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Agrisearch with a human touch

Land Resource and Hydrological Inventory of Kavalur Sub-watershed for Watershed Planning and Development Koppal Taluk, Koppal District, Karnataka (AESR 3.0)

Sujala – III
Karnataka Watershed Development Project- II
Funded by World Bank

ICAR - NBSS & LUP

THE WORLD BANK

ICAR - National Bureau of Soil Survey and Land Use Planning, Bangalore
Watershed Development Department, Govt. of Karnataka, Bangalore

About ICAR - NBSS&LUP

The National Bureau of Soil Survey and Land Use Planning (ICAR-NBSS&LUP), Nagpur, a premier Institute of the Indian Council of Agricultural Research (ICAR), was set up during 1976 with the objective to prepare soil resource maps at national, state and district levels and to provide research inputs in soil resource mapping and its applications, land evaluation, land use planning, land resource management, and database management using GIS for optimizing land use on different kinds of soils in the country.

The Bureau has been engaged in carrying out soil resource survey, agro-ecological and soil degradation mapping at the country, state and district levels for qualitative assessment and monitoring the soil health towards viable land use planning. The research activities have resulted in identifying the soil potentials and problems, and the various applications of the soil surveys with the ultimate objective of sustainable agricultural development. The Bureau has the mandate to correlate and classify soils of the country and maintain a National Register of all the established soil series. The Institute is also imparting in-service training to staff of the soil survey agencies in the area of soil survey, land evaluation and soil survey interpretations for land use planning. The Bureau in collaboration with Panjabrao Krishi Vidyapeeth, Akola is running post-graduate teaching and research programme in land resource management, leading to M.Sc. and Ph.D. degrees.

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PART-A

Land Resource Inventory of Kavalur Sub-watershed for Watershed Planning and Development

Koppal Taluk, Koppal District Karnataka (AESR 3.0)

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How to read and use the Atlas

The Land Resource Inventory of Kavalur Sub-watershed (Koppal Taluk, Koppal District) for Watershed Planning (AESR 3.0) was undertaken to provide comprehensive site- specific cadastral level information useful for farm level planning and integrated development of the area under Sujala – III, Karnataka Watershed Development Project- II.

This atlas contains the basic information on kinds of soils, their geographic distribution, characteristics and classification. The soil map and soil based thematic maps derived from soils data on soil depth, soil gravelliness, slope, land suitability for various crops and land use management maps are presented on 1:12,500 scale. The maps of fertility status (soil reaction, organic carbon, available phosphorus, available potassium, available sulphur, available calcium, available copper, available manganese, available zinc, available iron, available boron and salinity (EC) on 1:12,500 scale were derived from grid point sampling of the surface soils from the watersheds.

The atlas illustrates maps and tables that depict the soil resources of the watershed and the need for their sustainable management.

The user, depending on his/her requirement, can refer this atlas first by identifying his/her field and survey number on the village soil map and by referring the soil legend which is provided in tabular form after the soil map for details pertaining to his/her area of interest.

The atlas explains in simple terms the different kinds of soils present in the watershed, their potentials and problems through a series of thematic maps that help to develop site-specific plans as well as the need to conserve and manage this increasingly threatened natural resource through sustainable land use management. The Land Resource Atlas contains database collected at land parcel/ survey number level on soils, climate, water, vegetation, crops and cropping patterns, socio-economic conditions, marketing facilities *etc.* helps in identifying soil and water conservation measures required, suitability for crops and other uses and finally for preparing a viable and sustainable land use options for each and every land parcel.

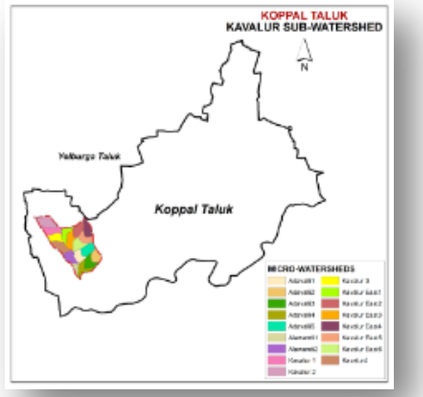
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

Physical, Cultural and Scientific symbols used in the Atlas

Each map in the atlas sheet is complemented with the physical, cultural and scientific symbols to facilitate easy map reading.

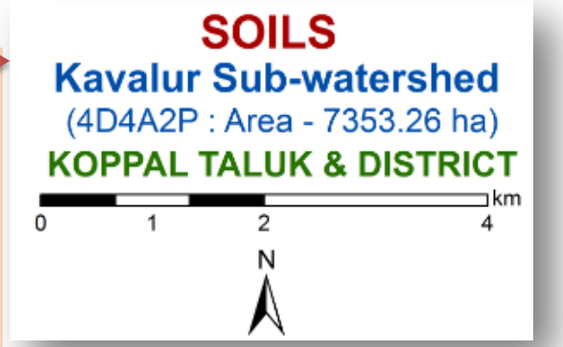
Inset map

Inset provided in each map conveys its strategic location i.e. Taluk, Sub-watershed and Sub-watershed.



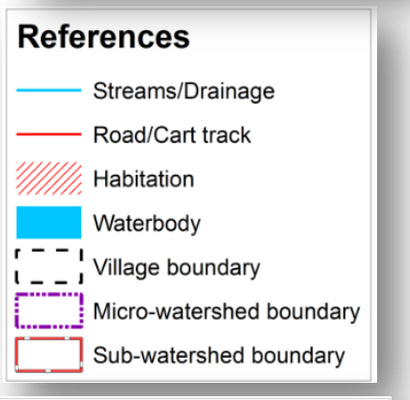
Map title

Map title conveys the relevance of thematic information presented along with a graphical scale, geographical location and watershed details in text form.



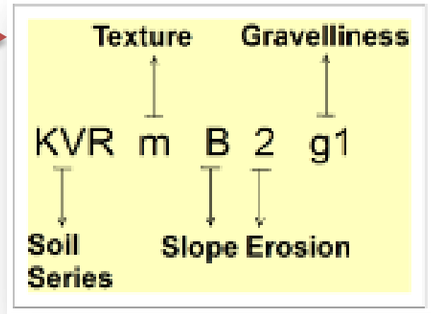
Legends and symbols

*Two legends accompany each map, a **map reference**, which depicts geographic features and a **thematic legend** which portrays spatial information. Picking up the symbol and colour of a particular enables one to go to the legends to obtain the required information.*



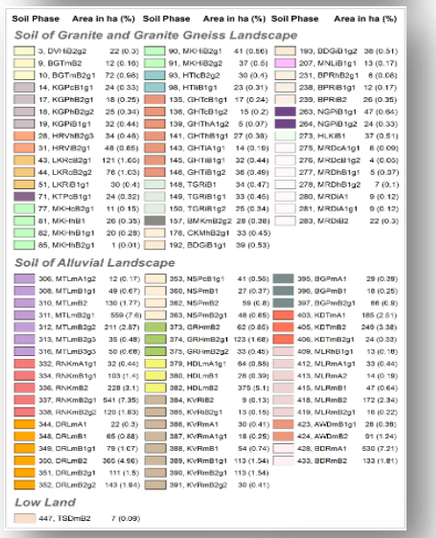
Soil Units

The soil map may be read at different levels. The most detailed level is that of the soil phase. Soil phases are distinguished within soil series mainly based on differences in surface of soil texture, slope, gravelliness , erosion ,etc.



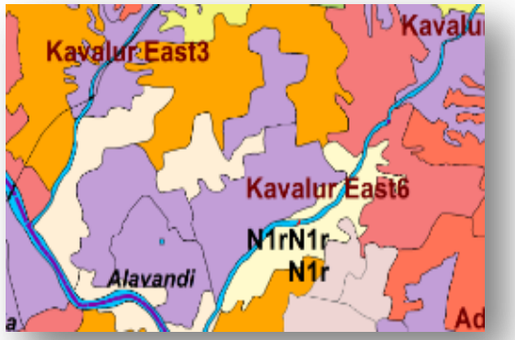
Map colours

Different shades of colours are used as an aid to distinguish the different classes of soils, crop suitability and other maps.



Soil and plot boundaries

Soil units shown on the map are represented by both the color and a numeral. The soil boundaries are superimposed on land parcel with revenue survey number boundaries to visualize its spatial extent.

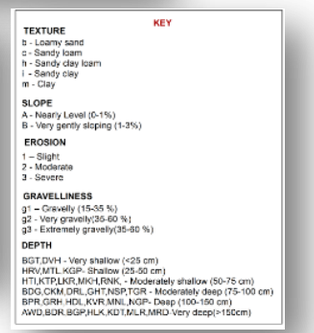


Map key

There are many thematic types to be differentiated on the map solely based on colour. Therefore soils and suitability types and their limitations are distinguished by colours with a combination of alpha-numeric characters.

Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
z- excess salt/calcareousness



1. Introduction

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use land in a rational and judicious manner. But what is happening in many areas of the state is a cause for concern to anyone involved in the management of land resources at the grassroots level. In India the area available for agriculture is about 51 per cent of the total area and more than 60 per cent of the people are still relying on agriculture for their livelihood. The limited land area is under severe stress and strain due to increasing population pressure and competing demands of various land uses. Due to this, every year there is a significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest for farming among the farmers in many areas, large tracts of cultivable lands are turning into fallows and this trend is continuing at an alarming rate.

The watershed management programs are aimed at designing suitable soil and water conservation measures, productivity enhancement of existing crops, crop diversification with horticultural species, greening the wastelands with forestry species of multiple uses and improving the livelihood opportunities for landless people.

The objectives can be met to a great extent when an appropriate Natural Resources Management (NRM) plan is prepared and implemented. It is essential to have site specific Land Resources Inventory (LRI) indicating the potentials and constraints for developing such a site specific plan. LRI can be obtained by carrying out detailed characterization and mapping of all the existing land resources like soils, climate, water, minerals and rocks, vegetation, crops, land use pattern, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed to the farmer and other land users of the area.

The major landforms identified in the Sub-watershed are uplands and low lands. The database was generated by using cadastral map of the village as a base along with high resolution satellite imagery (IRS LISS IV and Cartosat-1). The objectives of the land resource survey, carried out in the Kavalur Sub-watershed covering an area of 7353.26 ha are indicated below.

- Detailed characterization of all the land resources like soil, water, land use, cropping pattern and other resources available at parcel level in the village.
- Delineation of homogenous areas based on soil-site characteristics into management units.
- Collection and interpretation of climatic and agronomical data for crop planning.
- Identification of problems and potentials of the area and strategies for their management.
- Assessment of the suitability of land resources for various crops and other uses.
- Establishment of village level digital land resources database in a GIS framework.
- Enable the watershed and other line departments to prepare an action plan for the integrated development of the watershed.

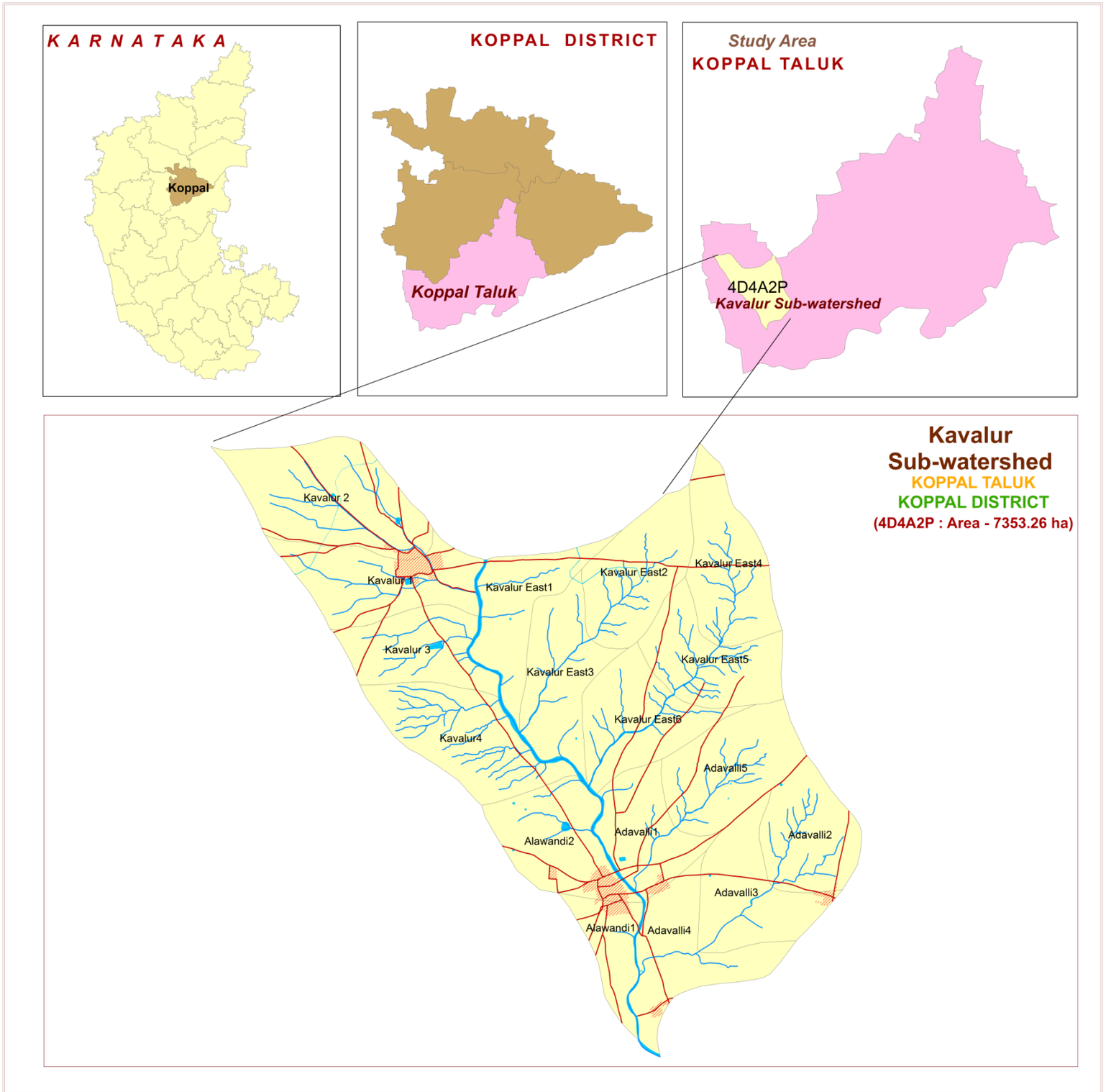
2. General Description of Sub-watershed

The Koppal district came to existence on 1st April 1998 by carving out of erst-while Raichur district of Karnataka with a geographical area of 552495 ha out of which forest area is 29451 ha, located in the northern part of the state. It lies between north latitudes 15˚09′ and 16˚ 01′ and east longitudes 75˚ 46′ and 76˚ 48′. The area falls in the Tungabhadra sub-basin of the Krishna basin. Tungabhadra river flows in the southern boundary of the district in north – easterly direction. The climate of the district is very hot and dry. The district has an average annual rainfall of 572 mm. Soils are well drained red sandy loam to medium deep black soils. This may be the weathering product of schistose, gneissic and granite terrain. Agriculture in Koppal district is dependent upon rainfall, irrigation tanks, wells, streams etc. The major agricultural crops grown are Jawar, Bajra, Wheat, Maize, Paddy, Horsegram, Greengram, Cowpea, Groundnut, Cotton, Niger seeds, Castor, Sunflower, Sugarcane etc. The major fruit crops include Pomegranates, Mango, Sapota, Citrus, Guava, Papaya. The major vegetable crops are leafy vegetables, Tomato, Onion, Brinjal *etc*.

As a pilot study, **ICAR-NBSS&LUP, Bangalore** carried out the generation of LRI for the Kavalur Sub-watershed in Koppal taluk, Koppal district. It was selected for data base generation under Sujala III project. Kavalur Sub-watershed (code - 4D4A2P) is covering an area of 7353.26 ha and spread across Kavalura, Alavandi, Kampli,Byrapura, Gattareddyhala, Marammanahalli and Betageri villages.

LOCATION AND EXTENT

LOCATION MAP OF KAVALUR SUB-WATERSHED

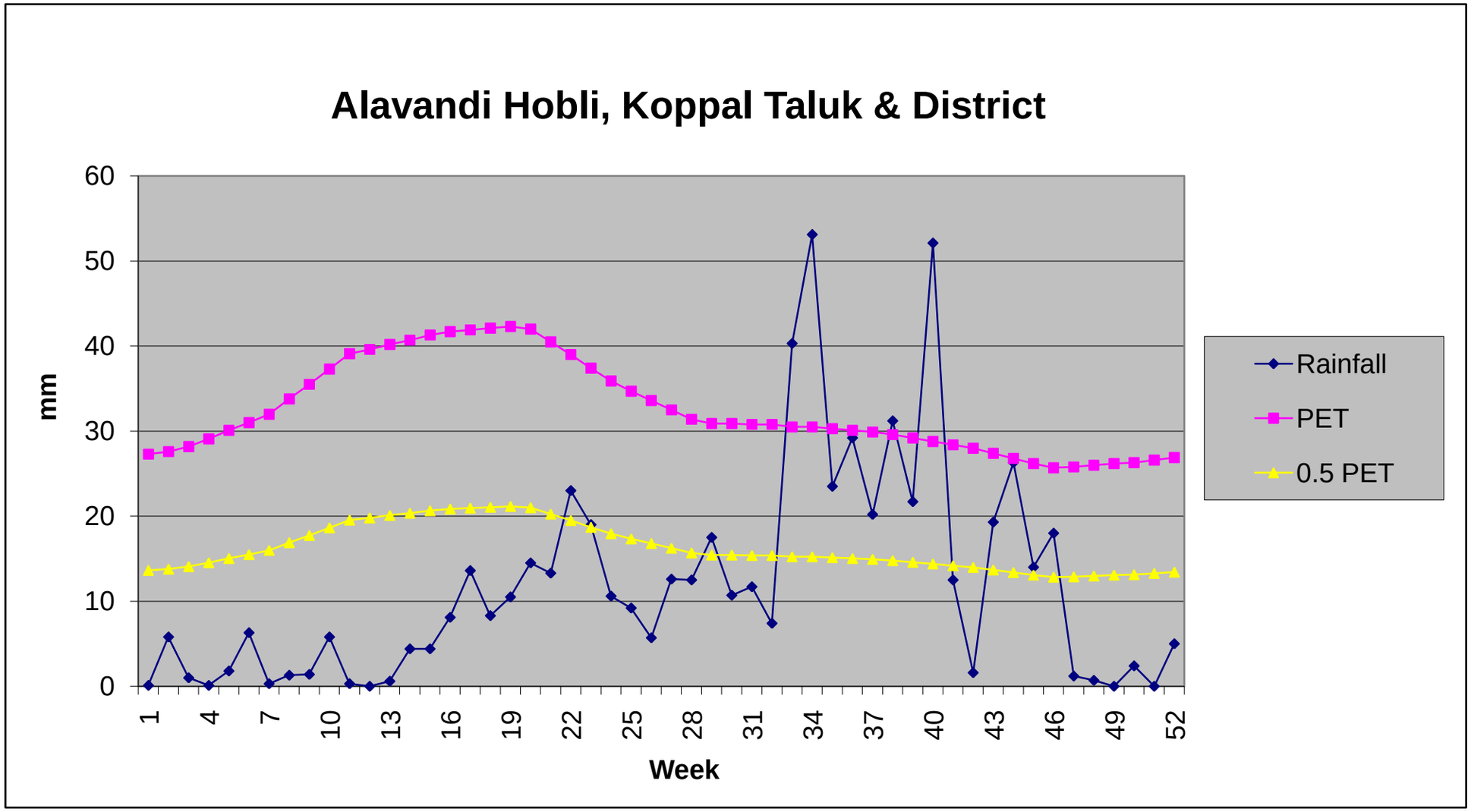


The Kavalur Sub-watershed (Koppal taluk, Koppal district) is located in between 15^0 11' – 15^0 18' North latitudes and 75^0 54' – 76^0 01' East longitudes, covering an area of about 7353.26 ha. bounded by across Kavalura, Alavandi, Kampli,Byrapura, Gattareddyhala, Marammanahalli and Betageri villages.

Agro Ecological Region (AER) – 3: (Deccan plateau, hot arid ecosubregion)
Karnataka Plateau (Rayalseema as inclusion), hot arid ESR with deep loamy and clayey mixed Red and Black soils, low to medium AWC and LGP 60-90 days

Agro-climatic Zone 3: Northern Dry Zone:
This zone is the largest in the state with a geographical area of 5.04 M ha, of which about 3.55 M ha is under cultivation. Irrigation is available to about 0.49 M ha. The zone encompasses the entire districts of Bijapur and Bellary, 6 taluks of Koppal, 5 taluks of Dharwad and 5 taluks of Belgaum. Of the 35 taluks in the zone, 9 taluks have a mean elevation of 800-900 m MSL while the rest have an elevation of 450-800 m. The rainfall is similar to that of the northeastern dry zone, ranging between 465 and 785 mm. Black soils are predominant in the zone with depth ranging from shallow to deep. General cropping season is *kharif* in shallow black soils and *rabi* in medium and deep black soils. Important crops of the zone are jowar, maize, bajra, groundnut, pulses, sunflower, cotton and sugarcane.

Climate

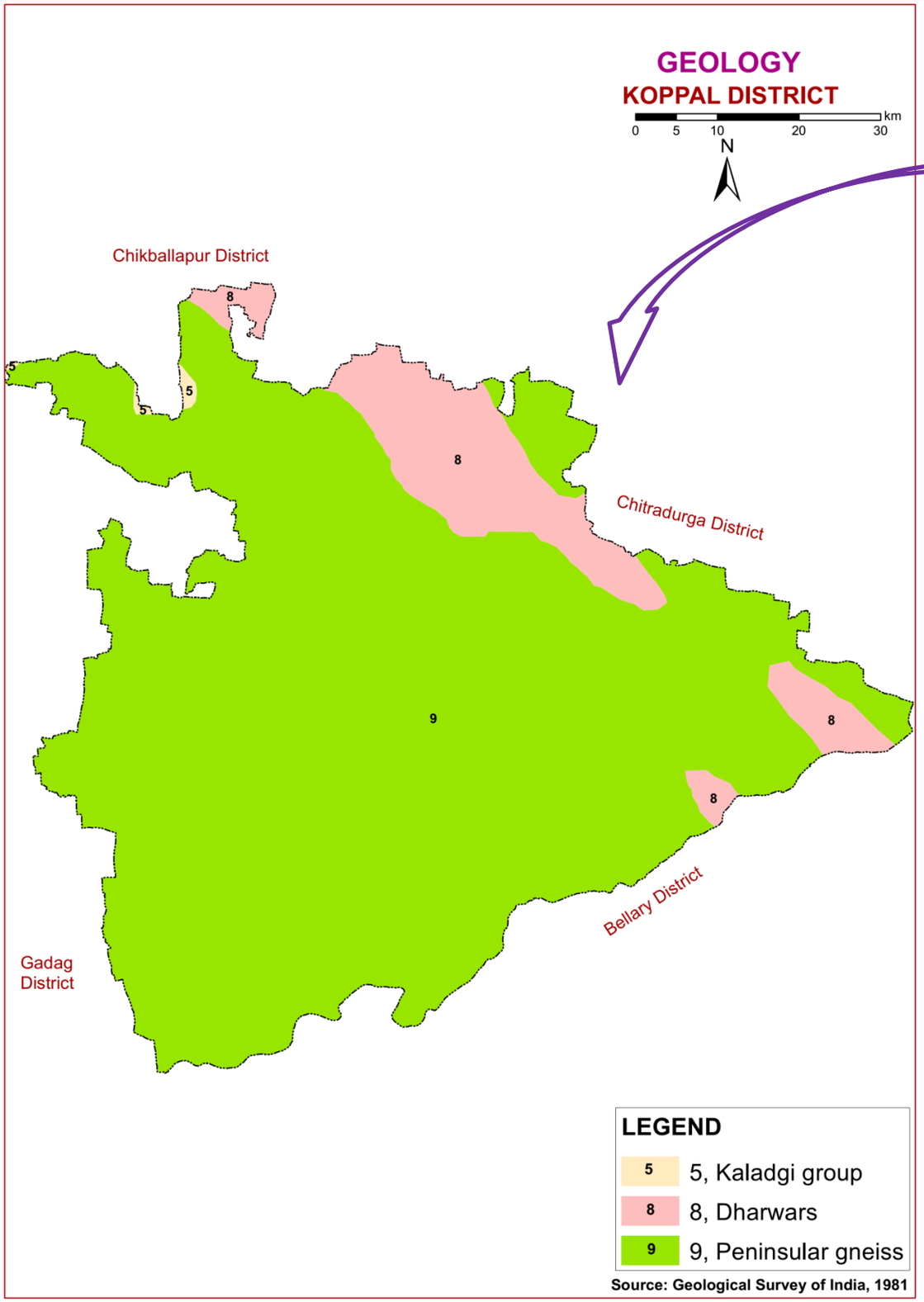


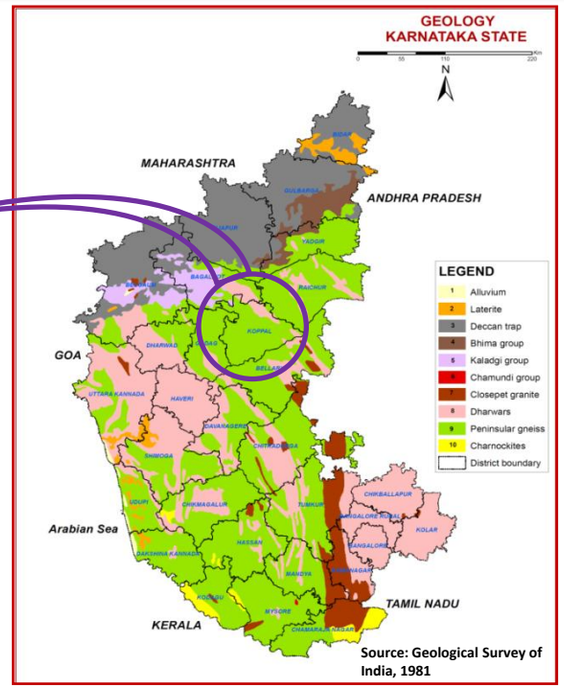
Length of Growing Period (LGP) is varying from August 2nd week to 2nd week of November (< 90 days)

Annual Rainfall : 614 mm. in the Alavandi Hobli, Koppal Taluk & District

Source: KSNMDC (1980-2011)

Geology





GEOLOGY - KARNATAKA STATE

Karnataka forms part of the Peninsular Shield, which is an ancient stable block of the earth's crust. The shield is composed of geologically ancient rocks of diverse origin. These rocks have undergone various degrees of metamorphism and crushing. Overlying these ancient rocks are Proterozoic, lete Creteceous to Palaeocene, Palaeocene to Recent, and Recent sediments.

