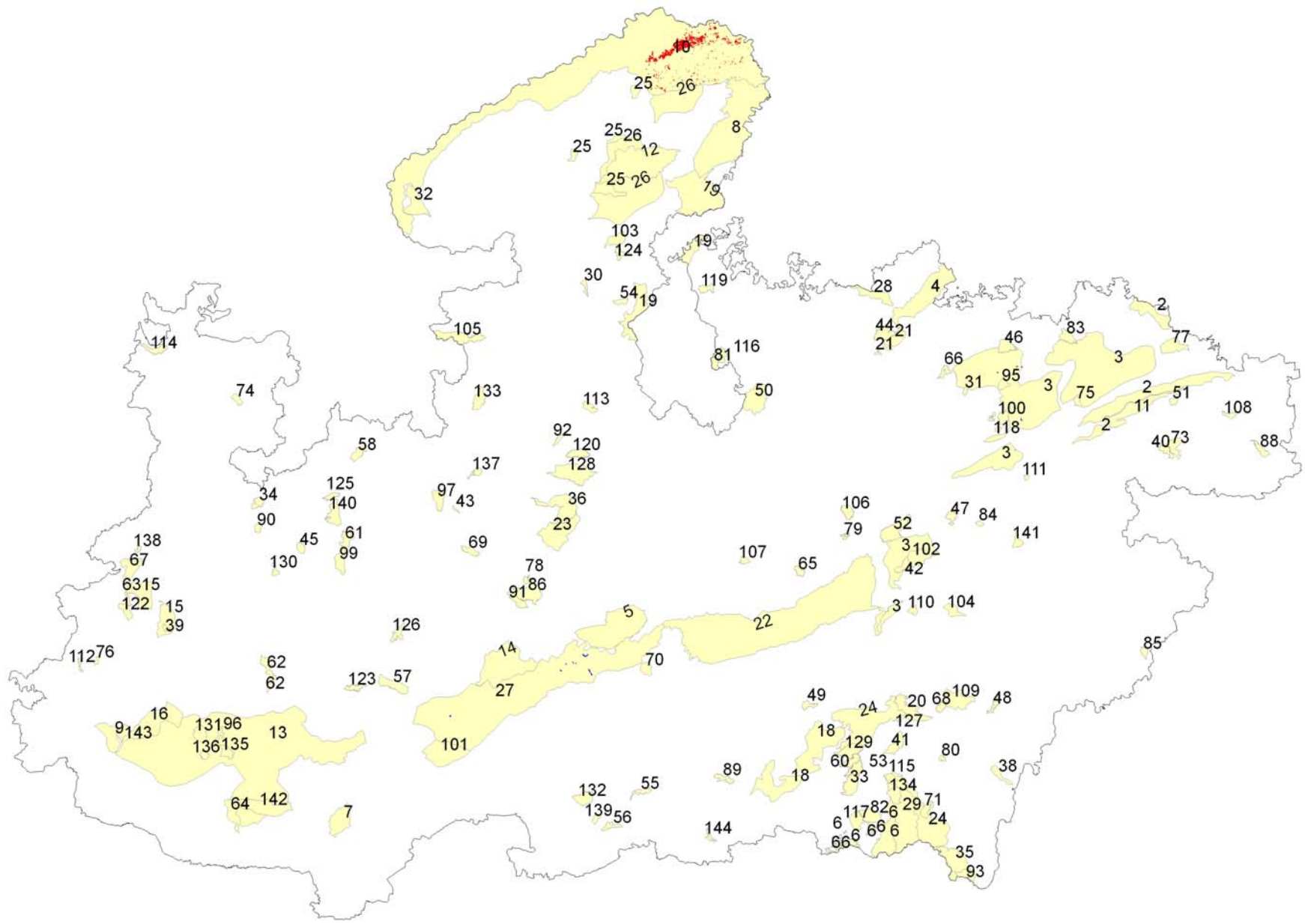
31 Medium comamnd areas with code

0 35 70 140 210 280 Kms

MP - Map No 2

Source: WRD, Madhya Pradesh

Waterlogged and Salt Affected Areas in the Commands of All Major and Medium Irrigation Projects of Madhya Pradesh Using Satellite Remote Sensing