In the stratigraphic succession of rocks in Karnataka the Archaean group is the oldest, followed by Proterozoic, Mesozoic and Cainozoic formations.

GEOLOGY - KOPPAL DISTRICT

Kaladgi group

It consists of nearly horizontal sedimentary rocks 3000 to 5000m thick overlying the Archaeans. The component rocks are sandstones, shales, limestone, dolomite and schists.

Dharwar schists

The Dharwar schists consist of a complex series of crystalline schists associated with ultrabasic rocks such as amphibolite, peridotites and dunites. These schists are found in long, narrow bands of various dimensions running NW-SE through the Peninsular Gneiss. The Dharwars are divided into Upper and Lower.

Upper Dharwars are equivalent to the Archaean to Lower Proterozoic, and are divided into Bababudan (comprises banded ferruginous quartzites, pyroxenite, gabbro, serpentinite, acid volcanic, phyllites, metabasalt, and quartz-chlorite schist) and Chitradurga groups (includes quartzite, limestone, dolomite, chlorite-schist, and manganese and iron ores with phyllite, metabasalt and conglomerates).

Lower Dharwars occur in Mysore district and include amphibolite schist, quartzite, ironstone and marble.

Peninsular Gneiss

Exposed over a large area of Karnataka in all the districts except Bidar is the Peninsular Gneiss which is a heterogeneous mixture of several types of granitic rocks such as banded gneisses, granitic gneisses, granites and gneissic granites, granodiorites and diorites. The banded gneisses consist of white bands of quartz-feldspar alternating with dark bands of biotite, hornblende, and minor accessories. The granite group includes granites of all shades with varying composition. Peninsular gneiss seems to have formed by the granitization of the older rocks.

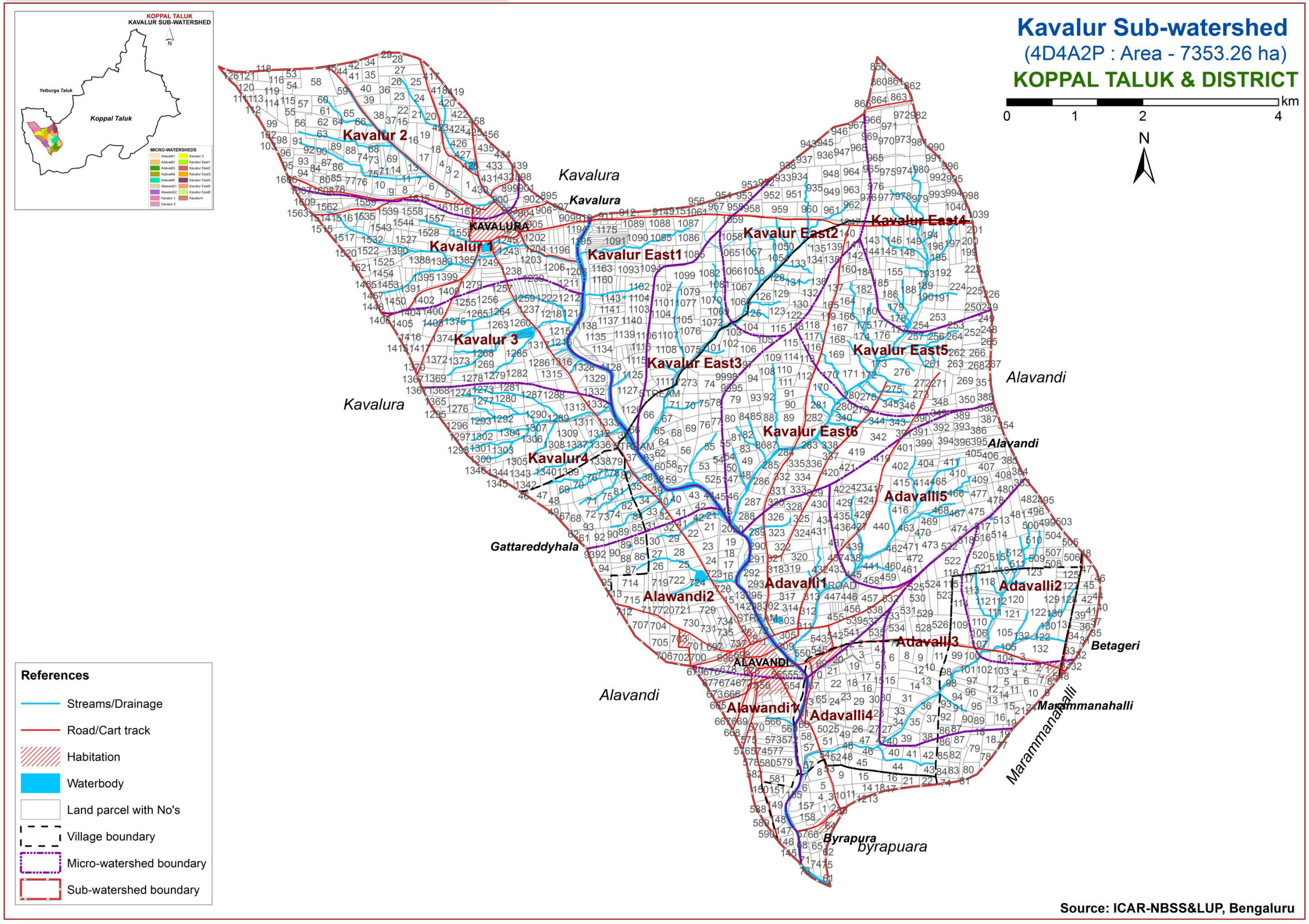
3. SURVEY METHODOLOGY

Sequence of activities in generation of LRI

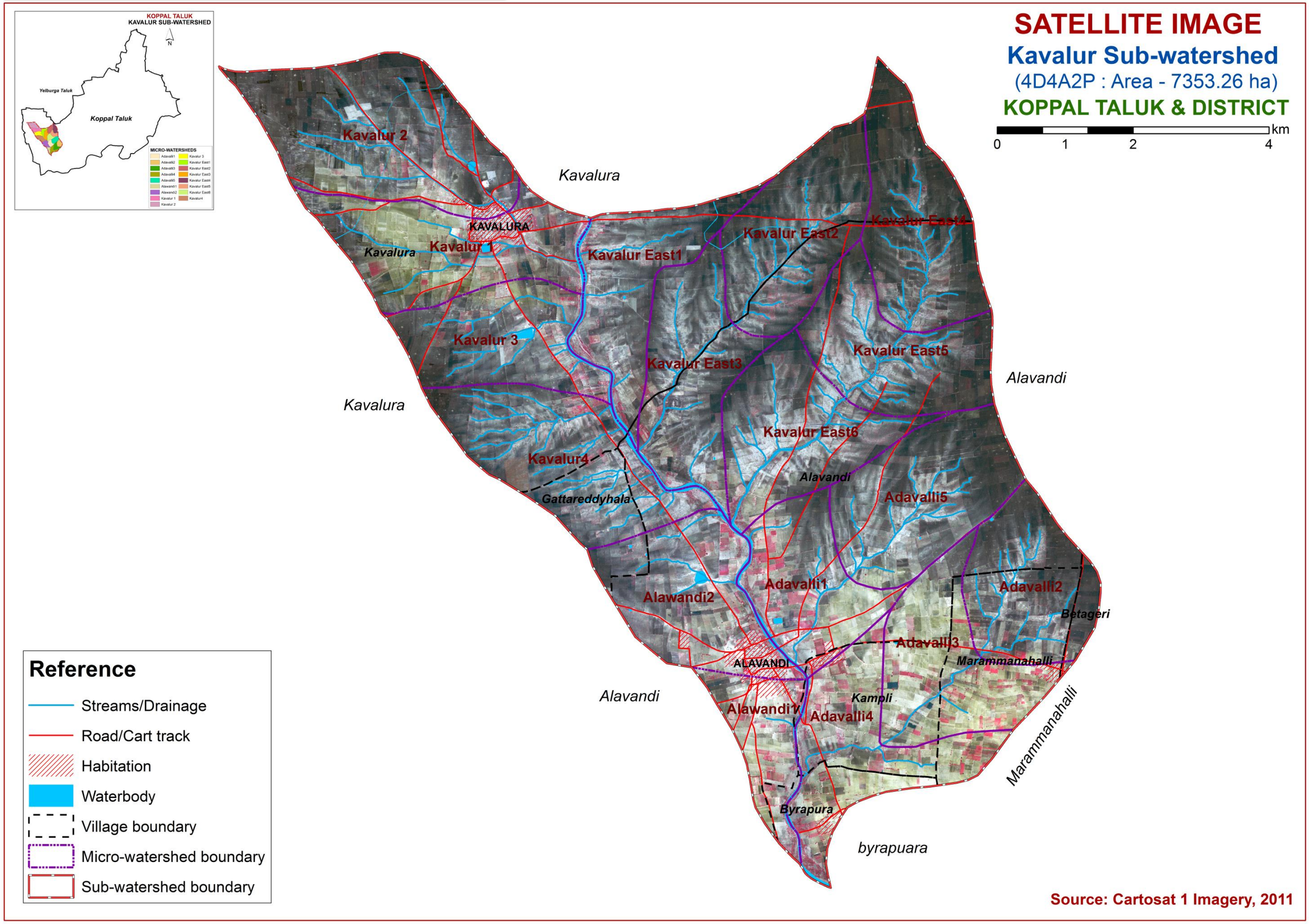
- Traversing the watershed using cadastral maps and imagery as base
- Identifying landforms, geology, land use and other features
- Selecting fields representing land units
- Opening profiles to 2 m depth
- Studying soil and site characteristics
- Grouping similar areas based on their soil-site characteristics into land management units
- Preparation of crop, soil and water conservation plan
- Socio-economic evaluation

The required site and soil characteristics are described and recorded on a standard proforma by following the protocols and guidelines given in the soil survey manual and field guide. Collection of soil samples from representative pedons for laboratory characterization and collection of surface soil samples from selected fields covering most of the management units for macro and micro-nutrient analysis is being carried out (320m grid intervals). Further processing of data at chemical lab and GIS lab are carried out to generate various thematic maps for each of the study area.

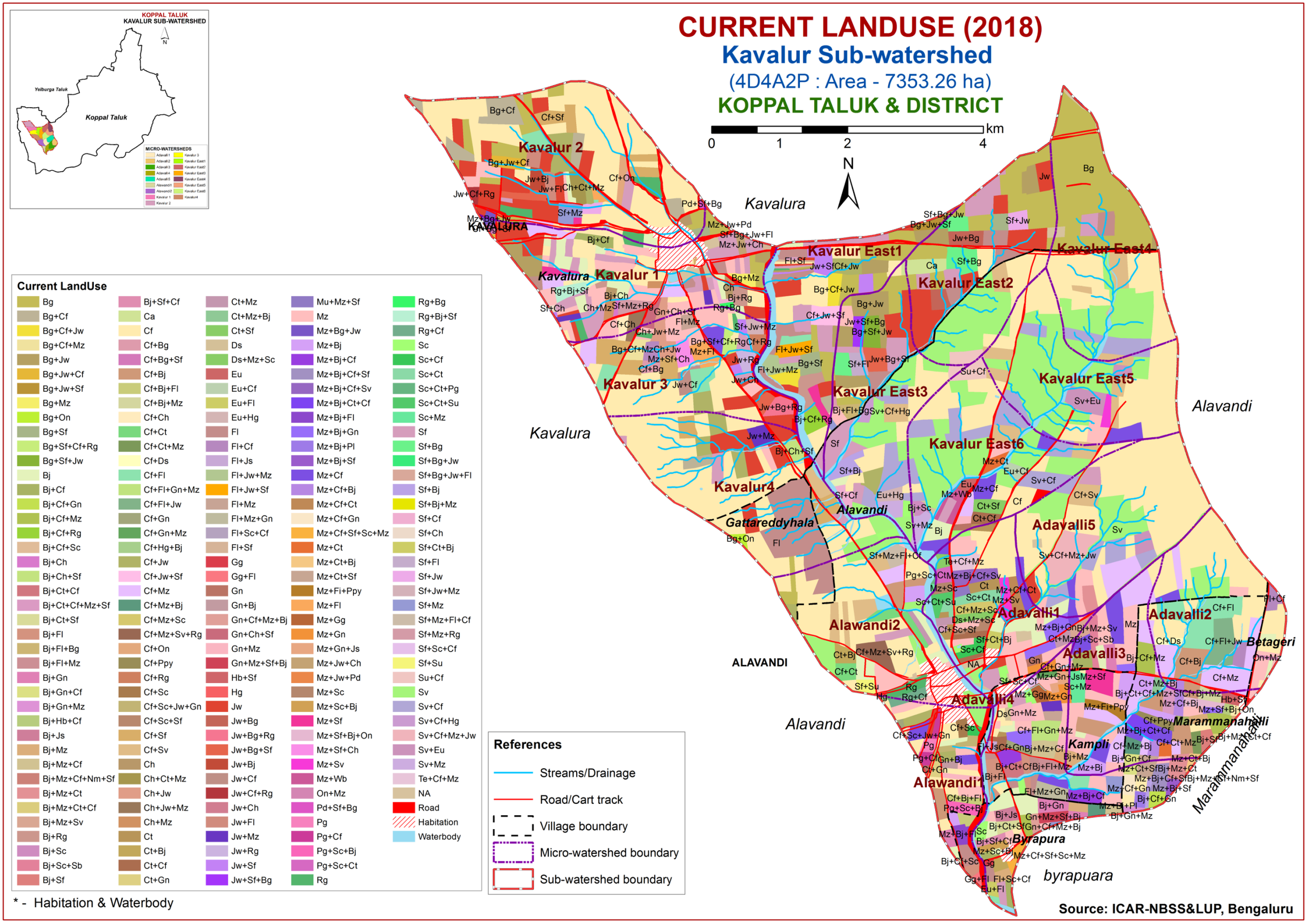
3.1. Database Used - Cadastral map



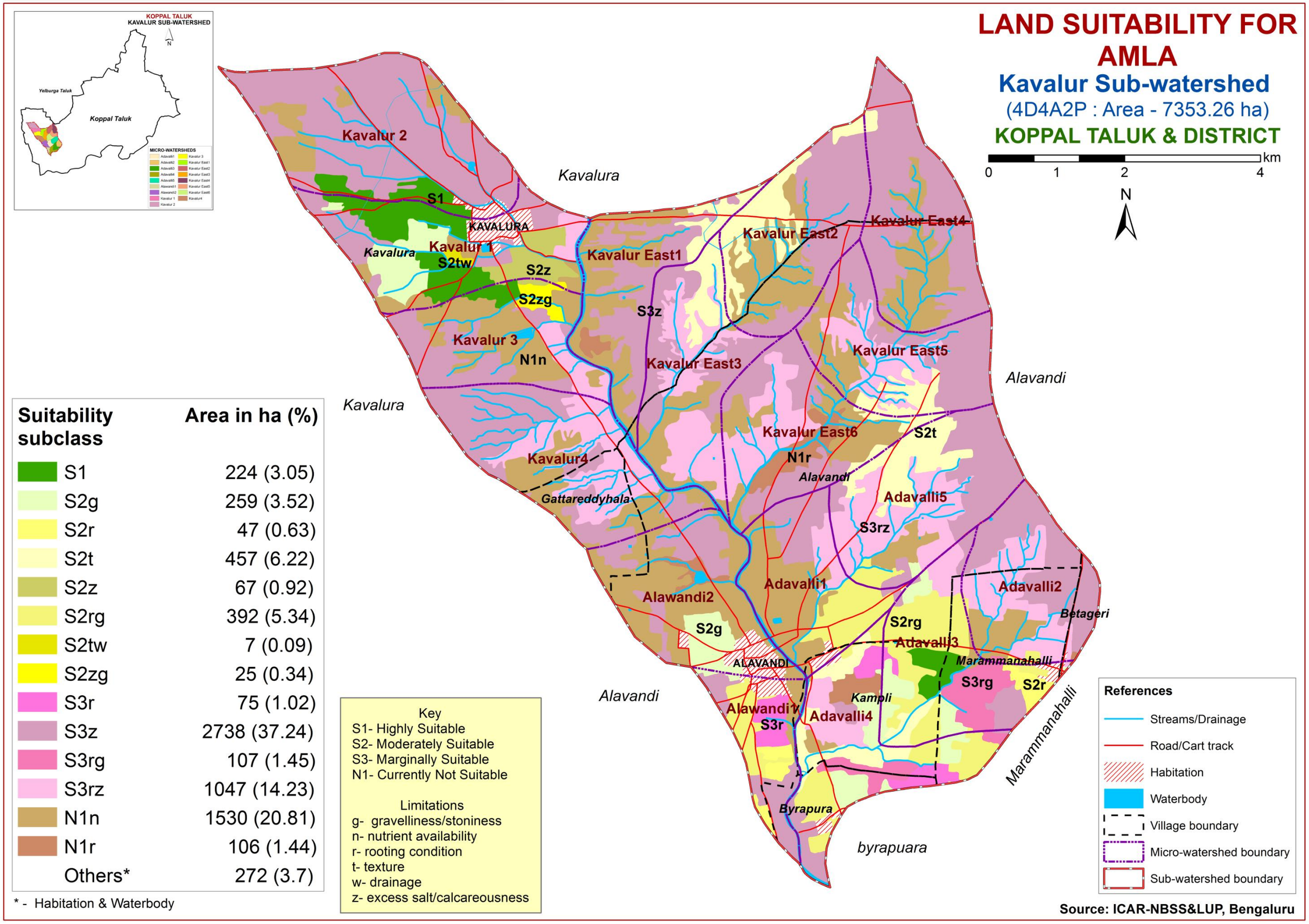
3.2. Database Used - Satellite Image



3.3. Current LandUse



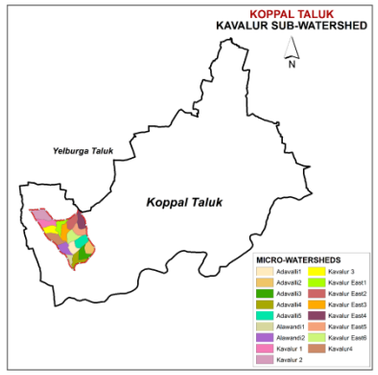
3.4. Location of Wells

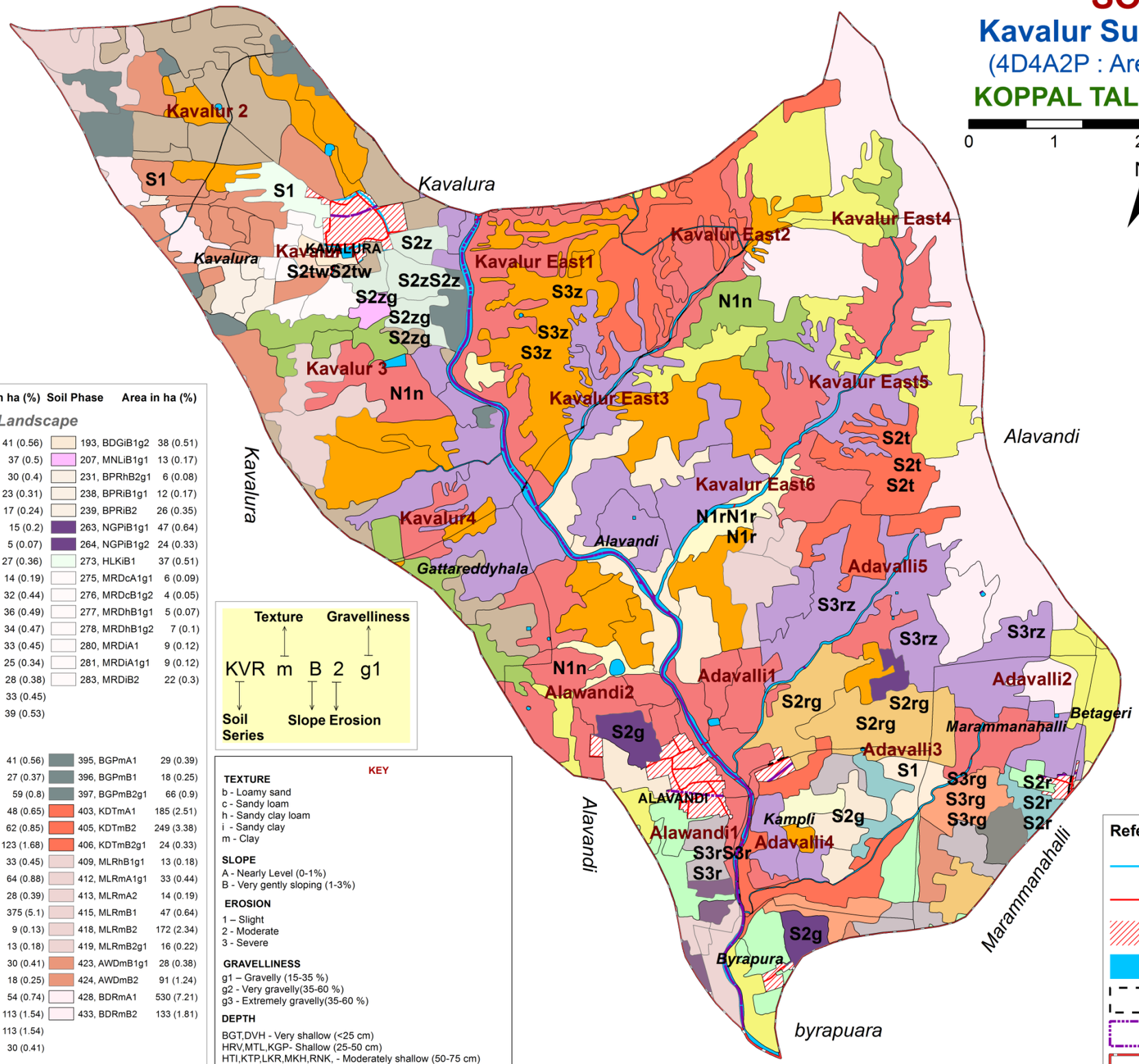


Suitability subclass	Area in ha (%)
S1	224 (3.05)
S2g	259 (3.52)
S2r	47 (0.63)
S2t	457 (6.22)
S2z	67 (0.92)
S2rg	392 (5.34)
S2tw	7 (0.09)
S2zg	25 (0.34)
S3r	75 (1.02)
S3z	2738 (37.24)
S3rg	107 (1.45)
S3rz	1047 (14.23)
N1n	1530 (20.81)
N1r	106 (1.44)
Others*	272 (3.7)

* - Habitation & Waterbody

4. The Soils





Soil Phase	Area in ha (%)	Soil Phase	Area in ha (%)	Soil Phase	Area in ha (%)
Soil of Granite and Granite Gneiss Landscape					
3, DVHiB2g2	22 (0.3)	90, MKHiB2g1	41 (0.56)	193, BDGiB1g2	38 (0.51)
9, BGTmB2	12 (0.16)	91, MKHiB2g2	37 (0.5)	207, MNLiB1g1	13 (0.17)
10, BGTmB2g1	72 (0.98)	93, HTIcB2g2	30 (0.4)	231, BPRhB2g1	6 (0.08)
14, KGPcB1g1	24 (0.33)	98, HTIiB1g1	23 (0.31)	238, BPRiB1g1	12 (0.17)
17, KGPhB2g1	18 (0.25)	135, GHTcB1g1	17 (0.24)	239, BPRiB2	26 (0.35)
18, KGPhB2g2	25 (0.34)	136, GHTcB1g2	15 (0.2)	263, NGPiB1g1	47 (0.64)
19, KGPiB1g1	32 (0.44)	139, GHThA1g2	5 (0.07)	264, NGPiB1g2	24 (0.33)
28, HRVhB2g3	34 (0.46)	141, GHThB1g1	27 (0.36)	273, HLKiB1	37 (0.51)
31, HRViB2g1	48 (0.65)	143, GHTiA1g1	14 (0.19)	275, MRDcA1g1	6 (0.09)
43, LKRcB2g1	121 (1.65)	145, GHTiB1g1	32 (0.44)	276, MRDcB1g2	4 (0.05)
44, LKRcB2g2	76 (1.03)	146, GHTiB1g2	36 (0.49)	277, MRDhB1g1	5 (0.07)
51, LKRiB1g1	30 (0.4)	148, TGRiB1	34 (0.47)	278, MRDhB1g2	7 (0.1)
71, KTPcB1g1	24 (0.32)	149, TGRiB1g1	33 (0.45)	280, MRDiA1	9 (0.12)
77, MKHcB2g1	11 (0.15)	150, TGRiB1g2	25 (0.34)	281, MRDiA1g1	9 (0.12)
81, MKHhB1	26 (0.35)	157, BMKmB2g2	28 (0.38)	283, MRDiB2	22 (0.3)
82, MKHhB1g1	20 (0.28)	176, CKMhB2g1	33 (0.45)		
85, MKHhB2g1	1 (0.01)	192, BDGiB1g1	39 (0.53)		
Soil of Alluvial Landscape					
306, MTLmA1g2	12 (0.17)	353, NSPcB1g1	41 (0.56)	395, BGPmA1	29 (0.39)
308, MTLmB1g1	49 (0.67)	360, NSPmB1	27 (0.37)	396, BGPmB1	18 (0.25)
310, MTLmB2	130 (1.77)	362, NSPmB2	59 (0.8)	397, BGPmB2g1	66 (0.9)
311, MTLmB2g1	559 (7.6)	363, NSPmB2g1	48 (0.65)	403, KDTmA1	185 (2.51)
312, MTLmB2g2	211 (2.87)	373, GRHmB2	62 (0.85)	405, KDTmB2	249 (3.38)
313, MTLmB2g3	35 (0.48)	374, GRHmB2g1	123 (1.68)	406, KDTmB2g1	24 (0.33)
316, MTLmB3g3	50 (0.68)	375, GRHmB2g2	33 (0.45)	409, MLRhB1g1	13 (0.18)
332, RNKmA1g1	32 (0.44)	379, HDLmA1g1	64 (0.88)	412, MLRmA1g1	33 (0.44)
334, RNKmB1g1	103 (1.4)	380, HDLmB1	28 (0.39)	413, MLRmA2	14 (0.19)
336, RNKmB2	228 (3.1)	382, HDLmB2	375 (5.1)	415, MLRmB1	47 (0.64)
337, RNKmB2g1	541 (7.35)	384, KVRiB2	9 (0.13)	418, MLRmB2	172 (2.34)
338, RNKmB2g2	120 (1.63)	385, KVRiB2g1	13 (0.18)	419, MLRmB2g1	16 (0.22)
344, DRLmA1	22 (0.3)	386, KVRmA1	30 (0.41)	423, AWDmB1g1	28 (0.38)
348, DRLmB1	65 (0.88)	387, KVRmA1g1	18 (0.25)	424, AWDmB2	91 (1.24)
349, DRLmB1g1	79 (1.07)	388, KVRmB1	54 (0.74)	428, BDRmA1	530 (7.21)
350, DRLmB2	365 (4.96)	389, KVRmB1g1	113 (1.54)	433, BDRmB2	133 (1.81)
351, DRLmB2g1	111 (1.5)	390, KVRmB2g1	113 (1.54)		
352, DRLmB2g2	143 (1.94)	391, KVRmB2g2	30 (0.41)		
Low Land					
447, TSDmB2	7 (0.09)				

Texture Gravelliness

KVR m B 2 g1

Soil Series Slope Erosion

KEY

TEXTURE
b - Loamy sand
c - Sandy loam
h - Sandy clay loam
i - Sandy clay
m - Clay

SLOPE
A - Nearly Level (0-1%)
B - Very gently sloping (1-3%)

EROSION
1 – Slight
2 - Moderate
3 - Severe

GRAVELLINESS
g1 – Gravelly (15-35 %)
g2 - Very gravelly(35-60 %)
g3 - Extremely gravelly(35-60 %)

DEPTH
BGT,DVH - Very shallow (<25 cm)
HRV,MTL,KGP- Shallow (25-50 cm)
HTI,KTP,LKR,MKH,RNK, - Moderately shallow (50-75 cm)
BDG,CKM,DRL,GHT,NSP,TGR - Moderately deep (75-100 cm)
BPR,GRH,HDL,KVR,MNL,NGP- Deep (100-150 cm)
AWD,BDR,BGP,HLK,KDT,MLR,MRD-Very deep(>150cm)

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

4.1 Mapping unit description of Kavalur (4D4A2P) Sub-watershed in Koppal taluk, Koppal district

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss Landscape				
	HLK	Hallikere soils are very deep (>150 cm), well drained, have dark brown to dark reddish brown clayey soils occurring on nearly level to very gently sloping uplands under cultivation		**37 (0.51)**
273		HLKiB1	Sandy clay surface, slope 1-3%, slight erosion	37 (0.51)
	MRD	Muradi soils are very deep (>150 cm), well drained, have red to dark red sandy clay loam soils occurring on nearly level to gently sloping uplands under cultivation		**62 (1.54)**
275		MRDcA1g1	Sandy loam surface, slope 0-1%, slight erosion, gravelly (15-35%)	6 (0.09)
276		MRDcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	4 (0.05)
277		MRDhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	5 (0.07)
278		MRDhB1g2	Sandy clay loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	7 (0.1)
280		MRDiA1	Sandy clay surface, slope 0-1%, slight erosion	9 (0.12)
281		MRDiA1g1	Sandy clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	9 (0.12)
283		MRDiB2	Sandy clay surface, slope 1-3%, moderate eroison	22 (0.3)
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**13 (0.17)**
207		MNLiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	13 (0.17)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**44 (0.6)**
231		BPRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	6 (0.08)
238		BPRiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	12 (0.17)
239		BPRiB2	Sandy clay surface, slope 1-3%, moderate erosion	26 (0.35)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay soils occurring on nearly level to gently sloping uplands under cultivation		**72 (0.97)**
263		NGPiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	47 (0.64)
264		NGPiB1g2	Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%)	24 (0.33)
	GHT	Gollarahatti soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam soils occurring on nearly level very gently sloping uplands under cultivation		**146 (1.99)**
135		GHTcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	17 (0.24)
136		GHTcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	15 (0.2)
139		GHThA1g2	Sandy clay loam surface, slope 0-1%, slight erosion, very gravelly (35-60%)	5 (0.07)
141		GHThB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	27 (0.36)
143		GHTiA1g1	Sandy clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	14 (0.19)
145		GHTiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	32 (0.44)
146		GHTiB1g2	Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%)	36 (0.49)
	TGR	Tigari soils are moderately deep (75-100 cm), well drained, have dark reddish brown to reddish brown, calcareous gravelly sandy clay loam soils occurring on very gently sloping uplands		**92 (1.26)**
148		TGRiB1	Sandy clay surface, slope 1-3%, slight erosion	34 (0.47)
149		TGRiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	33 (0.45)
150		TGRiB1g2	Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%)	25 (0.34)

To be continued...

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss Landscape				
	BMK	Bhimanakunte soils are moderately deep (75-100 cm), well drained, have very dark reddish brown to yellowish red gravelly, calcareous sandy clay to clay soils occurring on nearly level to very gently sloping uplands under cultivation		**28 (0.38)**
157		BMKmB2g2	Clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	28 (0.38)
	CKM	Chikkamegheri soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown red sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**33 (0.45)**
176		CKMhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	33 (0.45)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red clay soils occurring on nearly level to gently sloping uplands under cultivation		**77 (1.04)**
192		BDGiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	39 (0.53)
193		BDGiB1g2	Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%)	38 (0.51)
	LKR	Lakkur soils are moderately shallow (50-75 cm), well drained, have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation		**227 (3.08)**
43		LKRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	121 (1.65)
44		LKRcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	76 (1.03)
51		LKRiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	30 (0.4)
	KTP	Kethanapura soils are moderately shallow (50-75 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**24 (0.32)**
71		KTPcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	24 (0.32)
	MKH	Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown gravelly red sandy clay soils occurring on gently very gently to gently sloping uplands under cultivation		**136 (1.85)**
77		MKHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	11 (0.15)
81		MKHhB1	Sandy clay loam surface, slope 1-3%, slight erosion	26 (0.35)
82		MKHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	20 (0.28)
85		MKHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	1 (0.01)
90		MKHiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	41 (0.56)
91		MKHiB2g2	Sandy clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	37 (0.5)
	HTI	Hatti soils are moderately shallow (50-75 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**53 (0.71)**
93		HTIcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	30 (0.4)
98		HTIiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	23 (0.31)
	KGP	Kaggalipura soils are shallow (25-50 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay soils occurring on nearly level to moderately sloping uplands under cultivation		**99 (1.36)**
14		KGPcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	24 (0.33)
17		KGPhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	18 (0.25)
18		KGPhB2g2	Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	25 (0.34)
19		KGPiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	32 (0.44)

To be continued...

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss Landscape				
	HRV	Harve soils are shallow (25-50 cm), well drained, dark red to dark red dish brown, red gravelly sandy clay loam soils occurring on nearly level to gently sloping uplands under cultivation		**82 (1.11)**
28		HRVhB2g3	Sandy clay loam surface, slope 1-3%, moderate erosion, extremely gravelly (60-80%)	34 (0.46)
31		HRViB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	48 (0.65)
	DVH	Devihal soils are very shallow (< 25 cm), well drained, have dark reddish brown to yellowish red sandy clay loam soils occurring on very gently sloping uplands.		**22 (0.3)**
3		DVHiB2g2	Sandy clay surface, slope 1-3%, moderate erosion, very gravelly (60-80%)	22 (0.3)
	BGT	Belagatti soils are very shallow (< 25 cm), well drained, have dark gray to dark grayish brown gravelly calcareous clay soils occurring on very gently sloping uplands		**84 (1.14)**
9		BGTmB2	Clay surface, slope 1-3%, moderate erosion	12 (0.16)
10		BGTmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	72 (0.98)
	TSD	Thimmasandra soils are very deep (>150 cm), moderately well drained, have very dark brown to very dark grayish brown, clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**7 (0.09)**
447		TSDmB2	Clay surface, slope 1-3%, moderate erosion	7 (0.09)
Soils of Alluvial Landscape				
	BGP	Budagumpa soils are very deep (>150 cm), moderately well drained, have dark yellowish brown to dark brown and dark gray , calcareous sodic black clay soils occurring on nearly level to very gently sloping plains under cultivation		**113 (1.54)**
395		BGPmA1	Clay surface, slope 0-1%, slight erosion	29 (0.39)
396		BGPmB1	Clay surface, slope 1-3%, slight erosion	18 (0.25)
397		BGPmB2g1	Clay surface, slope 1-3%, moderate erosion	66 (0.9)
	KDT	Kadagathur soils are very deep (>150 cm), moderately well drained, have dark brown to very dark grayish brown, black sandy clay to clay soils occurring on nearly level to very gently sloping plains under cultivation		**458 (5.89)**
403		KDTmA1	Clay surface, slope 0-1%, slight erosion	185 (2.51)
405		KDTmB2	Clay surface, slope 1-3%, moderate erosion	249 (3.38)
406		KDTmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	24 (0.33)
	MLR	Murlapur soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**295 (4.01)**
409		MLRhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	13 (0.18)
412		MLRmA1g1	Clay surface, slope 0-1%, slight erosion	33 (0.44)
413		MLRmA2	Clay surface, slope 0-1%, moderate erosion	14 (0.19)
415		MLRmB1	Clay surface, slope 1-3%, slight erosion	47 (0.64)
418		MLRmB2	Clay surface, slope 1-3%, moderate erosion	172 (2.34)
419		MLRmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	16 (0.22)
	AWD	Alawandi soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to black , calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**119 (1.62)**
423		AWDmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	28 (0.38)
424		AWDmB2	Clay surface, slope 1-3%, moderate erosion	91 (1.24)

To be continued...

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss Landscape				
	BDR	Bardur soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to very dark gray, black cracking calcareous clay soils occurring on nearly level to very gently sloping plains under cultivation		**663 (9.02)**
428		BDRmA1	Clay surface, slope 0-1%, slight erosion	530 (7.21)
433		BDRmB2	Clay surface, slope 1-3%, moderate erosion	133 (1.81)
	GRH	Gatareddihal soils are deep (100-150 cm), moderately well drained, have light olive brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**218 (2.98)**
373		GRHmB2	Clay surface, slope 1-3%, moderate erosion	62 (0.85)
374		GRHmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	123 (1.68)
375		GRHmB2g2	Clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	33 (0.45)
	HDL	Handrala soils are deep (100-150 cm), moderately well drained, have dark gray to very dark gray, black calcareous cracking clay soils occurring on very gently sloping plains under cultivation		**467 (6.37)**
379		HDLmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	64 (0.88)
380		HDLmB1	Clay surface, slope 1-3%, slight erosion	28 (0.39)
382		HDLmB2	Clay surface, slope 1-3%, moderate erosion	375 (5.1)
	KVR	Kavalur soils are deep (100-150 cm), moderately well drained, have dark yellowish brown to very dark grayish brown, calcareous cracking black clay soils occurring on nearly level to very gently sloping plains under cultivation		**380 (22.13)**
384		KVRiB2	Sandy clay surface, slope 1-3%, moderate erosion	9 (0.13)
385		KVRiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	13 (0.18)
386		KVRmA1	Clay surface, slope 0-1%, slight erosion	30 (0.41)
387		KVRmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	18 (0.25)
388		KVRmB1	Clay surface, slope 1-3%,	54 (0.74)
389		KVRmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	113 (1.54)
390		KVRmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	113 (1.54)
391		KVRmB2g2	Clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	30 (0.41)

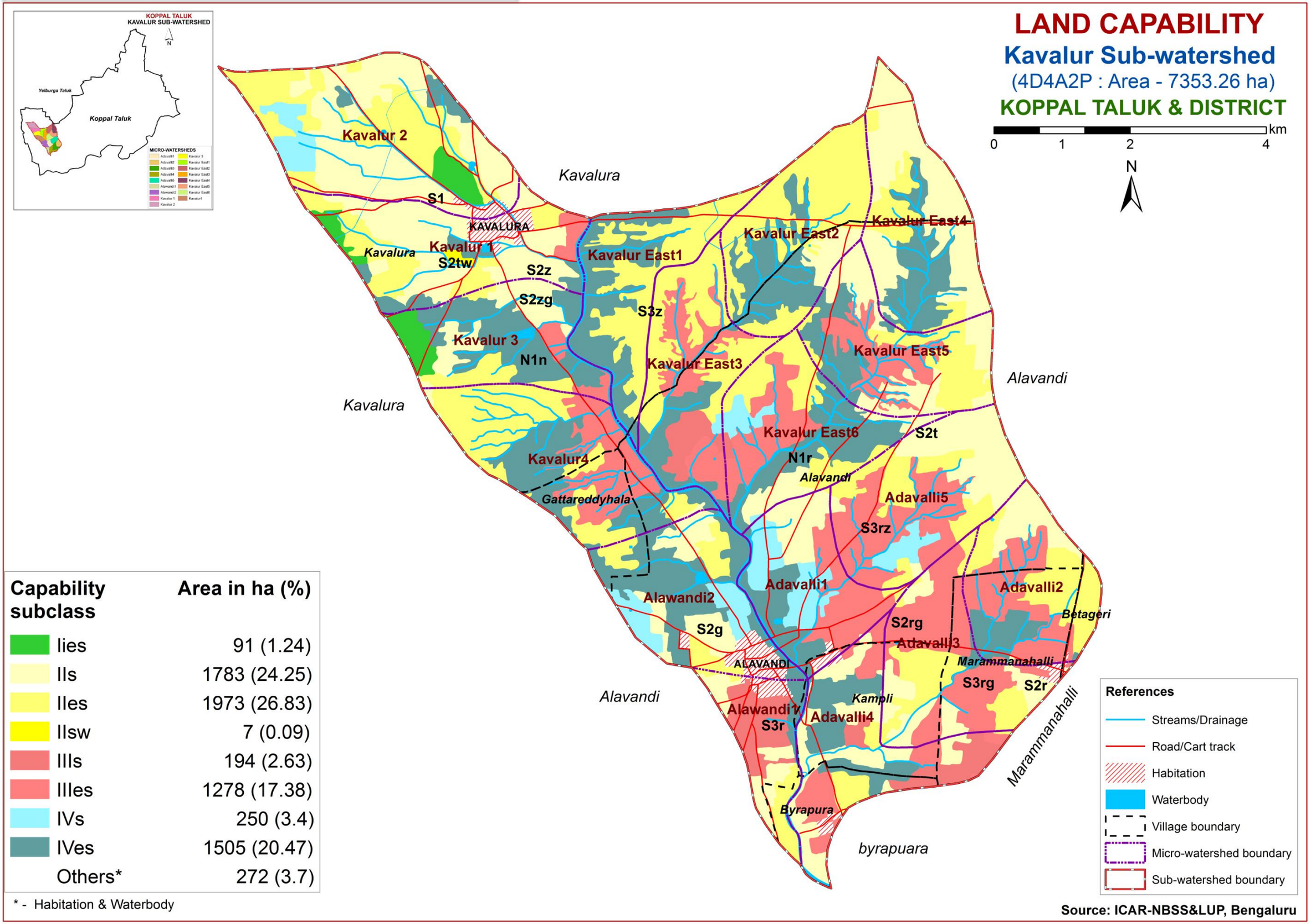
To be continued...

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite gneiss Landscape				
	DRL	Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have dark brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**785 (10.65)**
344		DRLmA1	Clay surface, slope 0-1%, slight erosion	22 (0.3)
348		DRLmB1	Clay surface, slope 1-3%, slight erosion	65 (0.88)
349		DRLmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	79 (1.07)
350		DRLmB2	Clay surface, slope 1-3%, moderate erosion	365 (4.96)
351		DRLmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	111 (1.5)
352		DRLmB2g2	Clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	143 (1.94)
	NSP	Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, sodic black calcareous clay soils occurring on nearly level to very gently sloping plains under cultivation		**175 (2.38)**
353		NSPcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	41 (0.56)
360		NSPmB1	Clay surface, slope 1-3%, slight erosion	27 (0.37)
362		NSPmB2	Clay surface, slope 1-3%, moderate erosion	59 (0.8)
363		NSPmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	48 (0.65)
	RNK	Ravanaki soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to very dark grayish brown and dark gray, sodic black clay soils occurring on nearly level to very gently sloping plains under cultivation		**1024 (13.92)**
332		RNKmA1g1	Clay surface, slope 0-1%, slight erosion, gravelly (15-35%)	32 (0.44)
334		RNKmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	103 (1.4)
336		RNKmB2	Clay surface, slope 1-3%, moderate erosion	228 (3.1)
337		RNKmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	541 (7.35)
338		RNKmB2g2	Clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	120 (1.63)
	MTL	Muttal soils are shallow (25-50 cm), well drained, have very dark grayish brown to dark brown, calcareous black gravelly clay soils occurring on nearly level to gently sloping plains under cultivation		**1046 (14.24)**
306		MTLmA1g2	Clay surface, slope 0-1%, slight erosion, very gravelly (35-60%)	12 (0.17)
308		MTLmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	49 (0.67)
310		MTLmB2	Clay surface, slope 1-3%, moderate erosion	130 (1.77)
311		MTLmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	559 (7.6)
312		MTLmB2g2	Clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	211 (2.87)
313		MTLmB2g3	Clay surface, slope 1-3%, moderate erosion, extremely gravelly (60-80%)	35 (0.48)
316		MTLmB3g3	Clay surface, slope 1-3%, severe erosion, extremely gravelly (60-80%)	50 (0.68)
1000		Others	Habitation and water body	**272 (3.7)**

*Soil map unit numbers are continuous for the taluk, not for the Sub-watershed

5. Soil Survey Interpretations

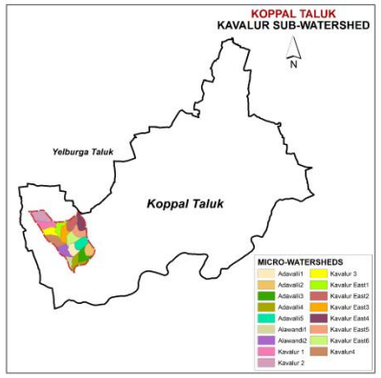
5.1. Land Capability Classification



Capability subclass	Area in ha (%)
IIes	91 (1.24)
IIs	1783 (24.25)
IIes	1973 (26.83)
IIsw	7 (0.09)
IIIs	194 (2.63)
IIIes	1278 (17.38)
IVs	250 (3.4)
IVes	1505 (20.47)
Others*	272 (3.7)

* - Habitation & Waterbody

5.2. Soil Depth



SOIL DEPTH

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalura
Kavalura
Kavalura
Alavandi
Alavandi
Marammanahalli
byrapuara
Kavalur 2
KAVALURA
Kavalur 1
Kavalur East1
Kavalur East2
Kavalur East4
Kavalur 3
Kavalur East3
Kavalur East5
Kavalur East6
Kavalur4
Gattareddyhala
Alavandi
Adavalli5
Adavalli1
Alawandi2
Adavalli2
Betageri
Adavalli3
Marammanahalli
ALAVANDI
Kampli
Alawandi1
Adavalli4
Byrapura

Depth Class	Area in ha (%)
Very shallow (<25 cm)	106 (1.44)
Shallow (25-50 cm)	1228 (16.7)
Moderately shallow (50-75 cm)	1462 (19.88)
Moderately deep (75-100 cm)	1334 (18.14)
Deep (100-150 cm)	1197 (16.28)
Very deep (>150 cm)	1754 (23.85)
Others*	272 (3.7)

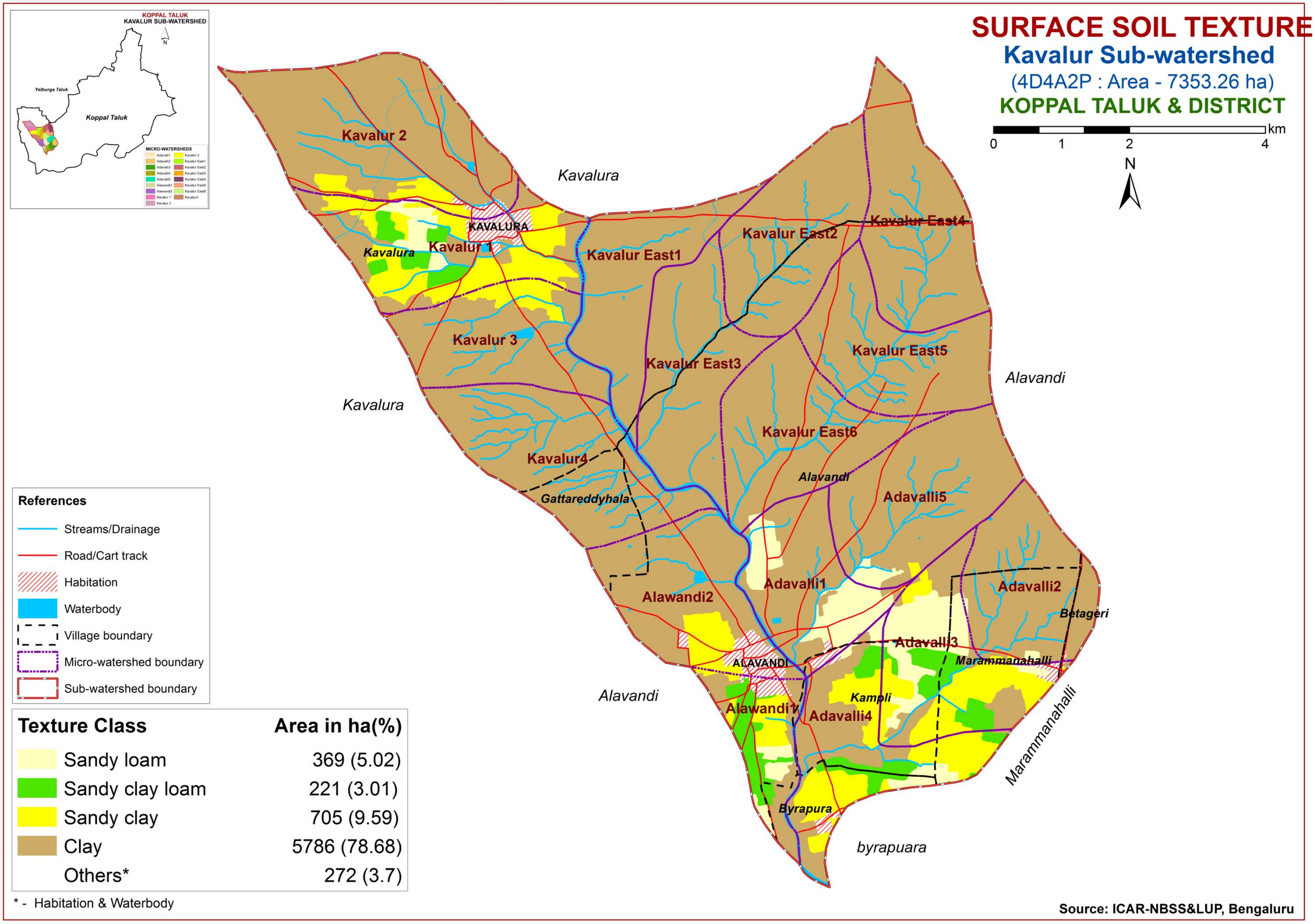
* - Habitation & Waterbody

References

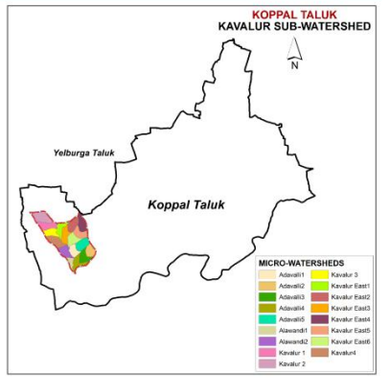
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

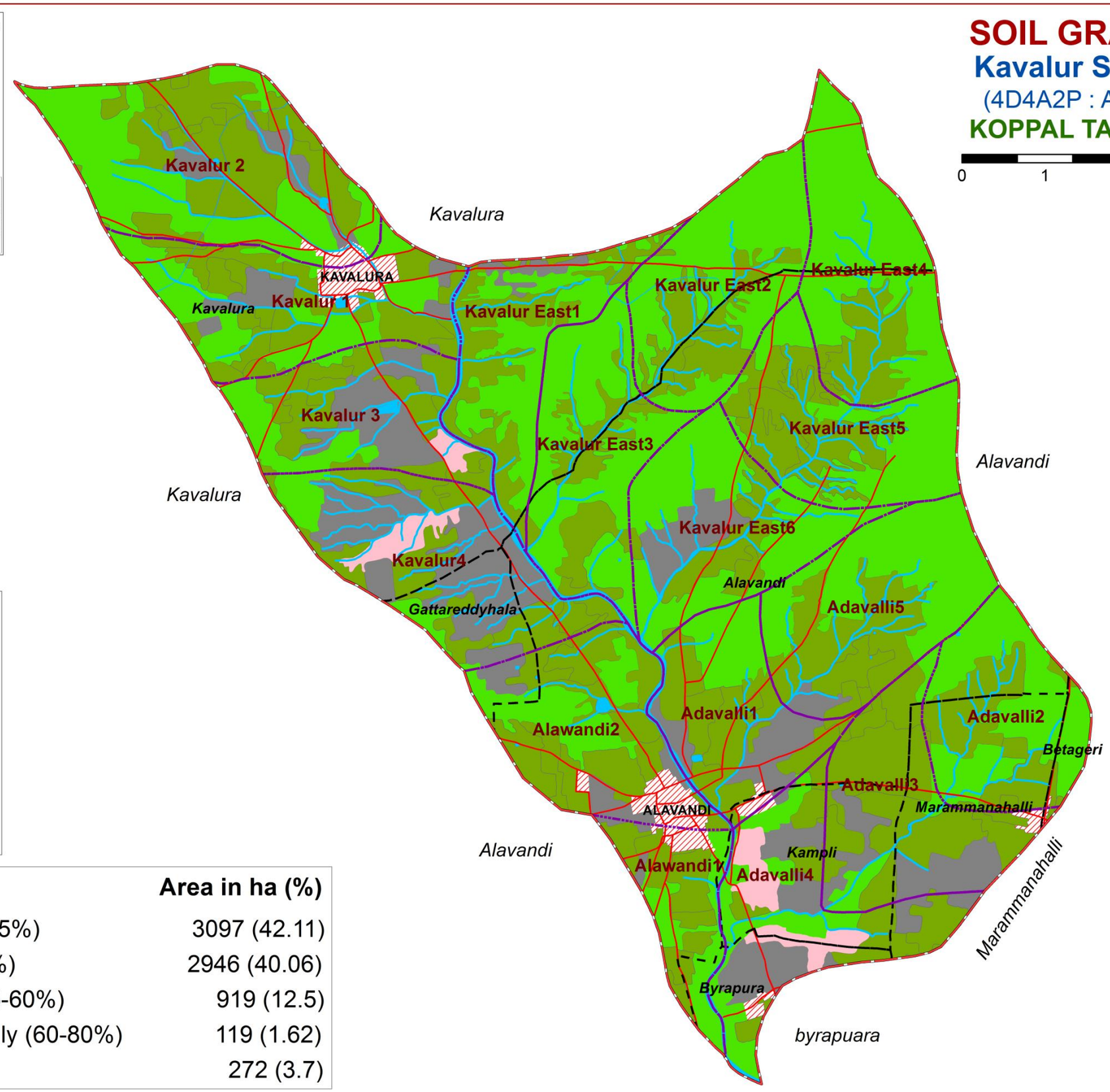
Source: ICAR-NBSS&LUP, Bengaluru

5.3. Surface Soil Texture



5.4. Surface Soil Gravelliness





References

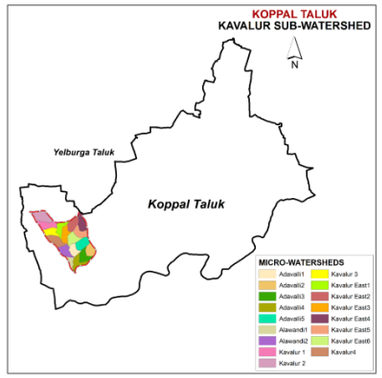
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