Salt Affected Area
Waterlogged Area
Command Area

0 37.5 75 150 225 300 Kms

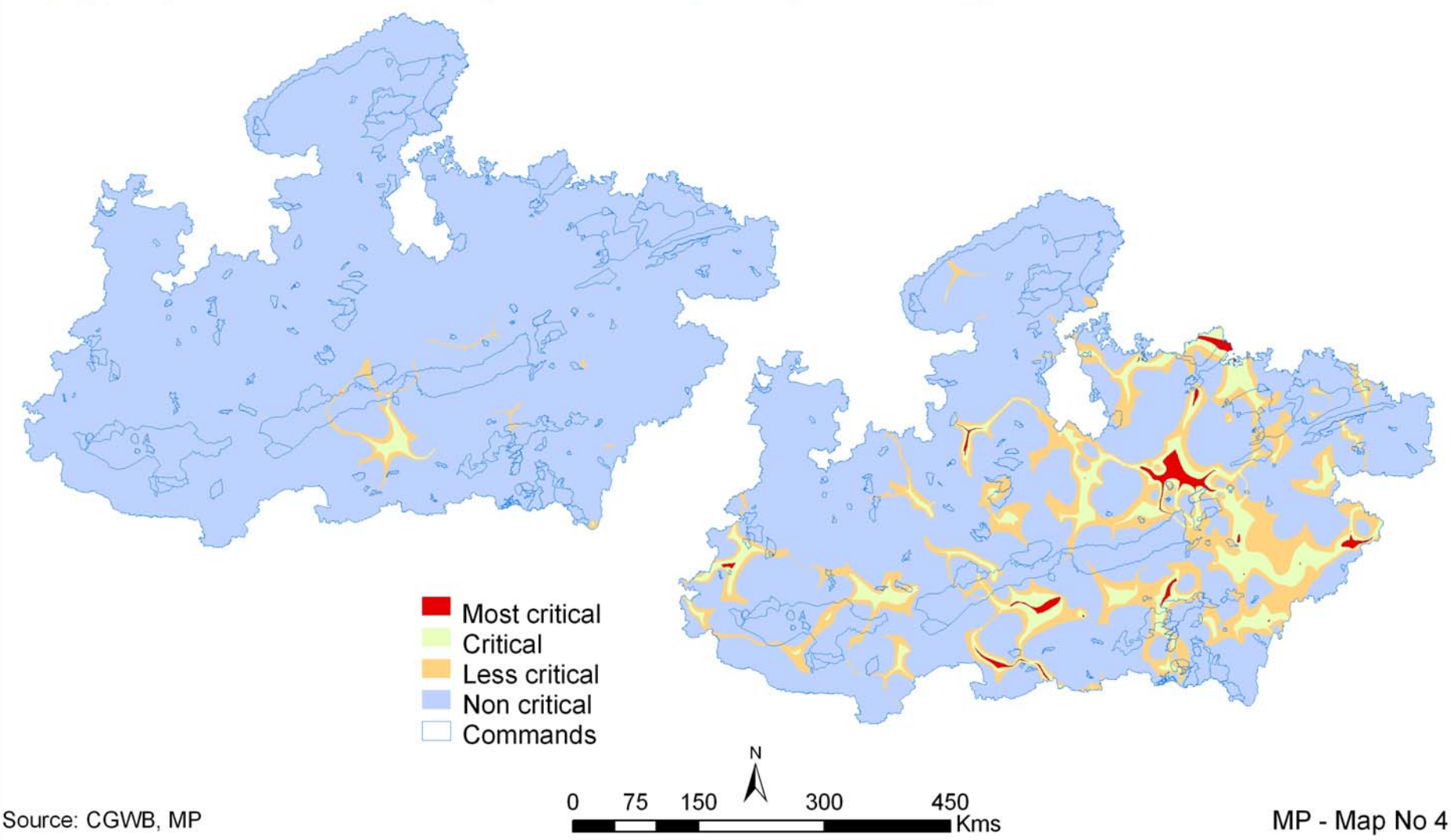
MP - Map No 3

Source: RRSSC/ISRO Jodhpur

For demarcation of critical waterlogged areas due to rise in water table depth, ground water table data of monitoring stations of CGWB were used. Table 3 and Map 4 show the critical area of depth of ground water for pre (May, 2004) and post (November, 2003) monsoon.

Table 3: Critical Area of Depth of Ground Water for Pre (May, 2004) and Post (November, 2003) Monsoon

	Most critical (< 1m)		Critical (1 – 2 m)		Less critical (2 – 3 m)		Non-critical (> 3 m)	
	(Th ha)	(%)	(Th ha)	(%)	(Th ha)	(%)	(Th ha)	(%)
Pre Monsoon (May, 2004)	0.000	0.00	0.875	0.02	36.211	0.74	4825.802	99.24
Post Monsoon (November, 2003)	15.031	0.31	154.101	3.17	588.038	12.09	4105.718	84.43



Project Team

Smt. Rajashree V. Bothale (PI), RRSSC, Jodhpur
Shri S.K. Singh, CWC, New Delhi
Shri Jamalaiah, CWC, New Delhi

Soil Sample Collection and Analysis support by ITAC, Jodhpur

Acknowledgements

Shri P K Tiwari, Engineer in Chief, WRD, Madhya Pradesh
Chief Engineer, Chambal Betwa, WRD, Bhopal
Chief Engineer, Dhasan Ken, WRD, Sagar
Chief Engineer, Ganga Basin, WRD, Rewa
Chief Engineer, Narmada Tapti Basin, WRD, Indore
Chief Engineer, O & M, WRD, Bhopal
Chief Engineer, Wainganga Basin, WRD, Seoni
Chief Engineer, Yamuna Basin, WRD, Gwalior
Shri S P Kakran, Chief Engineer (NBO), CWC, Bhopal
Regional Director, North Central Region, CGWB, Bhopal
Shri Manikant Sharma, Superintending Engineer (Monitoring), WRD, Bhopal
Superintending Engineer (D), WRD, Chambal Betwa Basin, Bhopal
Superintending Engineer, O & M, WRD, Bhopal
Superintending Engineer, WRD, Yamuna Basin, Gwalior
Shri Yogesh Paithankar, Deputy Director, CWC, Bhopal,
Executive Engineer (D), Wainganga Basin, WRD, Seoni
Shri B D Baredia, Executive Engineer, WRD, Gohad, Gwalior,
Executive Engineer, WRD, Ratlam
Assistant Engineer, WRD, Balaghat
Assistant Engineer, WRD, Shivpuri
Shri R S Raghuwanshi, SDO, WRD, Itarsi Division,
Shri P C Mehto, SDO, WRD, Teghara District Sub Division