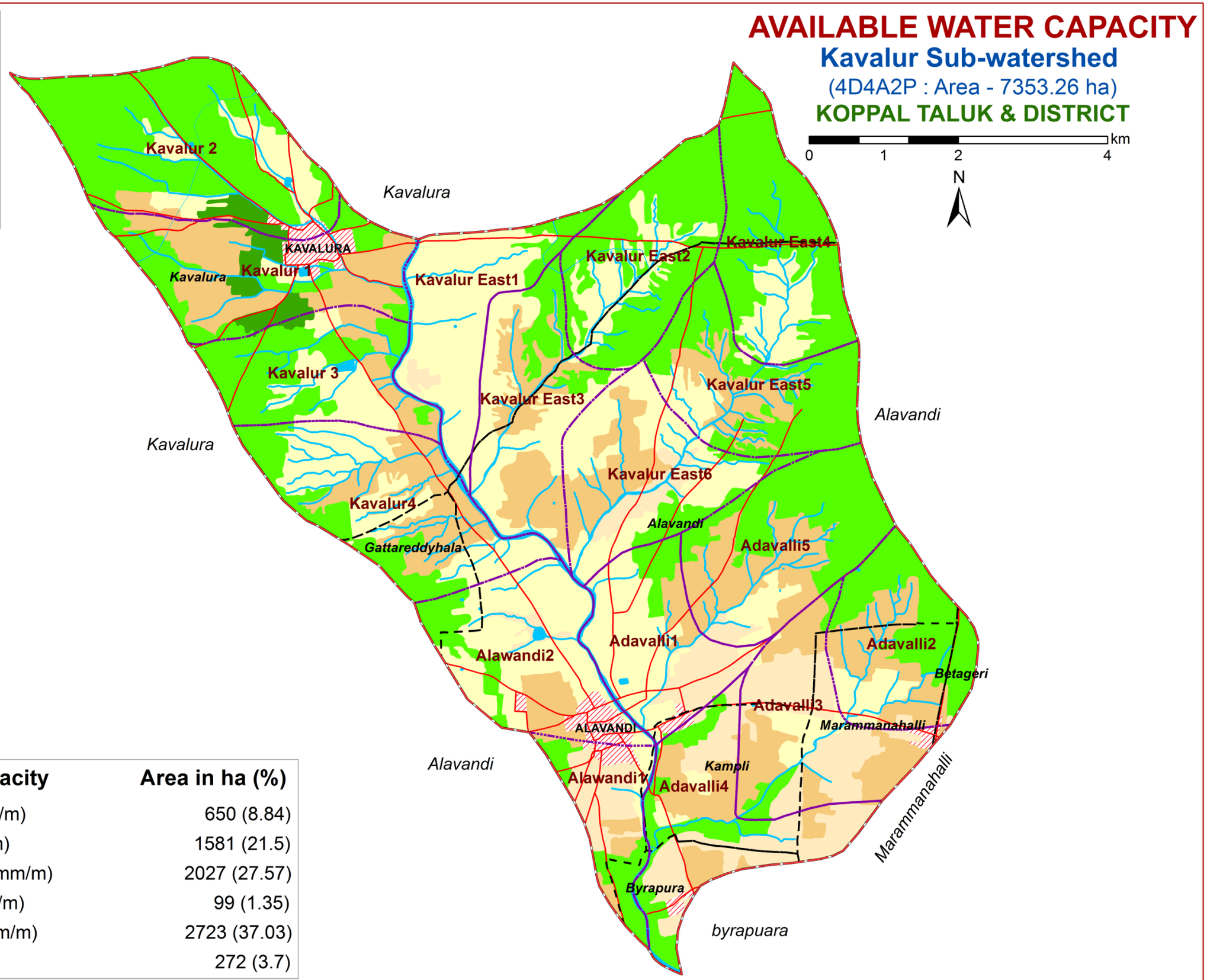
Gravelly Class	Area in ha (%)
Non gravelly (<15%)	3097 (42.11)
Gravelly (15-35%)	2946 (40.06)
Very gravelly (35-60%)	919 (12.5)
Extremely gravelly (60-80%)	119 (1.62)
Others*	272 (3.7)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.5. Available Water Capacity





References

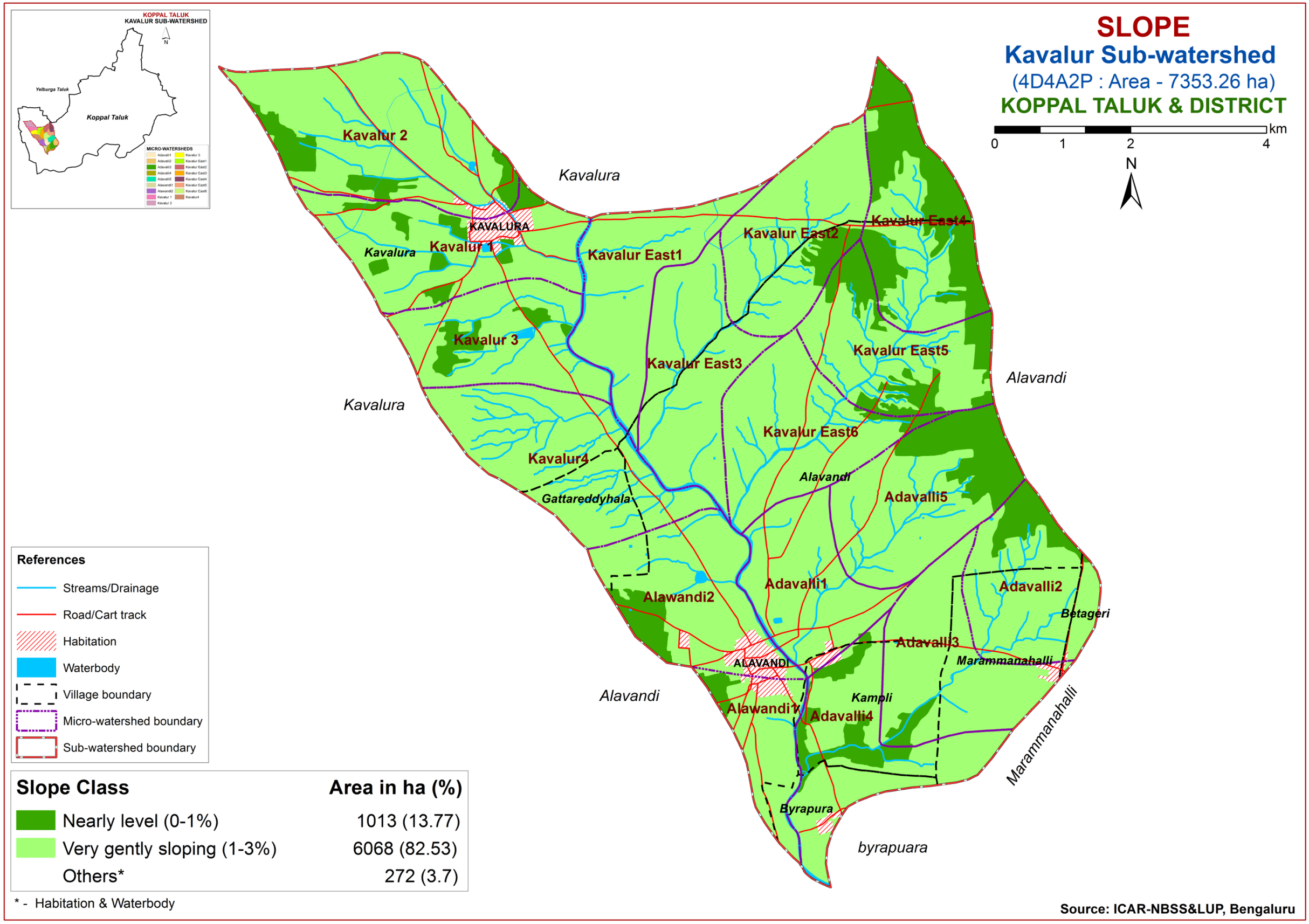
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Available Water Capacity	Area in ha (%)
Very Low (<50 mm/m)	650 (8.84)
Low (51-100 mm/m)	1581 (21.5)
Medium (101-150 mm/m)	2027 (27.57)
High (151-200 mm/m)	99 (1.35)
Very high (>200 mm/m)	2723 (37.03)
Others*	272 (3.7)

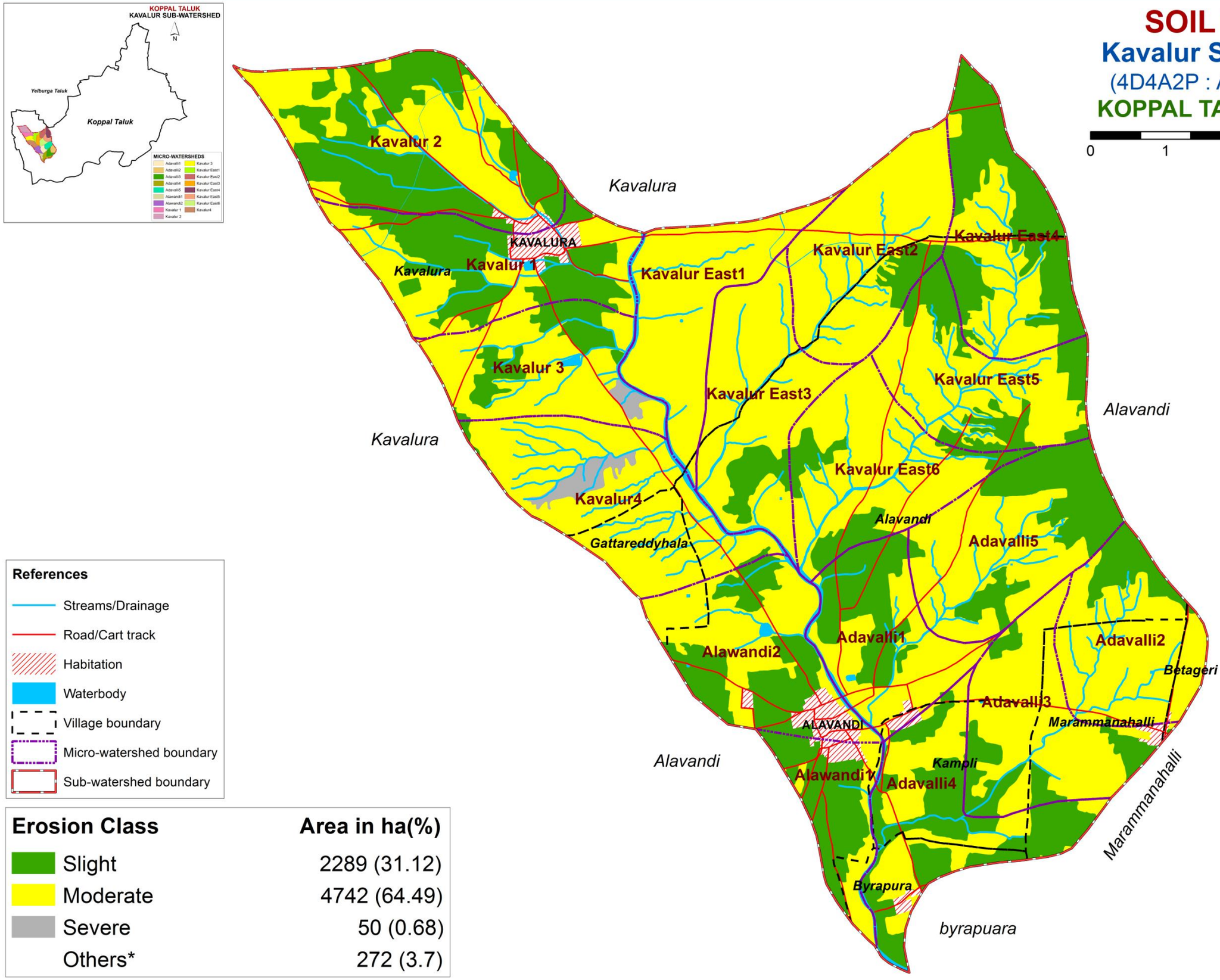
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.6.Slope

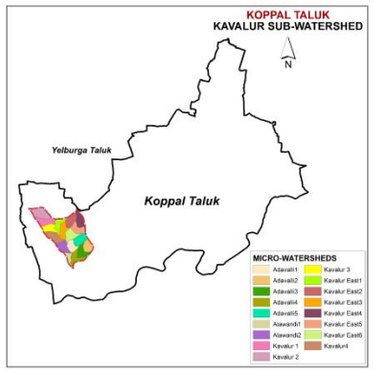

SLOPE
Kavalur Sub-watershed
(4D4A2P : Area - 7353.26 ha)
KOPPAL TALUK & DISTRICT
0 1 2 4 km
N
KOPPAL TALUK
KAVALUR SUB-WATERSHED
Yelburga Taluk
Koppal Taluk
MICRO-WATERSHEDS
Kavalur 2
Kavalura
KAVALURA
Kavalura
Kavalur 1
Kavalur East1
Kavalur East2
Kavalur East4
Kavalur 3
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
Kavalur4
Alavandi
Gattareddyhala
Adavalli5
Adavalli1
Adavalli2
Alawandi2
Betageri
Adavalli3
ALAVANDI
Marammanahalli
Alavandi
Kampli
Alawandi1
Adavalli4
Marammanahalli
Byrapura
byrapuara
References
Streams/Drainage
Road/Cart track
Habitation
Waterbody
Village boundary
Micro-watershed boundary
Sub-watershed boundary
Slope Class
Area in ha (%)
Nearly level (0-1%) 1013 (13.77)
Very gently sloping (1-3%) 6068 (82.53)
Others* 272 (3.7)
* - Habitation & Waterbody
Source: ICAR-NBSS&LUP, Bengaluru

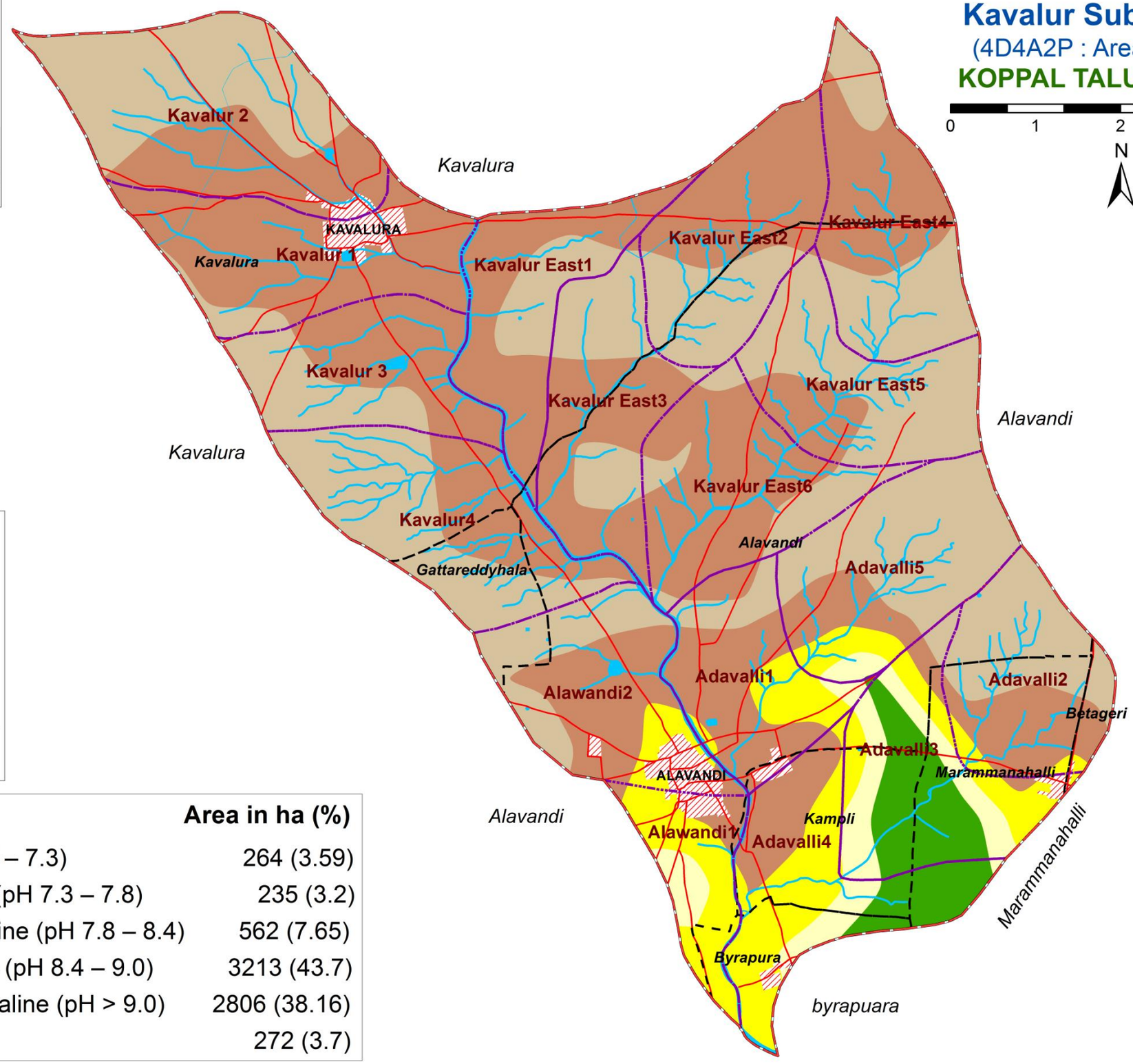
5.7.Soil Erosion



6. Soil Fertility Status

6.1. Soil Reaction (pH)





References

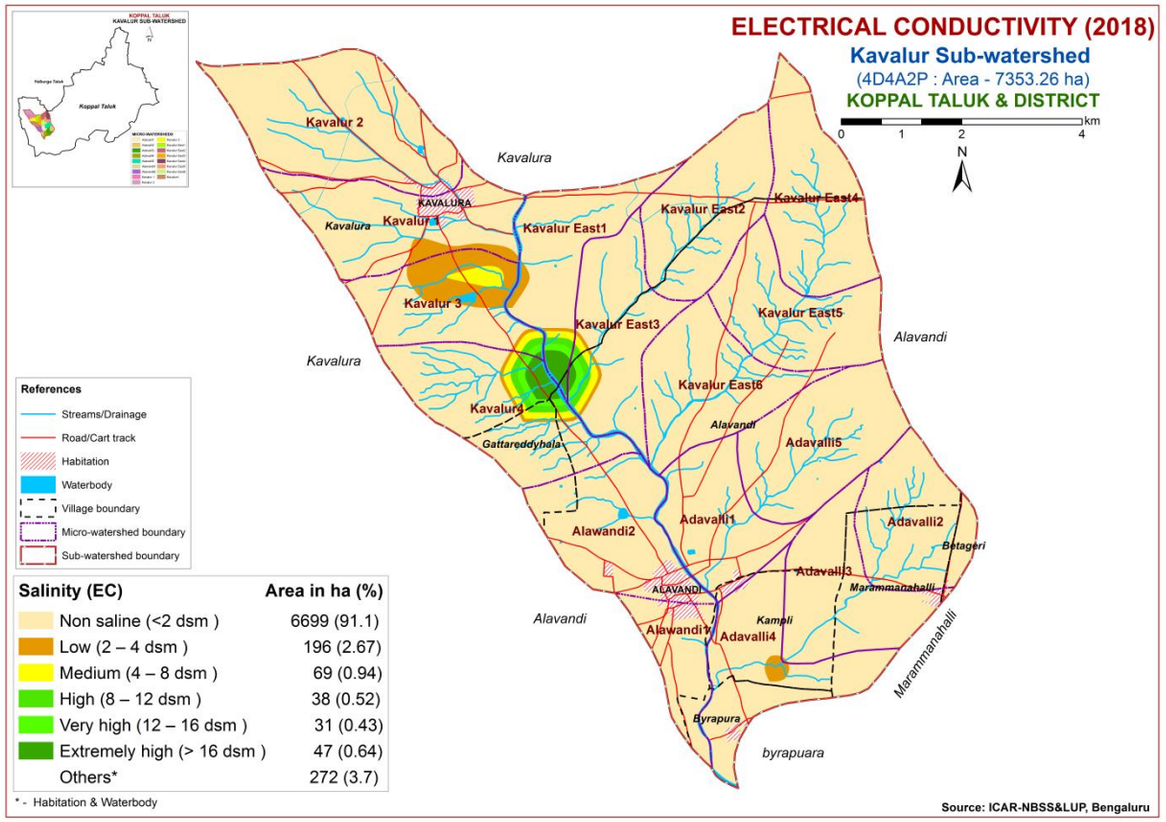
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Reaction Class	Area in ha (%)
Neutral (pH 6.5 – 7.3)	264 (3.59)
Slightly alkaline (pH 7.3 – 7.8)	235 (3.2)
Moderately alkaline (pH 7.8 – 8.4)	562 (7.65)
Strongly alkaline (pH 8.4 – 9.0)	3213 (43.7)
Very strongly alkaline (pH > 9.0)	2806 (38.16)
Others*	272 (3.7)

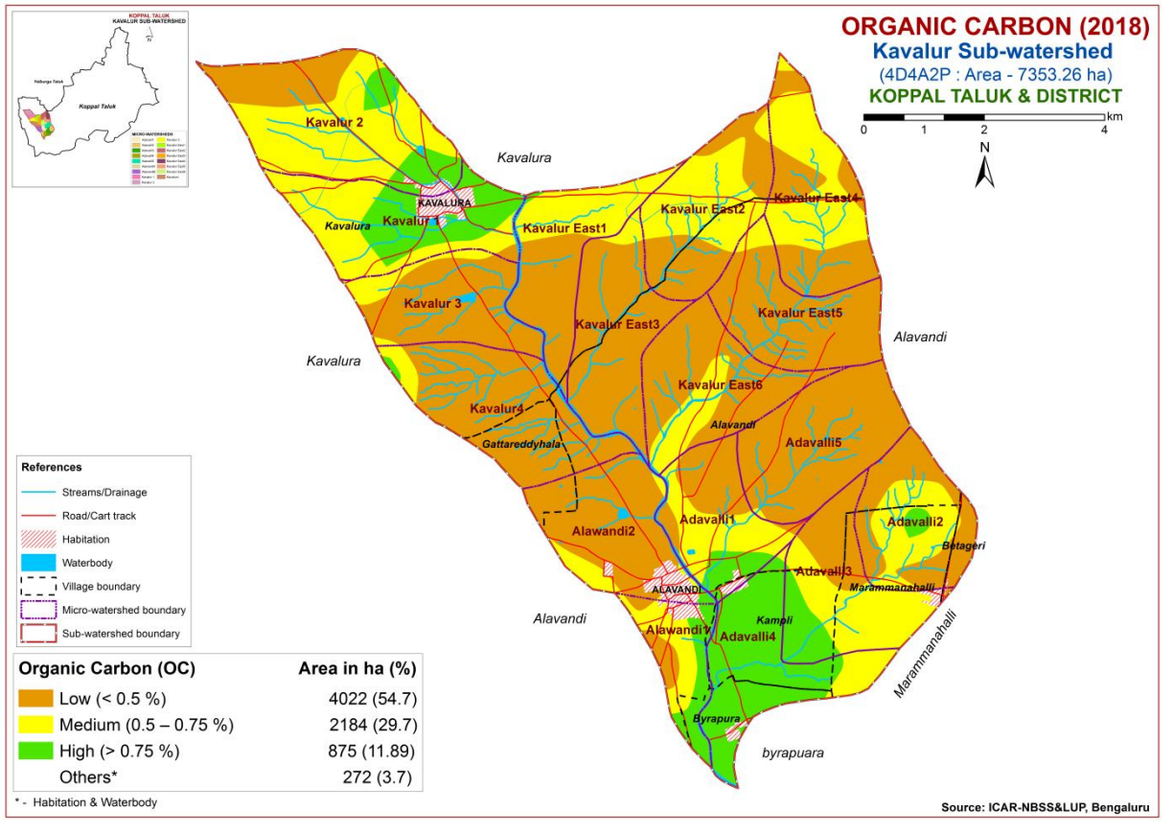
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

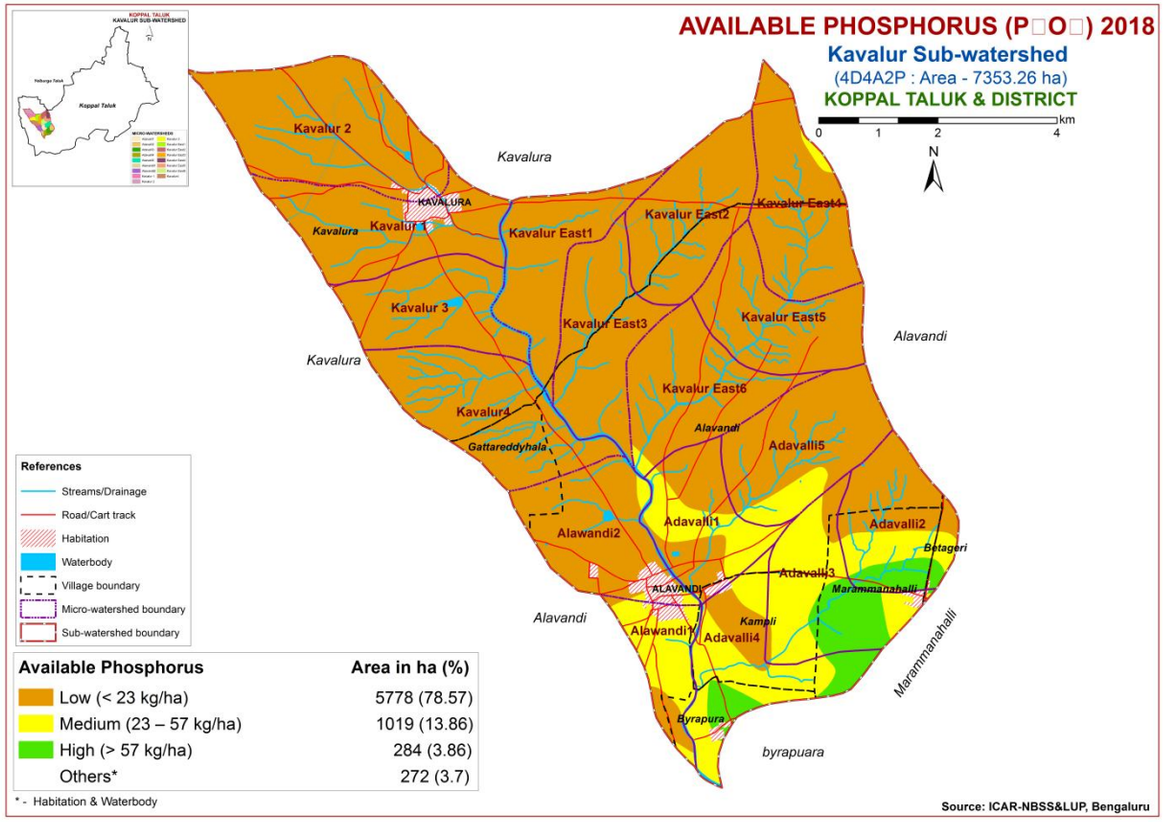
6.2. Electrical Conductivity (EC)



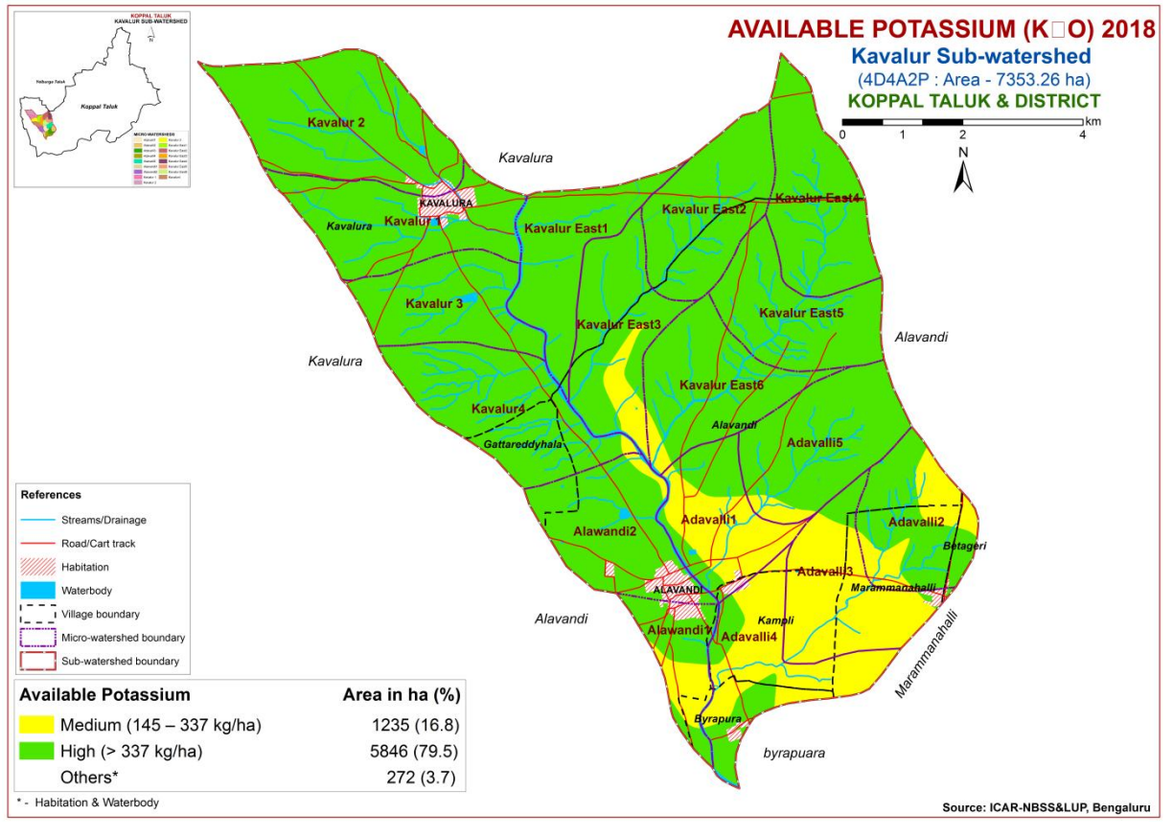
6.3. Organic Carbon



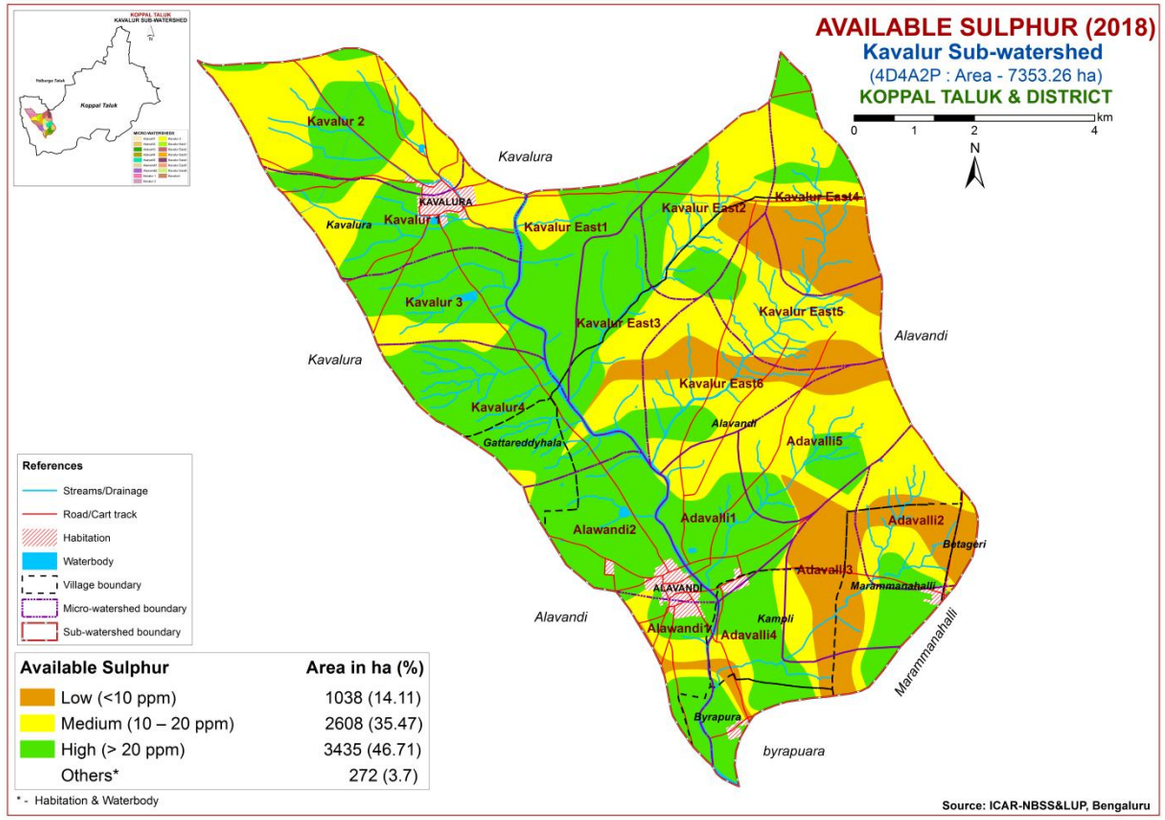
6.4. Available Phosphorus



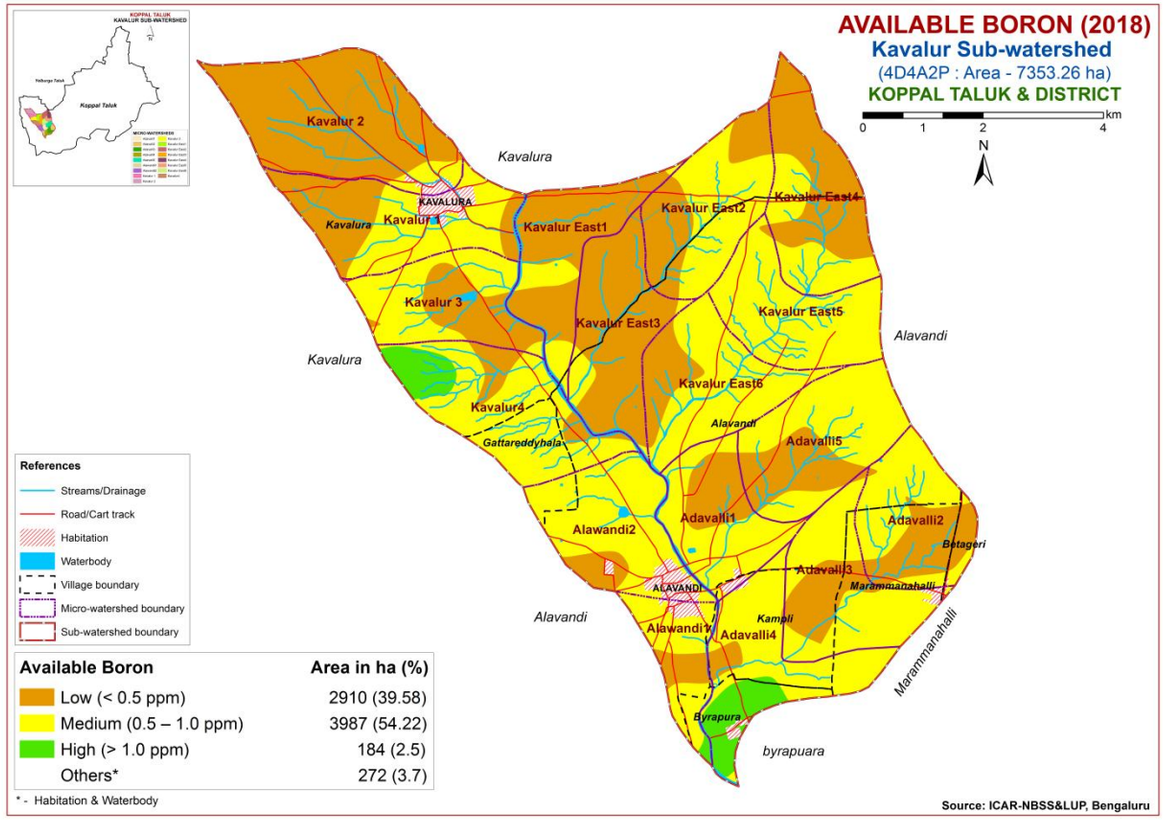
6.5. Available Potassium



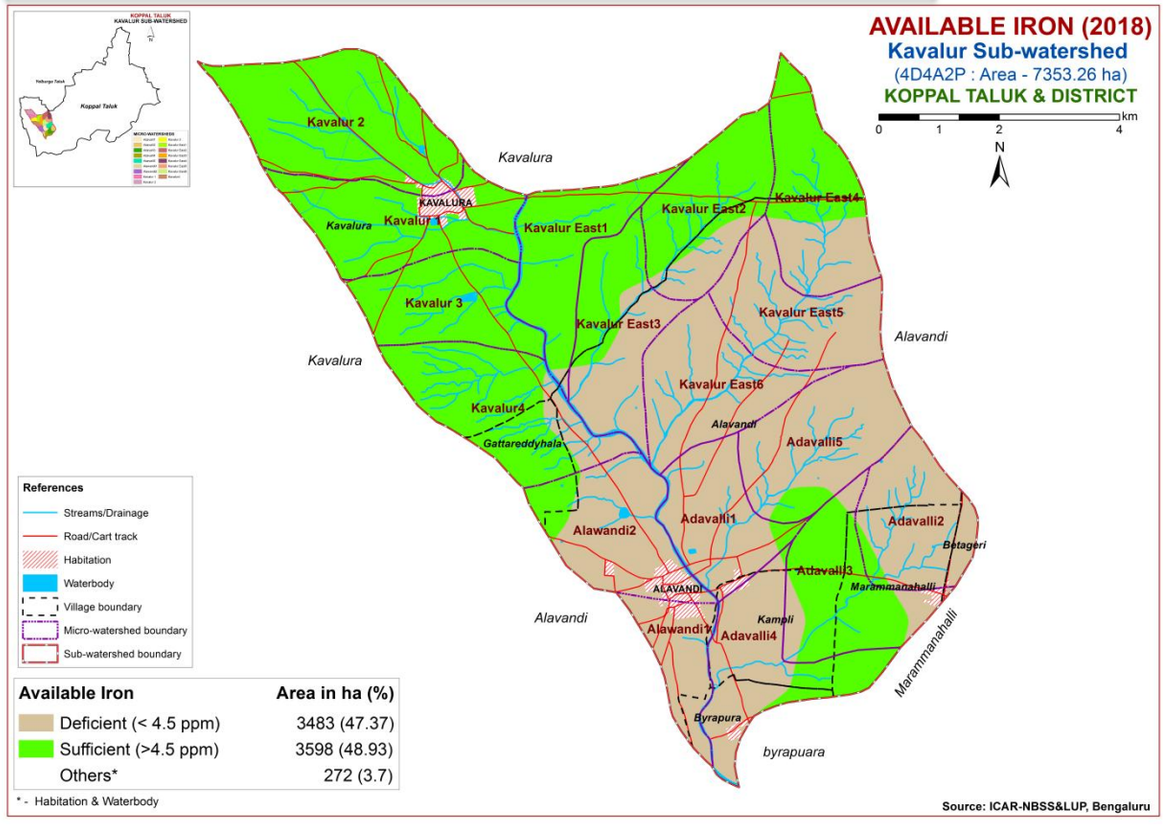
6.6. Available Sulphur



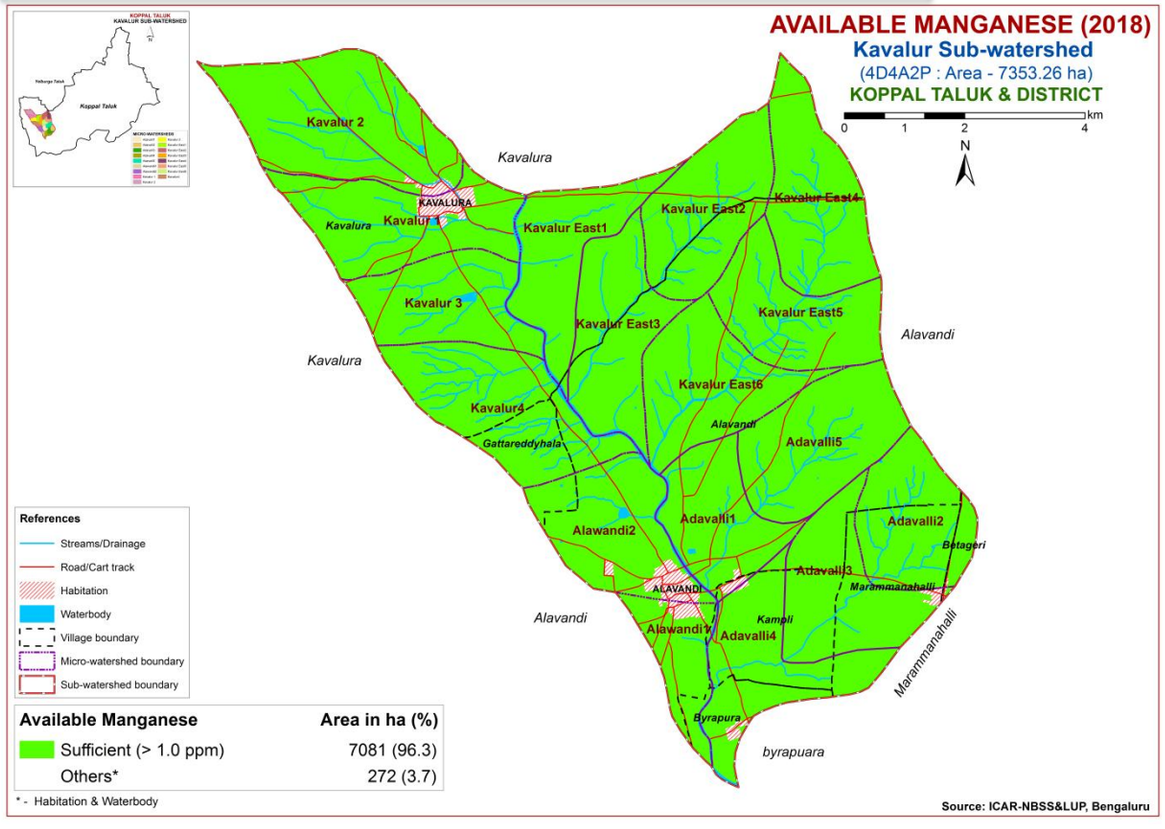
6.7. Available Boron



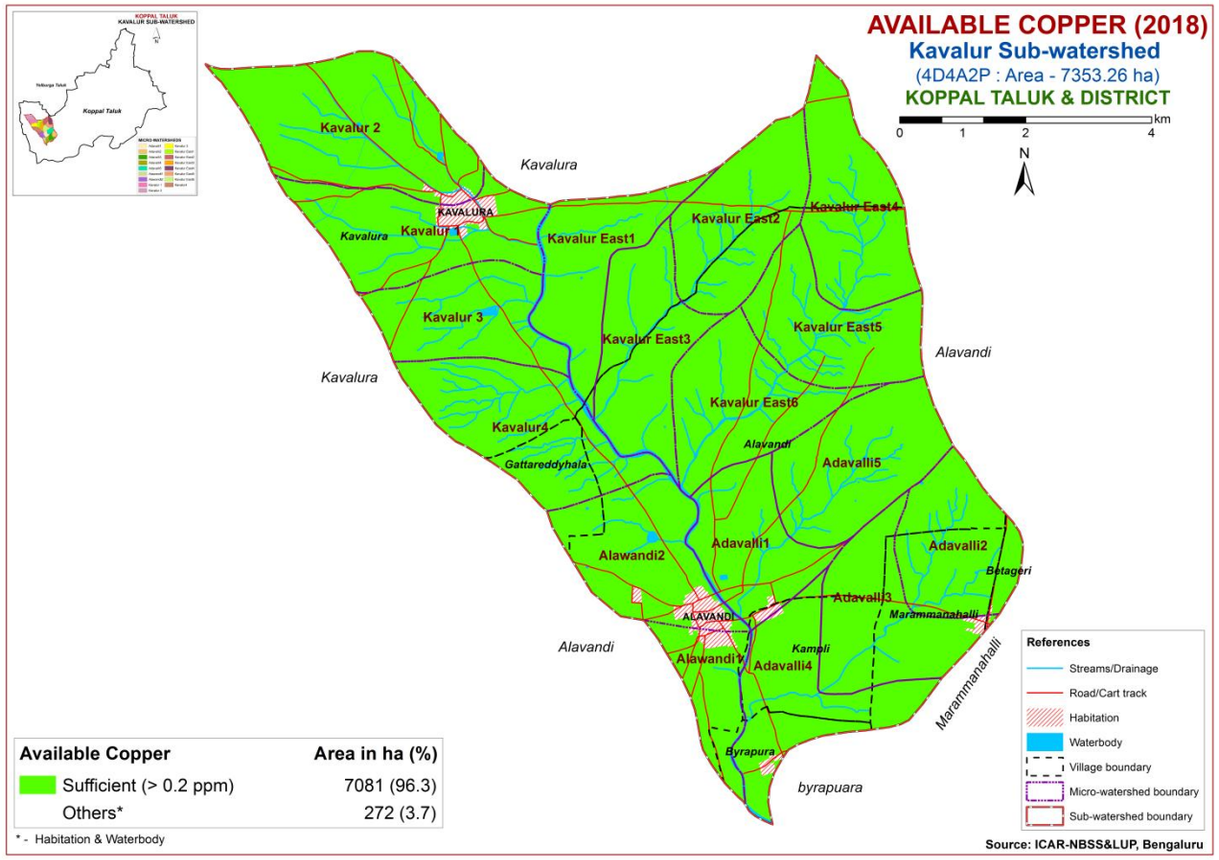
6.8. Available Iron



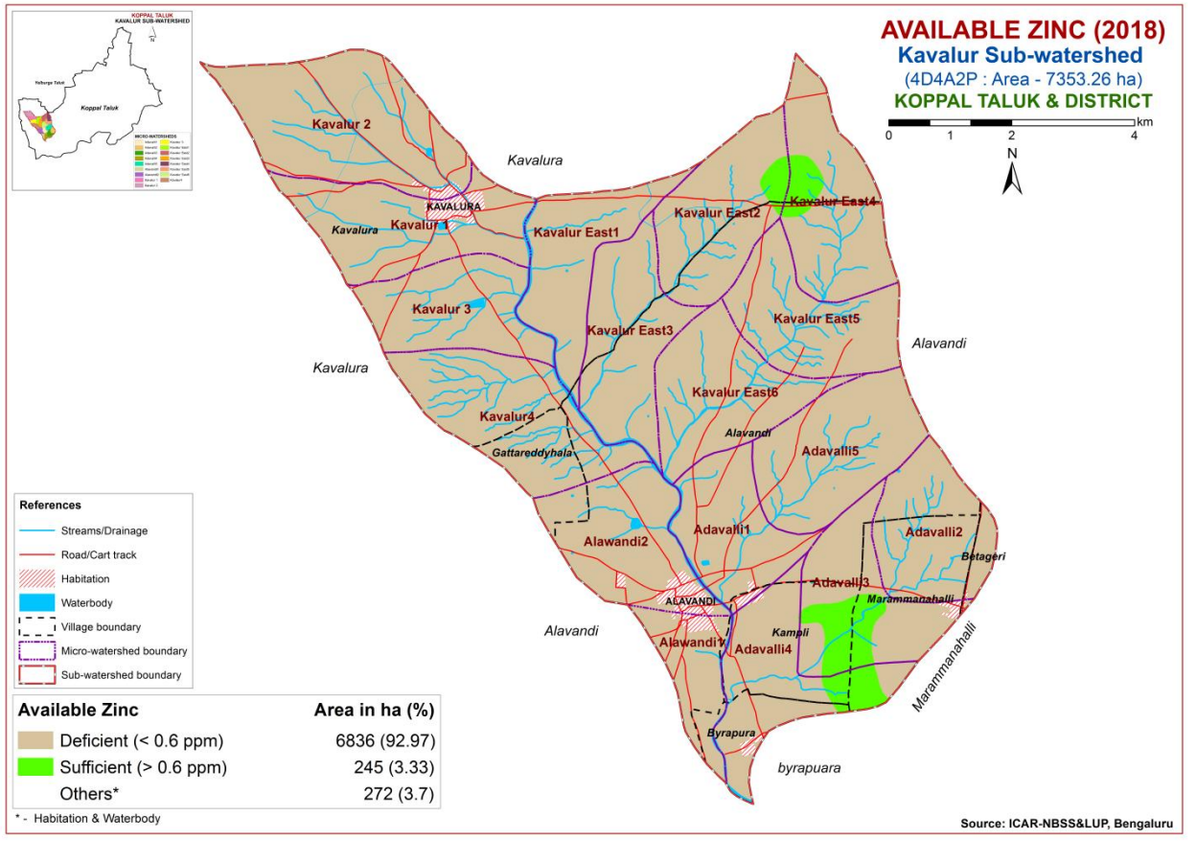
6.9. Available Manganese



6.10. Available Copper



6.11. Available Zinc



6.12. Correcting the Soil Nutrient Deficiencies

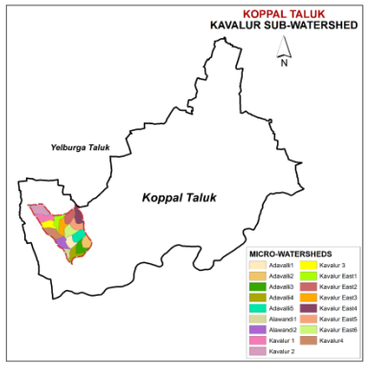
1. Reclamation of Salt affected soils
   a) When the soil is having neutral pH (6.5-7.5), no need of adding amendments (lime or gypsum)
   b) If the soil pH is <6.5, apply burnt lime to soil as per specifically recommended dosage and again after 2 years proper change has to be made based on soil test results.
   c) If the soil pH is 7.5-8.5 due to excess calcium content, drain out the excess calcium form the soil with good quality irrigation water.
   d) If the soil pH is more than 8.5 due to higher sodium content in soil, apply specifically recommended dose of gypsum & drain out the excess salts with good quality irrigation water.

2. In case of low & high content of major nutrients in the soil, follow the modifications as given bellow:
   - N: P: K (N: P_2O_5: K_2O) **For low N content**, add 25 % extra to the Recommended Dose of Fertilisers (RDF).
     For high N content, reduce 25% from the RDF and apply to soil.
     Eg:- if 100kg N, then we have to apply
     100+25% for deficient soil.
     100% for medium available N content soil.
     100-25% for higher N content soil.
   - Follow the same in case of P & K.

3. Use or Incorporation of biofertilizers like Rhizobium, Azotobacter, Azospirillum, Phosphate Solubilizing Bacteria and mycorrhiza enhances normal available nutrients in soil to the plants and also reduce the input cost of cultivation.
4. For calcium deficient soil, apply N-fertilizers like calcium ammonium nitrate; Gypsum can also supply calcium ($CaSO_4$. $2H_2O$)
5. Apply 405kg $MgSO_4$ per ha to the magnesium deficient soil. In case of perennial horticulture crops apply 150-200g/ plant.
6. In sulphur deficient acid soils (Humid region) apply phosphorus (in the form of) through SSP & use sulphur coated urea to the crops.
7. Apply 30-50kg ferrous sulfate ($FeSO_4$) per ha to the iron deficient soils. In case of perennial Horticulture crops apply 3-5g/ litre $FeSo_4$ /plant as foliar spray.
8. Apply 30-40kg/ha – manganese sulfate ($MnSO_4$) as soil application to the manganese deficient soils. In case of perennial Horticulture crops apply 3-5 g/litre $MnSO_4$ /plant as foilar application.
9. Apply Zinc – 10-25 kg/ha –$ZnSO_4$ – soil application to the Zinc deficient soils. In case of perennial Horticulture crops apply 3-5g/ litre – foliar application.
10. Apply Copper – 5-10 kg /ha – copper sulfate ($CuSO_4$) soil application for the copper deficient soils and for Perennial horticultural crops 3-5g/ litre – $CuSO_4$/plant as foliar application.
11. Apply borax 8-10 kg/ha in boron deficient soils and for Perennial horticultural crops as foliar application – 1g / litre.
12. Apply molybdenum – ammonium molybdate 200-250 gm/ha for Molybdenum deficient soils or dissolve 1g / litre ammonium molybdate for Foliar spray.
13. Soil sampling and testing needs to be done at every 2-3 years interval.

7. Land Suitability for Major Crops

7.1. Land Suitability for Sorghum



LAND SUITABILITY FOR SORGHUM

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	495 (6.73)
S2g	176 (2.4)
S2t	31 (0.42)
S2w	7 (0.09)
S2z	2711 (36.86)
S2gt	121 (1.65)
S2rg	23 (0.31)
S2rt	24 (0.32)
S2tz	92 (1.26)
S2zg	28 (0.38)
S3g	510 (6.94)
S3n	1530 (20.81)
S3r	75 (1.02)
S3rg	73 (0.99)
S3rz	997 (13.55)
N1g	34 (0.46)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

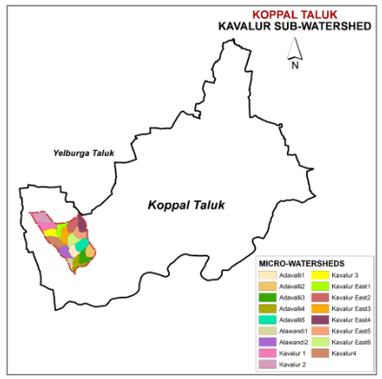
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

References
Streams/Drainage
Road/Cart track
Habitation
Waterbody
Village boundary
Micro-watershed boundary
Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.2. Land Suitability for Maize



LAND SUITABILITY FOR MAIZE

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalura
Kavalur 2
KAVALURA
Kavalura
Kavalur 1
S2tw
S1
S2zg
Kavalur East1
Kavalur East2
Kavalur East4
S2tz
Kavalur 3
S3n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
N1rz
Kavalur4
Gattareddyhala
Kavalur East6
N1r
Alavandi
S2t
Adavalli5
S3rz
Adavalli1
Alawandi2
S2g
Adavalli2
Betageri
S3g
Adavalli3
Marammanahalli
ALAVANDI
S3rg
S2rg
Alavandi
Kampli
S2gt
Alawandi1
S3r
Adavalli4
N1g
Marammanahalli
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	31 (0.42)
S2g	259 (3.52)
S2t	495 (6.73)
S2gt	39 (0.53)
S2rg	47 (0.63)
S2tw	7 (0.09)
S2tz	2711 (36.86)
S2zg	120 (1.63)
S3g	510 (6.94)
S3n	1530 (20.81)
S3r	75 (1.02)
S3rg	73 (0.99)
S3rz	997 (13.55)
N1g	34 (0.46)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

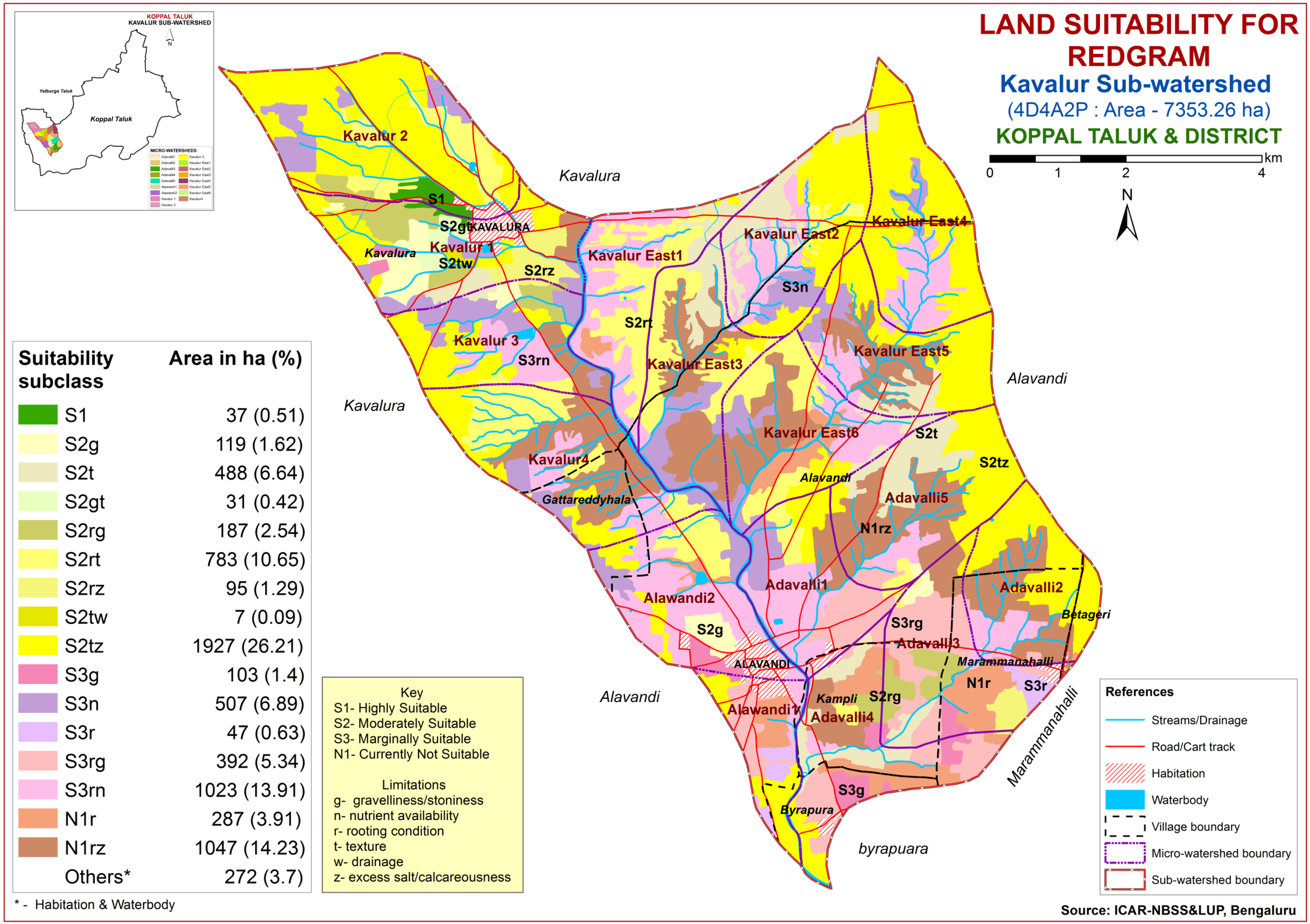
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

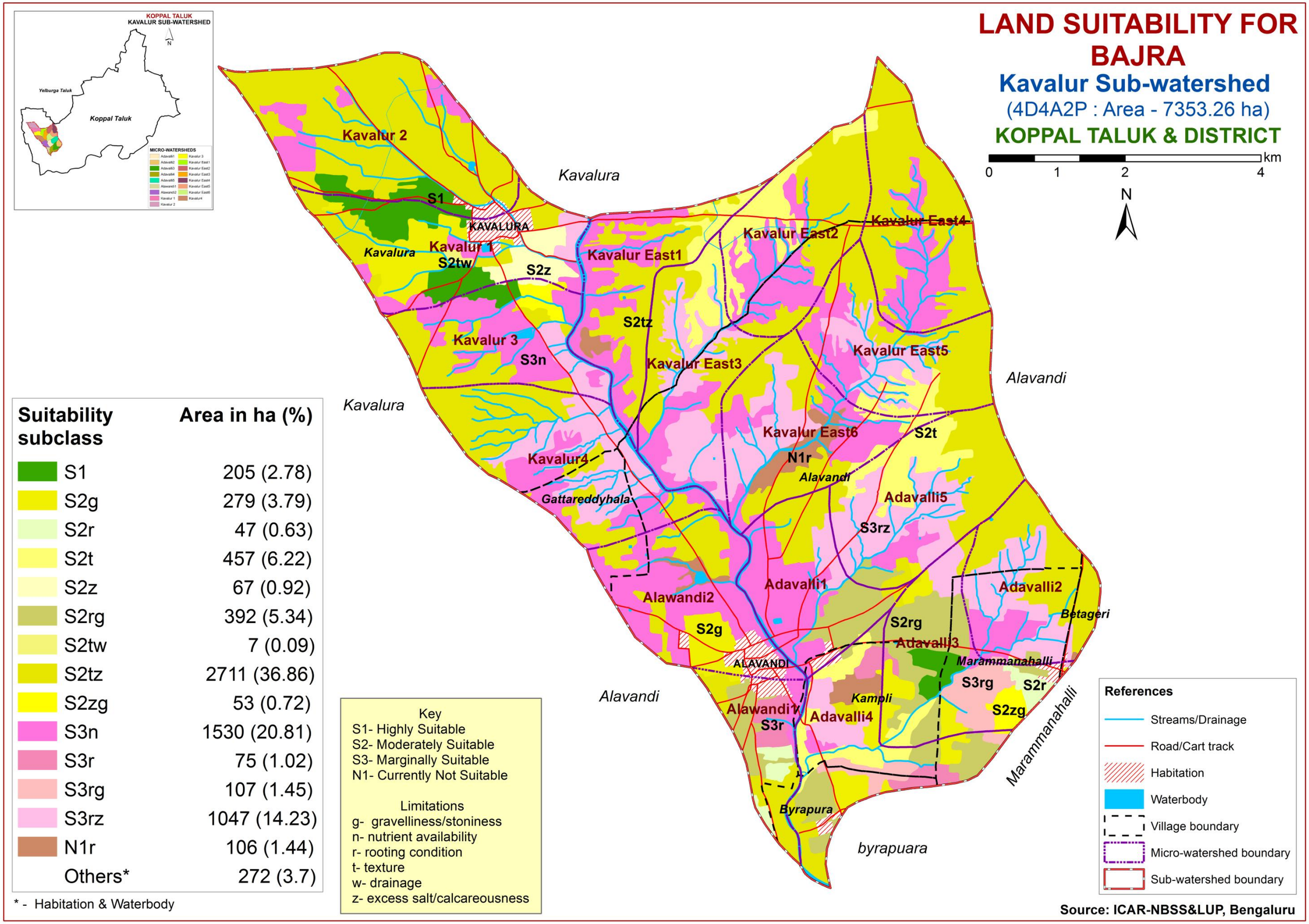
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

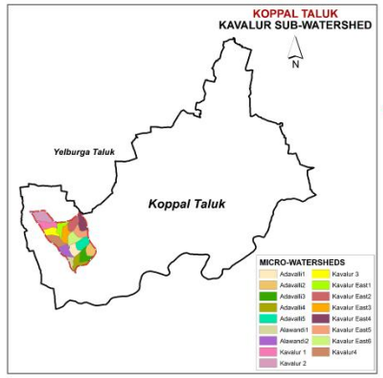
7.3. Land Suitability for Redgram



7.4. Land Suitability for Bajra



7.5. Land Suitability for Drumstick



LAND SUITABILITY FOR DRUMSTICK

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
KAVALURA
Kavalur 1
Kavalura
S2tw
S2rz
Kavalur East1
Kavalur East2
Kavalur East4
S3z
S2tz
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
S2t
Kavalur4
Alavandi
Gattareddyhala
Adavalli5
N1rz
Adavalli1
Adavalli2
Alawandi2
Betageri
S3rg
S2g
Adavalli3
S2r
Marammanahalli
ALAVANDI
N1r
Alavandi
Kampli
S2rg
S3r
Alawandi1
Adavalli4
Marammanahalli
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	101 (1.37)
S2g	127 (1.72)
S2r	123 (1.68)
S2t	457 (6.22)
S2rg	132 (1.8)
S2rz	92 (1.26)
S2tw	7 (0.09)
S2tz	119 (1.62)
S3r	76 (1.04)
S3z	2619 (35.62)
S3rg	363 (4.93)
N1n	1530 (20.81)
N1r	287 (3.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

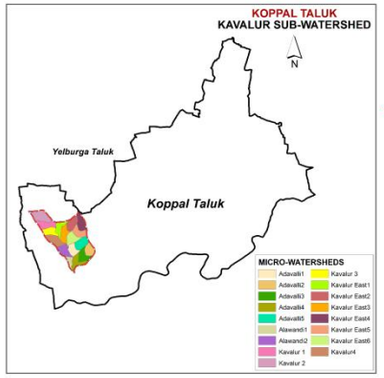
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.6. Land Suitability for Sunflower



LAND SUITABILITY FOR SUNFLOWER

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S2gt KAVALURA
Kavalur 1
S2w
S2t
Kavalura
Kavalur East1
Kavalur East2
Kavalur East4
S2rz
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
S1
S2z
Kavalur4
Gattareddyhala
Alavandi
Adavalli5
N1rz
Adavalli1
Alawandi2
S2g
Adavalli2
Betageri
S3rg
Adavalli3
ALAVANDI
Marammanahalli
N1r
S3r
Alavandi
Kampli
S2rg
Alawandi1
Adavalli4
Marammanahalli
S3g
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	495 (6.73)
S2g	104 (1.42)
S2t	31 (0.42)
S2w	7 (0.09)
S2z	1927 (26.21)
S2gt	31 (0.42)
S2rg	162 (2.21)
S2rz	903 (12.29)
S3g	118 (1.6)
S3r	47 (0.63)
S3rg	392 (5.34)
N1n	1530 (20.81)
N1r	287 (3.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

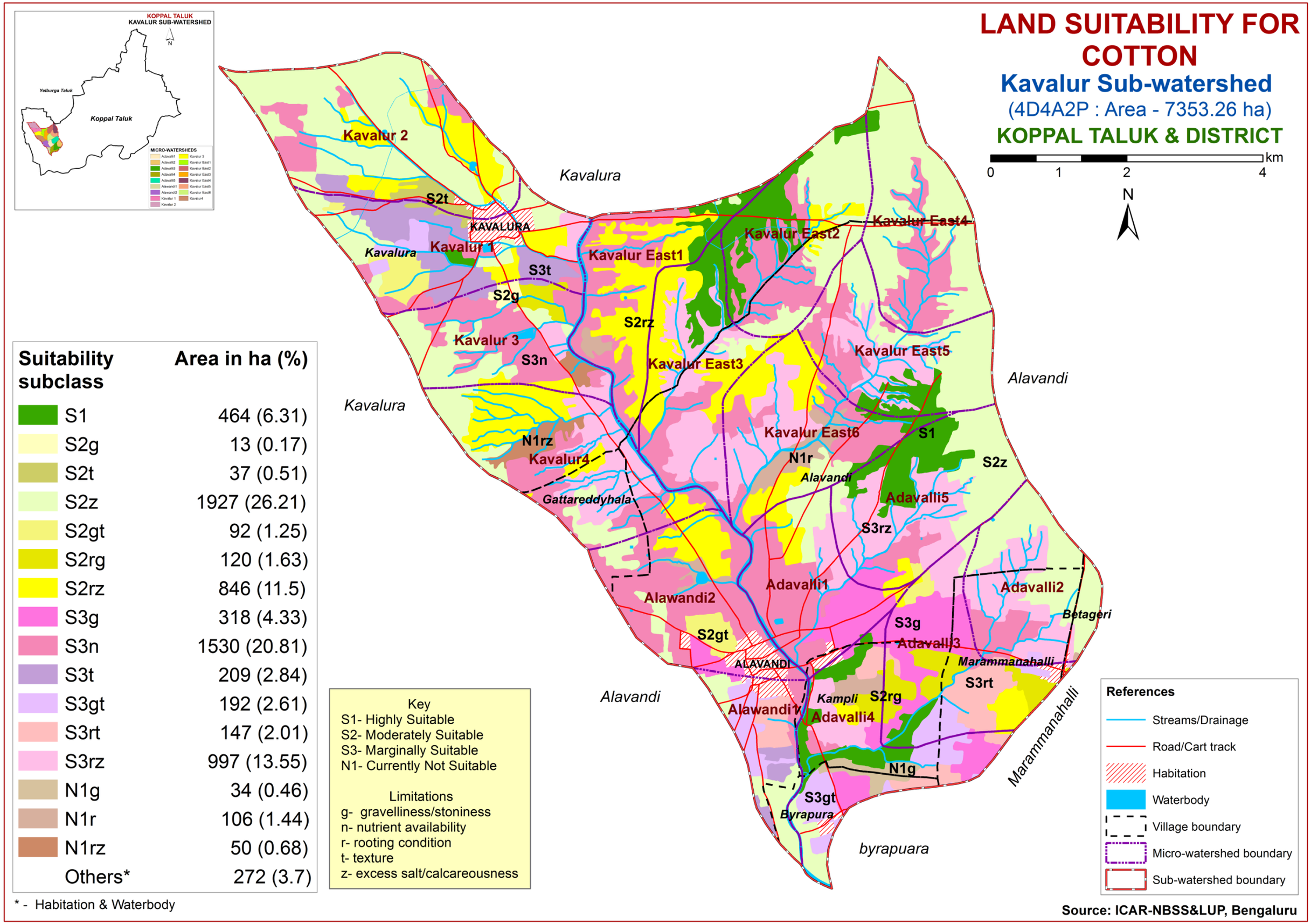
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

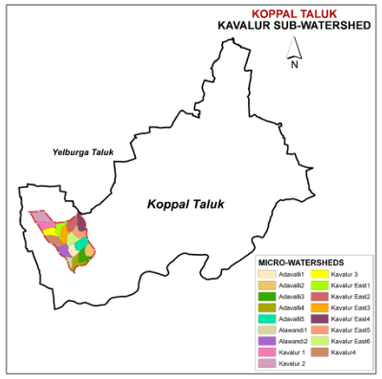
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.7. Land Suitability for Cotton



7.8. Land Suitability for Bengalgram



LAND SUITABILITY FOR BENGALGRAM

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S3t
KAVALURA
Kavalura
Kavalur 1
Kavalur East1
Kavalur East2
Kavalur East4
S2z
Kavalur 3
S3n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
N1rz
Kavalur4
Gattareddyhala
Kavalur East6
N1r
Alavandi
S1
Adavalli5
S3rz
Adavalli1
Alawandi2
Adavalli2
Betageri
S3gt
Adavalli3
ALAVANDI
Marammanahalli
S3rt
Alavandi
Alawandi1
Kampli
Adavalli4
S3tg
S3tz
Marammanahalli
N1g
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	464 (6.31)
S2z	2711 (36.86)
S3n	1530 (20.81)
S3t	598 (8.13)
S3gt	387 (5.26)
S3rt	147 (2.01)
S3rz	997 (13.55)
S3tg	30 (0.4)
S3tz	28 (0.38)
N1g	34 (0.46)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

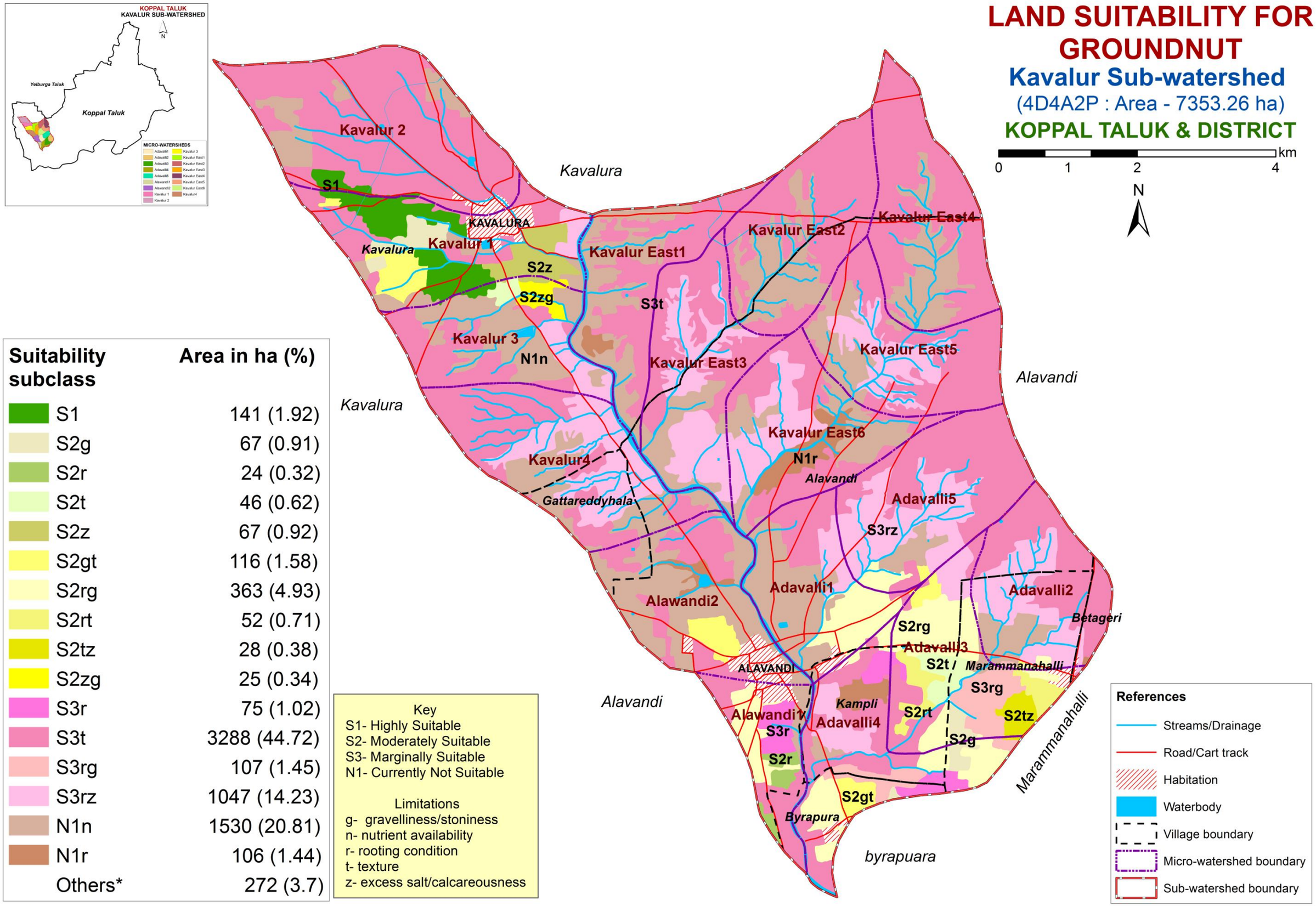
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

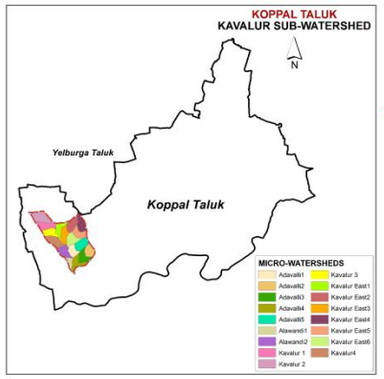
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.9. Land Suitability for Groundnut



7.10. Land Suitability for Chilli



LAND SUITABILITY FOR CHILLI

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
KAVALURA
Kavalura
Kavalur 1
S2tw
S2zg
Kavalur East1
Kavalur East2
Kavalur East4
S2tz
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
N1rz
Kavalur4
Kavalur East6
S2t
N1r
Alavandi
Gattareddyhala
Adavalli5
S3rz
Adavalli1
Adavalli2
Alawandi2
Betageri
S2g
S3g
Adavalli3
ALAVANDI
Marammanahalli
S3rg
S2rg
Alavandi
Kampli
Alawandi1
S3r
Adavalli4
N1g
Marammanahalli
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	69 (0.93)
S2g	297 (4.04)
S2t	457 (6.22)
S2rg	47 (0.63)
S2tw	7 (0.09)
S2tz	2711 (36.86)
S2zg	92 (1.26)
S3g	538 (7.32)
S3r	75 (1.02)
S3rg	73 (0.99)
S3rz	997 (13.55)
N1g	34 (0.46)
N1n	1530 (20.81)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

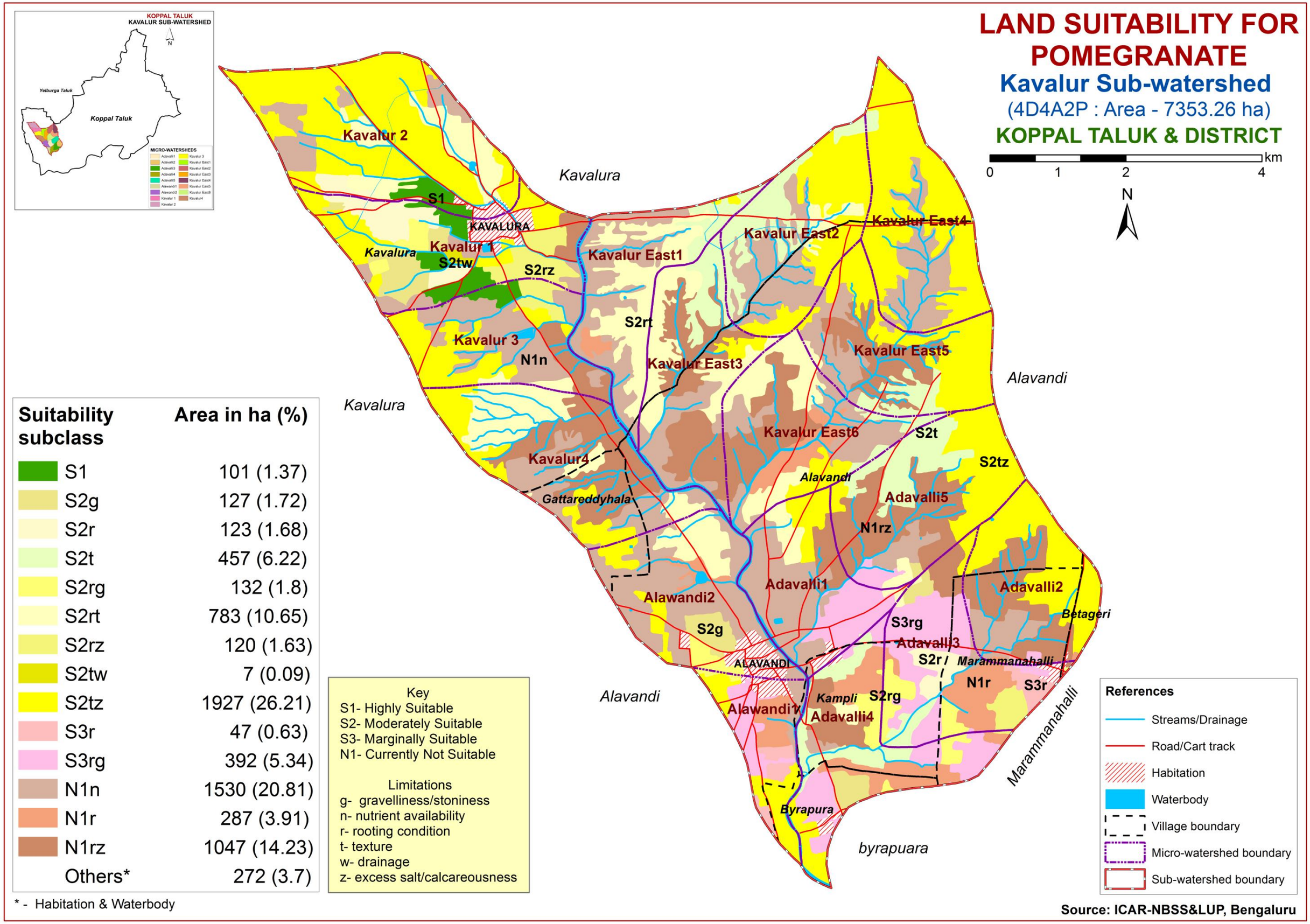
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

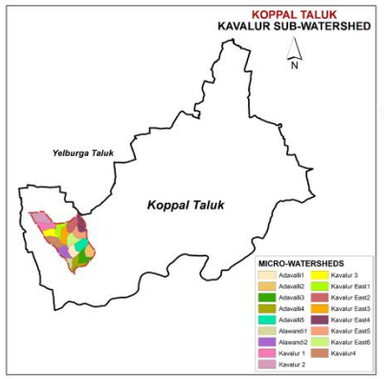
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.11. Land Suitability for Pomegranate



7.12. Land Suitability for Tomato



LAND SUITABILITY FOR TOMATO

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
KAVALURA
Kavalura
Kavalur 1
S2zg
Kavalur East1
Kavalur East2
Kavalur East4
S3t
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
N1rz
Kavalur4
Kavalur East6
N1r
Alavandi
Gattareddyhala
Adavalli5
S3rz
Adavalli1
Alawandi2
Adavalli2
Betageri
S2g
S3g
Adavalli3
ALAVANDI
Marammanahalli
S3rg
S2rg
Alavandi
Kampli
Alawandi1
S3r
Adavalli4
Marammanahalli
N1g
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	69 (0.93)
S2g	297 (4.04)
S2rg	47 (0.63)
S2zg	92 (1.26)
S3g	538 (7.32)
S3r	75 (1.02)
S3t	3174 (43.17)
S3rg	73 (0.99)
S3rz	997 (13.55)
N1g	34 (0.46)
N1n	1530 (20.81)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

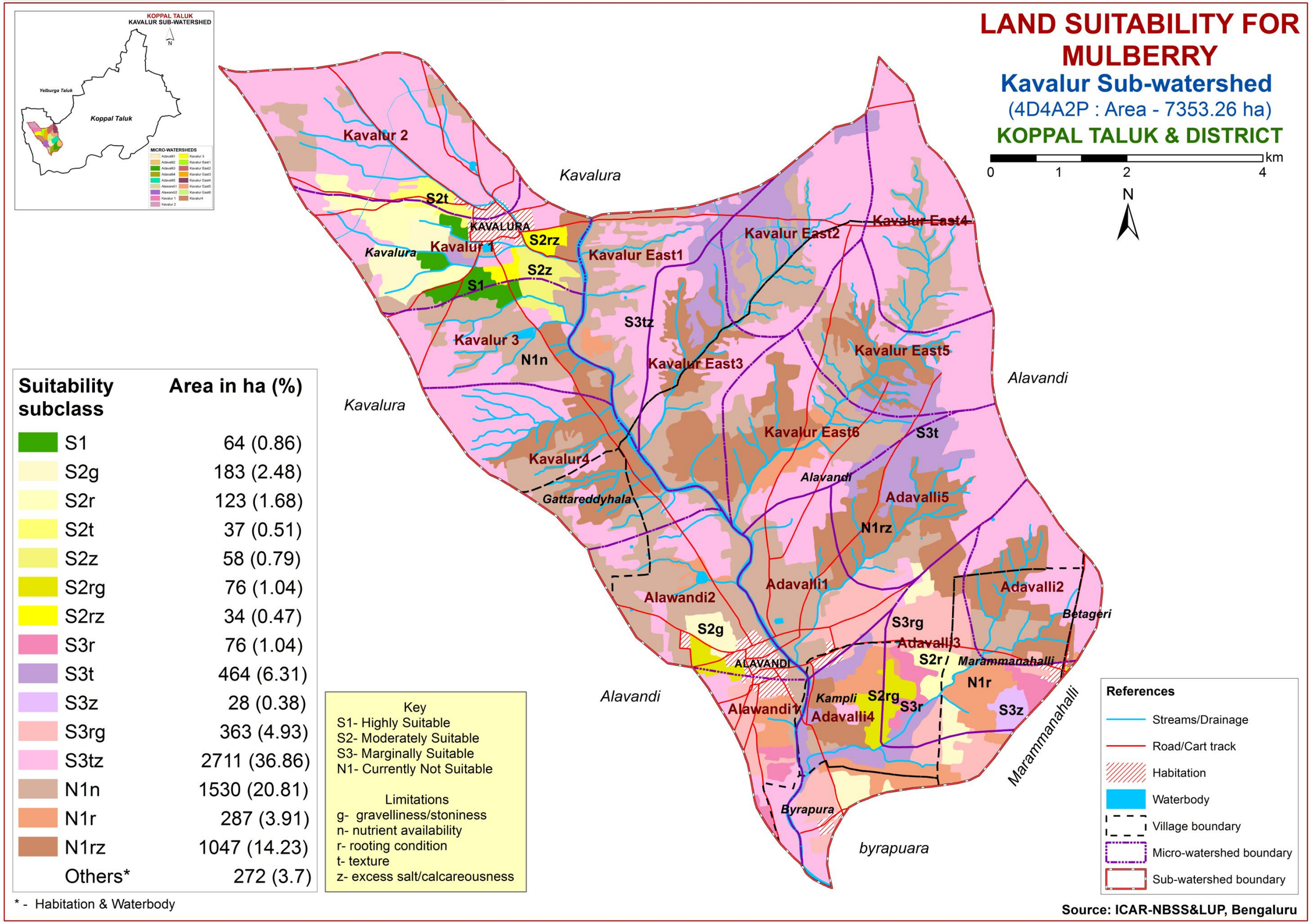
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

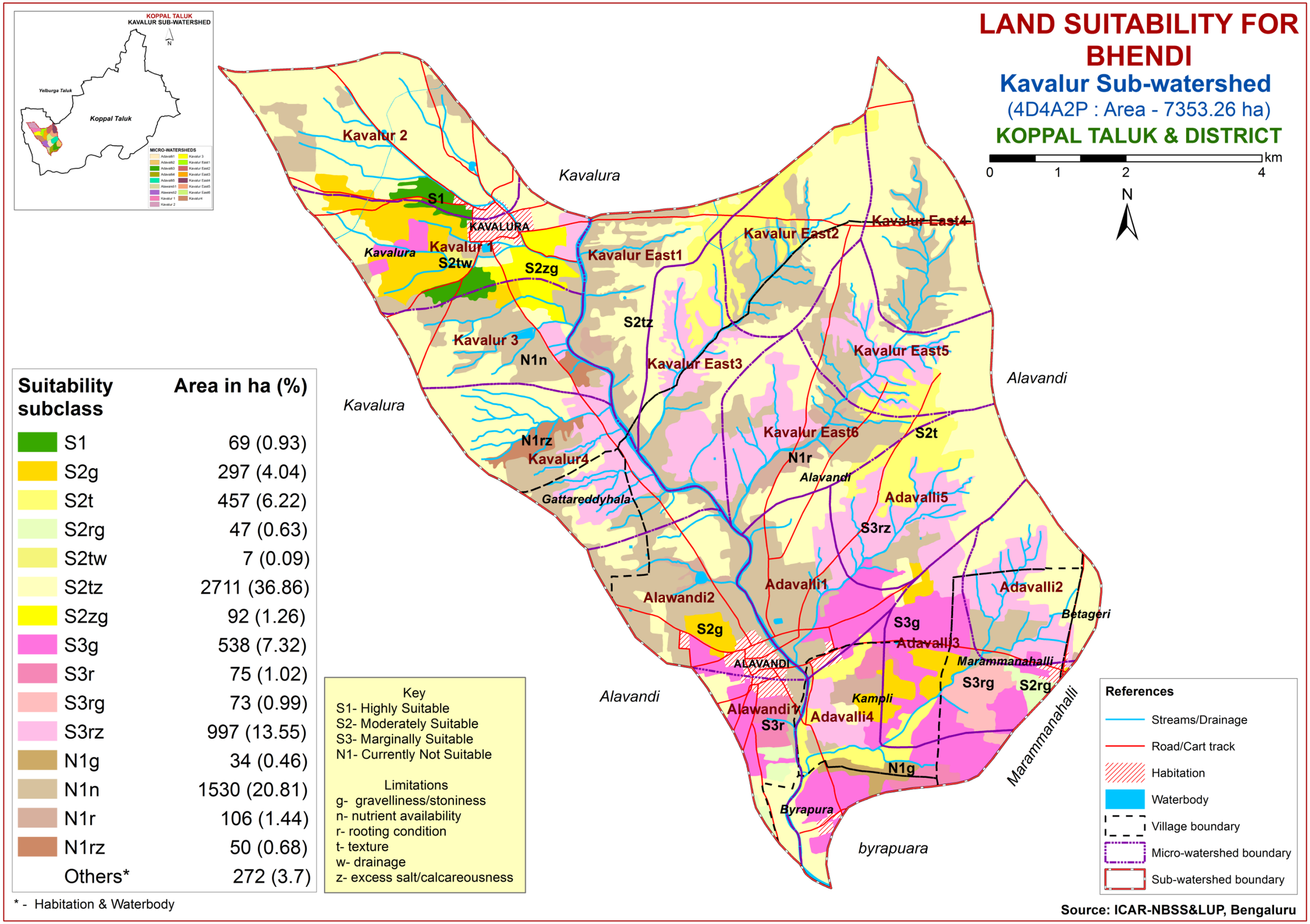
Source: ICAR-NBSS&LUP, Bengaluru

7.13. Land Suitability for Mulberry

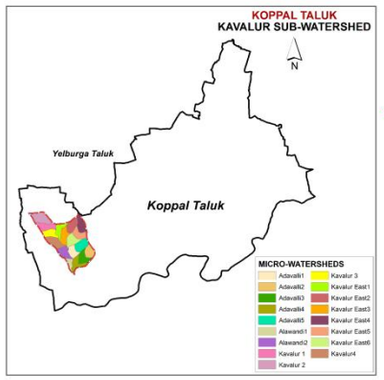


NOTE: Mulberry suitability evaluation only for mulberry leaf, not for silkworm rearing

7.14. Land Suitability for Bhendi



7.15. Land Suitability for Guava



LAND SUITABILITY FOR GUAVA

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
KAVALURA
Kavalura
Kavalur 1
S2rz
Kavalur East1
Kavalur East2
Kavalur East4
S3tz
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
S3t
Kavalur4
Alavandi
Gattareddyhala
Adavalli5
N1rz
Adavalli1
Alawandi2
Adavalli2
Betageri
S2g
S3rg
Adavalli3
ALAVANDI
S2r
Marammanahalli
N1r
S3r
Alavandi
Kampli
S2rg
Alawandi1
Adavalli4
S3z
Marammanahalli
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	101 (1.37)
S2g	127 (1.72)
S2r	123 (1.68)
S2rg	132 (1.8)
S2rz	92 (1.26)
S3r	47 (0.63)
S3t	464 (6.31)
S3z	28 (0.38)
S3rg	392 (5.34)
S3tz	2711 (36.86)
N1n	1530 (20.81)
N1r	287 (3.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

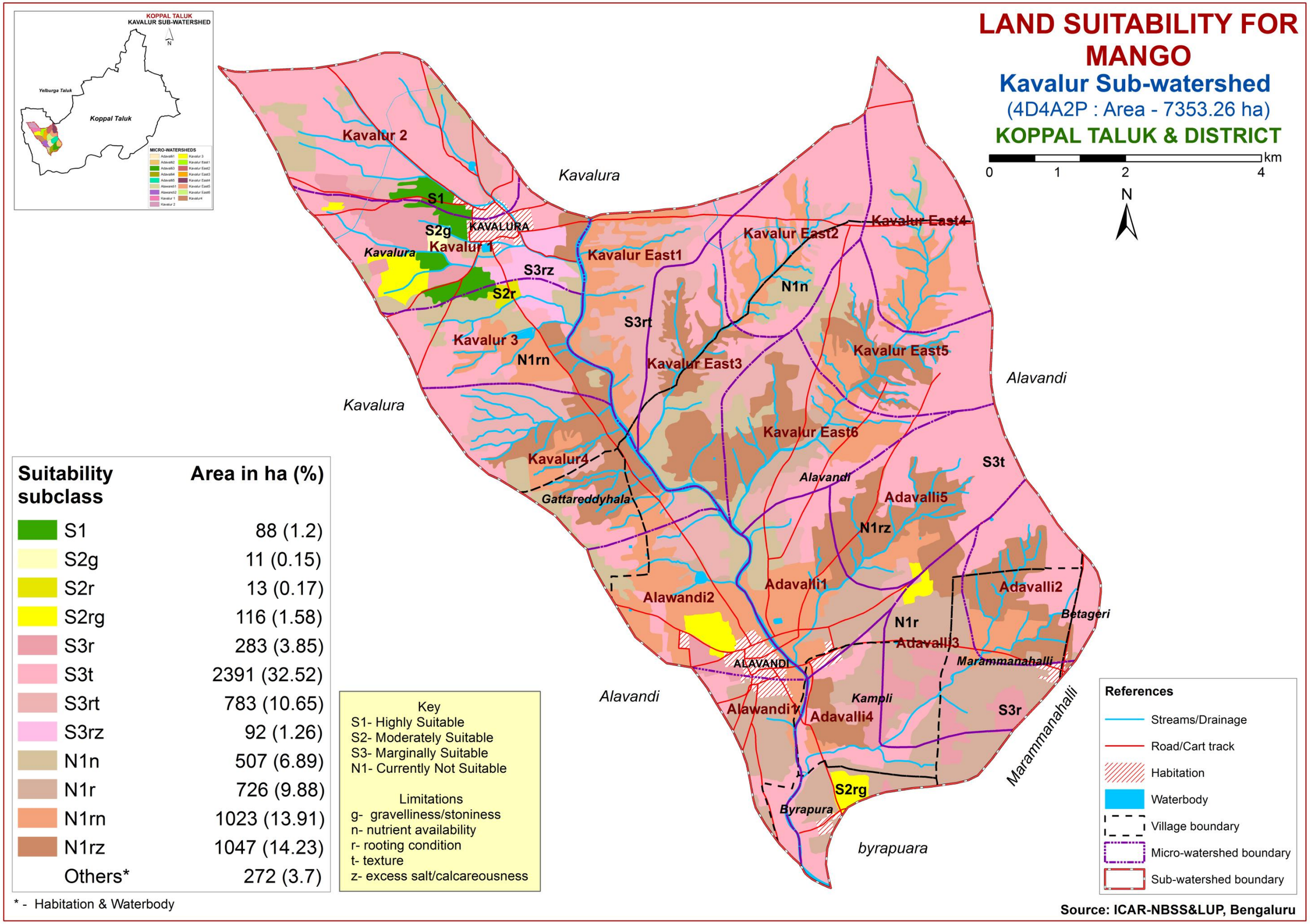
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

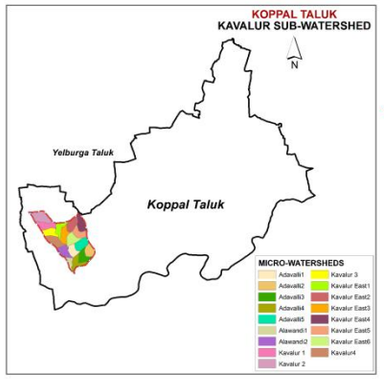
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.16. Land Suitability for Mango



7.17. Land Suitability for Sapota



LAND SUITABILITY FOR SAPOTA

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
KAVALURA
Kavalura
Kavalur 1
S2rz
Kavalur East1
Kavalur East2
Kavalur East4
S3t
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
Kavalur4
Alavandi
Gattareddyhala
Adavalli5
N1rz
Adavalli1
Alawandi2
Adavalli2
Betageri
S2g
S3rg
Adavalli3
S2r
Marammanahalli
ALAVANDI
N1r
S3r
Alavandi
Kampli
S2rg
Alawandi1
Adavalli4
Marammanahalli
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	101 (1.37)
S2g	127 (1.72)
S2r	123 (1.68)
S2rg	132 (1.8)
S2rz	120 (1.63)
S3r	47 (0.63)
S3t	3174 (43.17)
S3rg	392 (5.34)
N1n	1530 (20.81)
N1r	287 (3.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

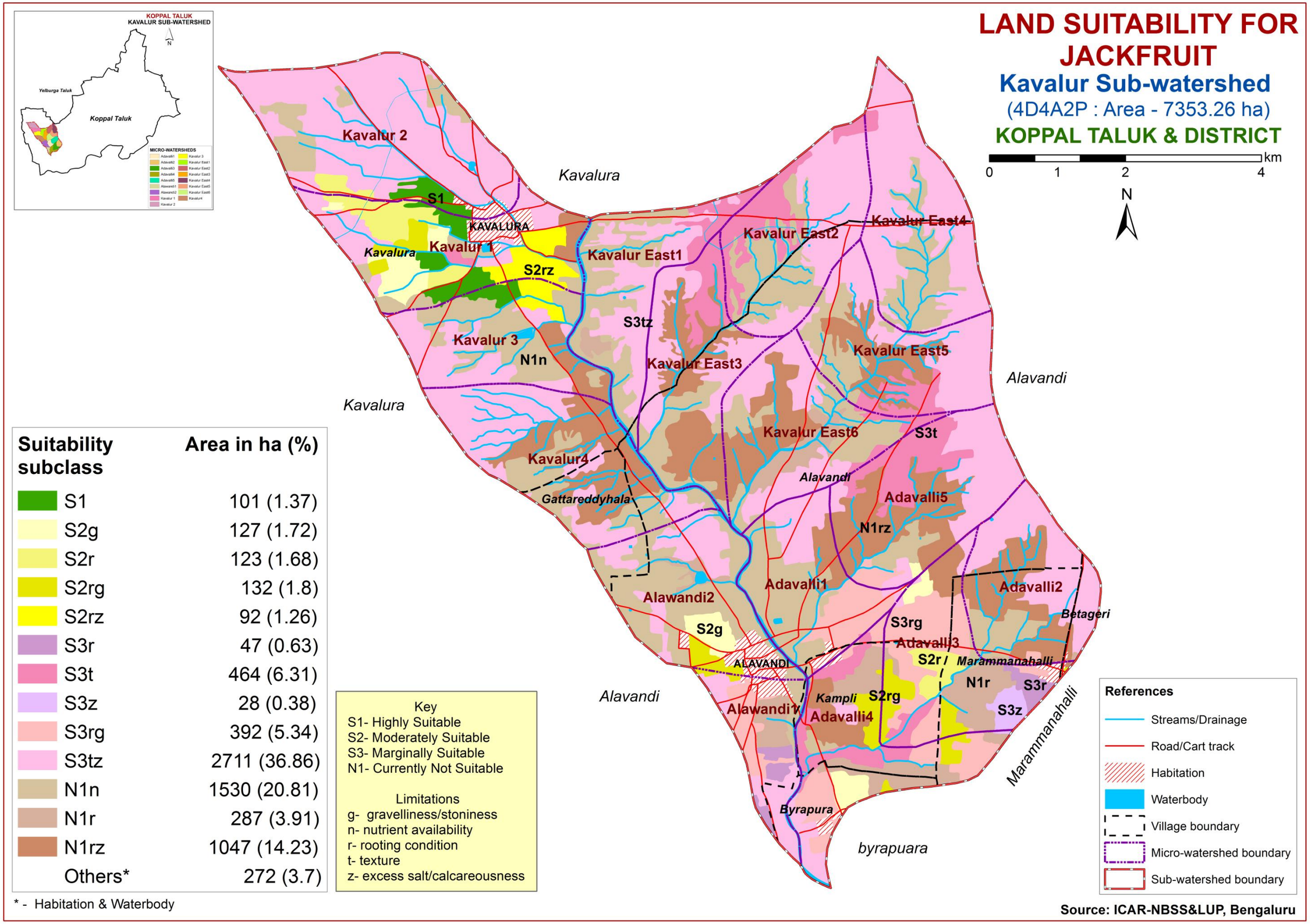
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

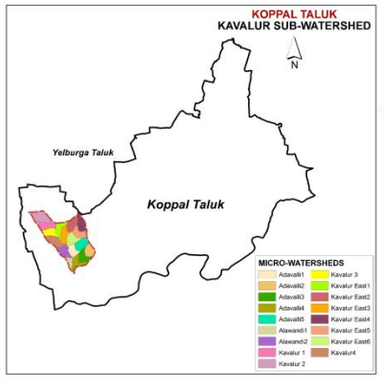
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.18. Land Suitability for Jackfruit



7.19. Land Suitability for Jamun



LAND SUITABILITY FOR JAMUN

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
S2g
KAVALURA
Kavalur 1
Kavalura
S2tw
S2r
Kavalur East1
Kavalur East2
Kavalur East4
S3rz
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
S2t
S3z
Kavalur4
Alavandi
Gattareddyhala
Adavalli5
N1rz
Adavalli1
Alawandi2
Adavalli2
Betageri
S3rg
Adavalli3
Marammanahalli
ALAVANDI
N1r
Alavandi
Kampli
Alawandi1
Adavalli4
S3r
Marammanahalli
S2rg
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	88 (1.2)
S2g	11 (0.15)
S2r	13 (0.17)
S2t	457 (6.22)
S2rg	116 (1.58)
S2tw	7 (0.09)
S3r	330 (4.49)
S3z	1927 (26.21)
S3rg	392 (5.34)
S3rz	876 (11.91)
N1n	1530 (20.81)
N1r	287 (3.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

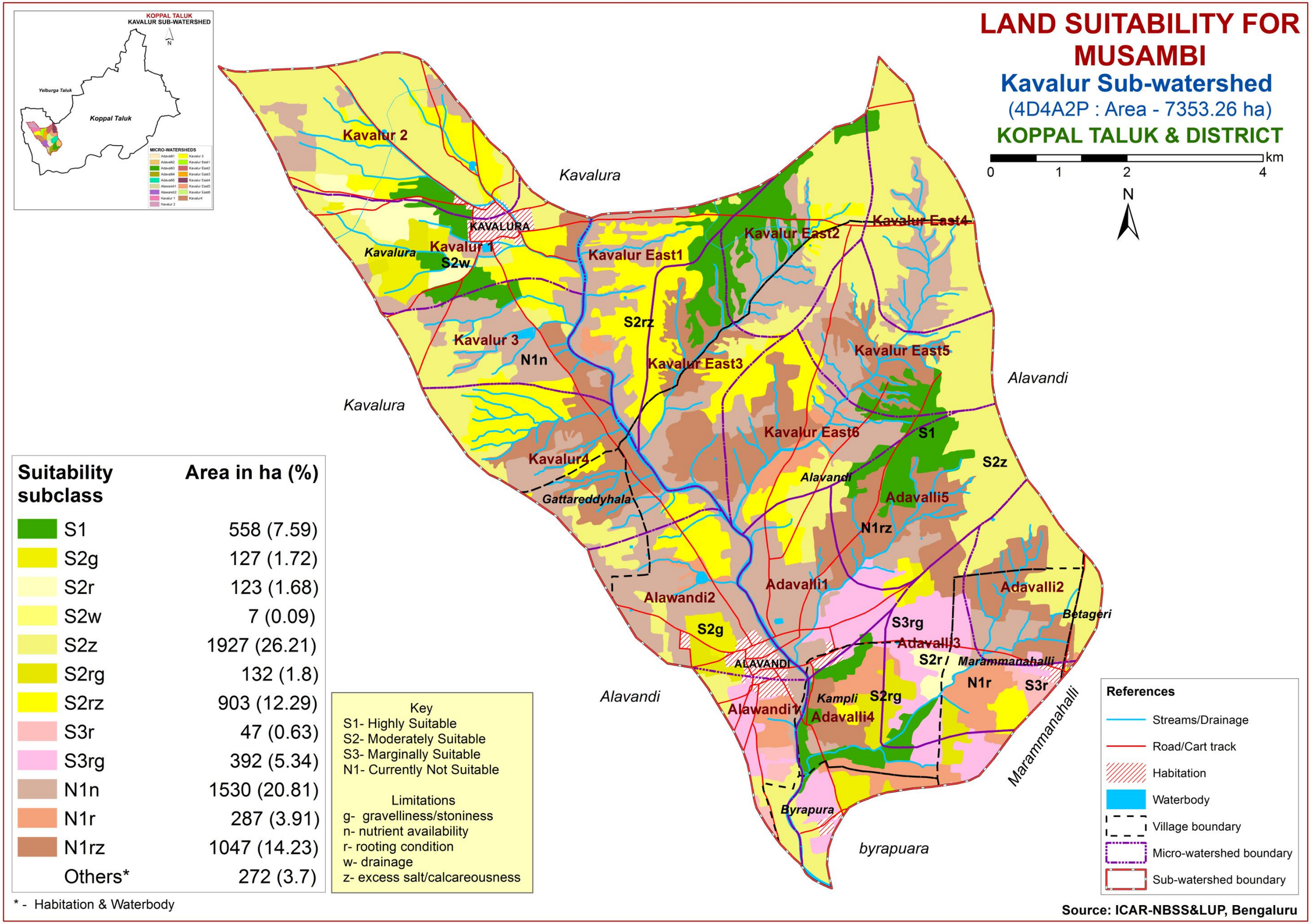
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

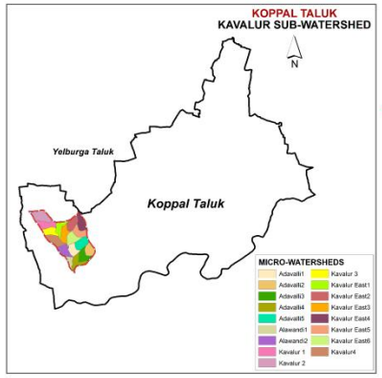
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.20. Land Suitability for Musambi



7.21. Land Suitability for Lime

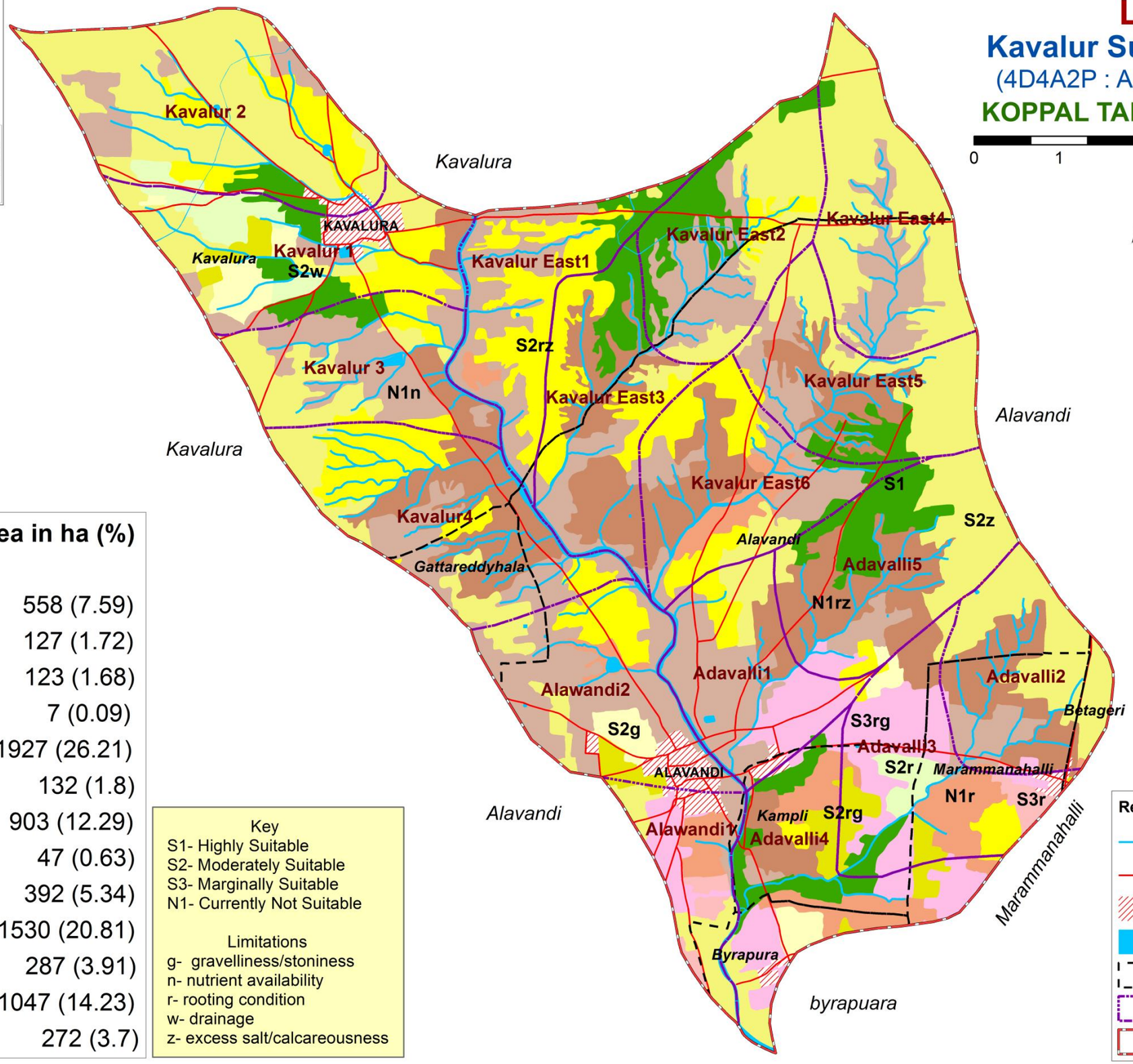


LAND SUITABILITY FOR LIME

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT



Suitability subclass	Area in ha (%)
S1	558 (7.59)
S2g	127 (1.72)
S2r	123 (1.68)
S2w	7 (0.09)
S2z	1927 (26.21)
S2rg	132 (1.8)
S2rz	903 (12.29)
S3r	47 (0.63)
S3rg	392 (5.34)
N1n	1530 (20.81)
N1r	287 (3.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

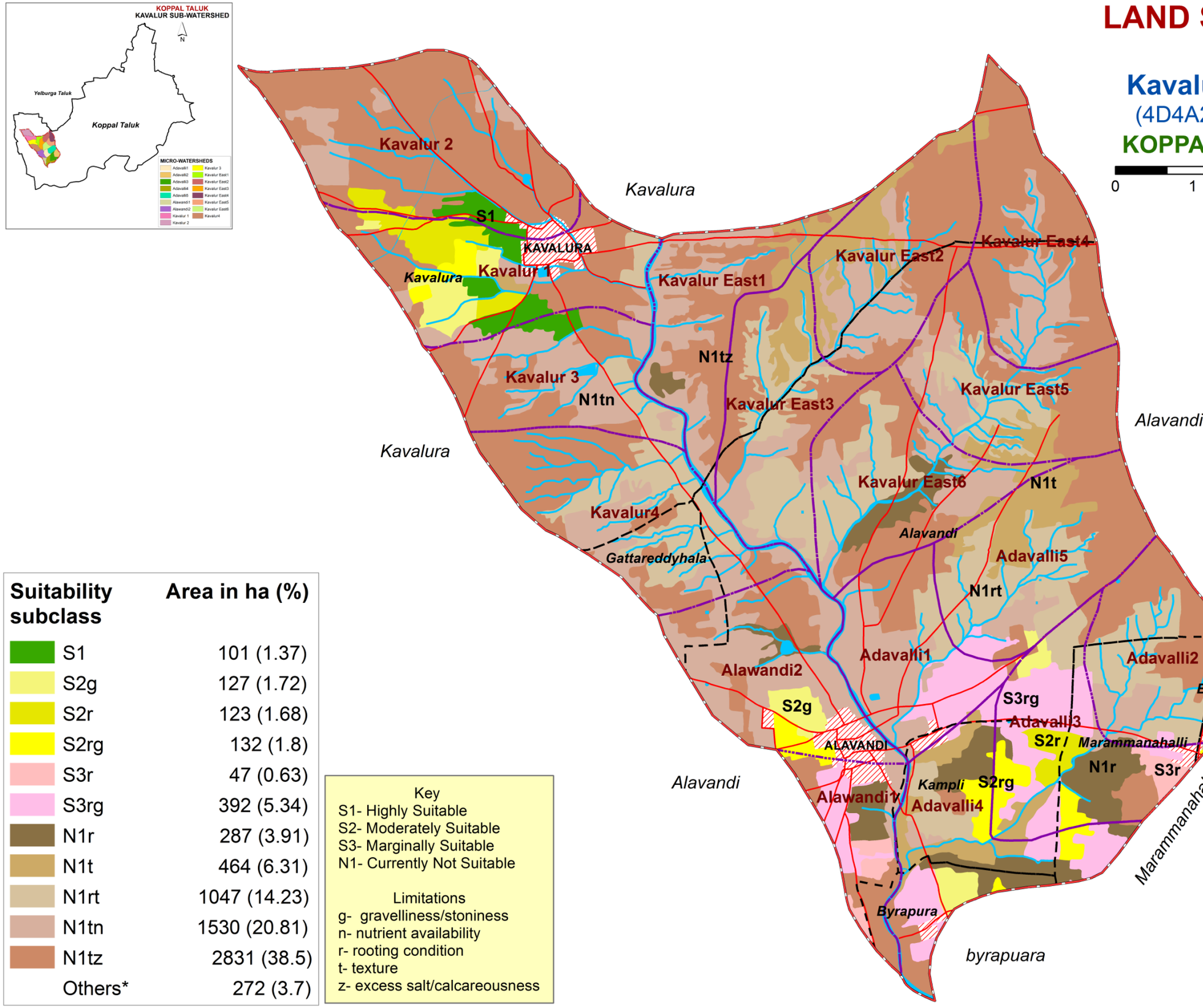
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.22. Land Suitability for Cashew



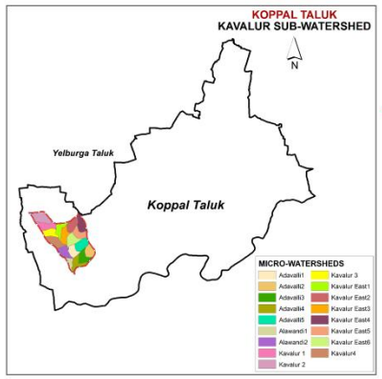
Suitability subclass	Area in ha (%)
S1	101 (1.37)
S2g	127 (1.72)
S2r	123 (1.68)
S2rg	132 (1.8)
S3r	47 (0.63)
S3rg	392 (5.34)
N1r	287 (3.91)
N1t	464 (6.31)
N1rt	1047 (14.23)
N1tn	1530 (20.81)
N1tz	2831 (38.5)
Others*	272 (3.7)

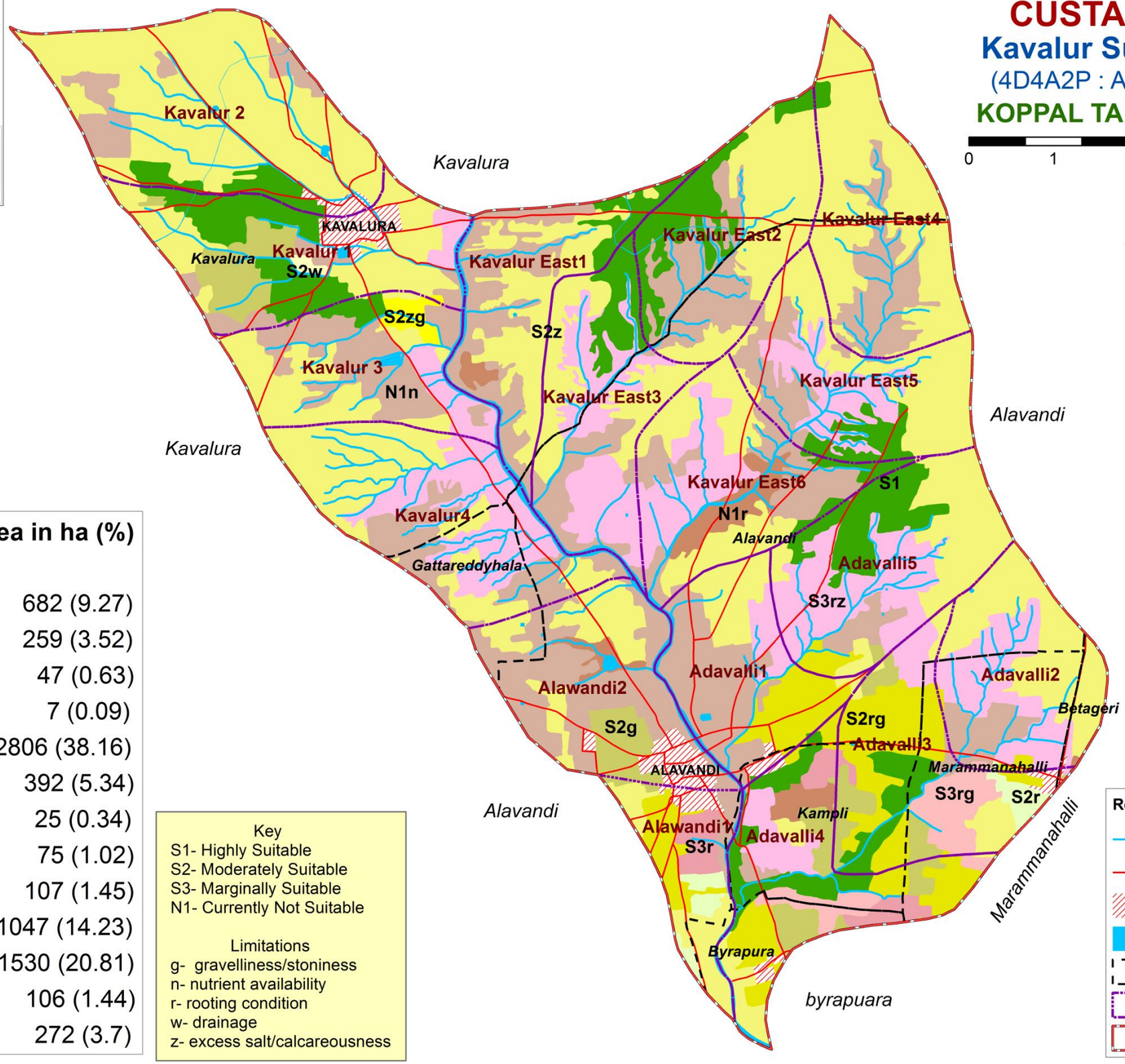
* - Habitation & Waterbody

Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

7.23. Land Suitability for Custard Apple





LAND SUITABILITY FOR CUSTARD APPLE

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	682 (9.27)
S2g	259 (3.52)
S2r	47 (0.63)
S2w	7 (0.09)
S2z	2806 (38.16)
S2rg	392 (5.34)
S2zg	25 (0.34)
S3r	75 (1.02)
S3rg	107 (1.45)
S3rz	1047 (14.23)
N1n	1530 (20.81)
N1r	106 (1.44)
Others*	272 (3.7)

* - Habitation & Waterbody

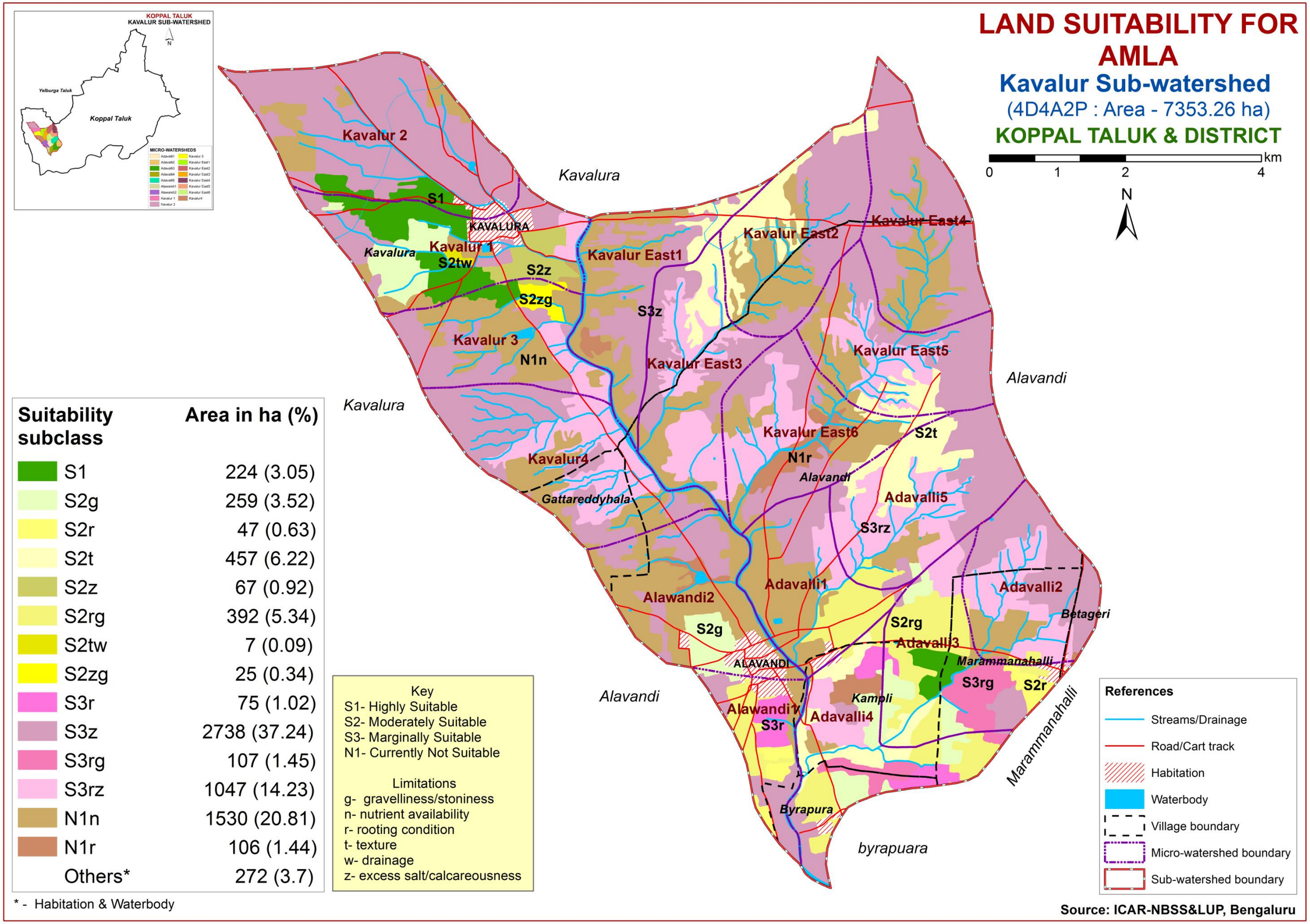
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

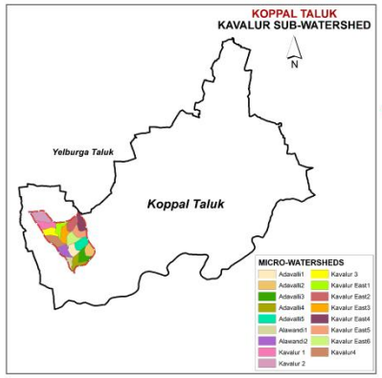
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.24. Land Suitability for Amla



7.25. Land Suitability for Tamarind



LAND SUITABILITY FOR TAMARIND

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalur 2
Kavalura
S1
S2g
KAVALURA
Kavalur 1
Kavalura
S3t
S2r
Kavalur East1
Kavalur East2
Kavalur East4
N1n
S3rz
Kavalur 3
N1rn
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
S2t
S3z
Kavalur4
Alavandi
Gattareddyhala
Adavalli5
N1rz
Adavalli1
Adavalli2
Alawandi2
Betageri
N1r
Adavalli3
ALAVANDI
Marammanahalli
Alavandi
Kampli
Alawandi1
Adavalli4
S3r
Marammanahalli
S2rg
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	88 (1.2)
S2g	11 (0.15)
S2r	13 (0.17)
S2t	457 (6.22)
S2rg	116 (1.58)
S3r	283 (3.85)
S3t	7 (0.09)
S3z	1927 (26.21)
S3rz	876 (11.91)
N1n	507 (6.89)
N1r	726 (9.88)
N1rn	1023 (13.91)
N1rz	1047 (14.23)
Others*	272 (3.7)

* - Habitation & Waterbody

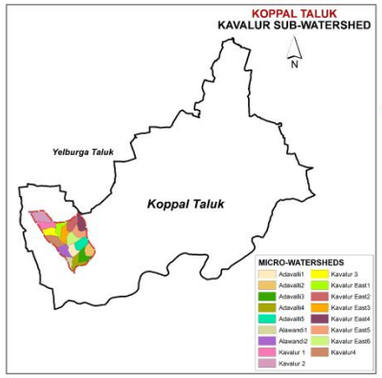
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7.26. Land Suitability for Brinjal



LAND SUITABILITY FOR BRINJAL

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalura
Alavandi
Gattareddyhala
Byrapura
byrapuara
Marammanahalli
Betageri
Kampli
KAVALURA
ALAVANDI

Kavalur 2
S1
Kavalur 1
S2tw
S2zg
Kavalur East1
Kavalur East2
Kavalur East4
S3t
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Kavalur East6
N1r
N1rz
Kavalur4
Adavalli5
S3rz
Adavalli1
Alawandi2
S2g
Adavalli2
S3g
Adavalli3
S3rg
S2rg
Alawandi1
S3r
Adavalli4
N1g

Suitability subclass	Area in ha (%)
S1	69 (0.93)
S2g	297 (4.04)
S2rg	47 (0.63)
S2tw	7 (0.09)
S2zg	92 (1.26)
S3g	538 (7.32)
S3r	75 (1.02)
S3t	3168 (43.08)
S3rg	73 (0.99)
S3rz	997 (13.55)
N1g	34 (0.46)
N1n	1530 (20.81)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

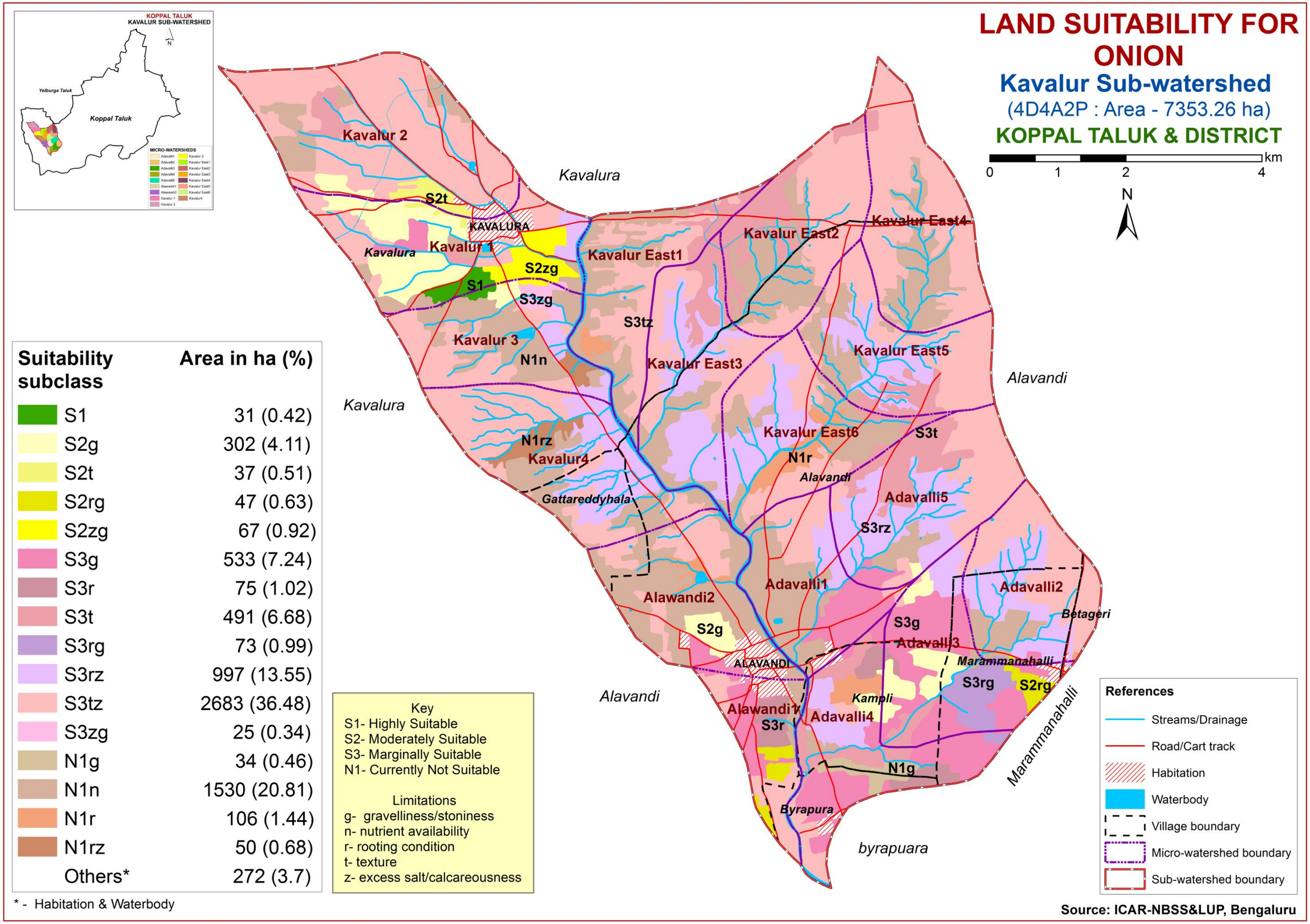
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

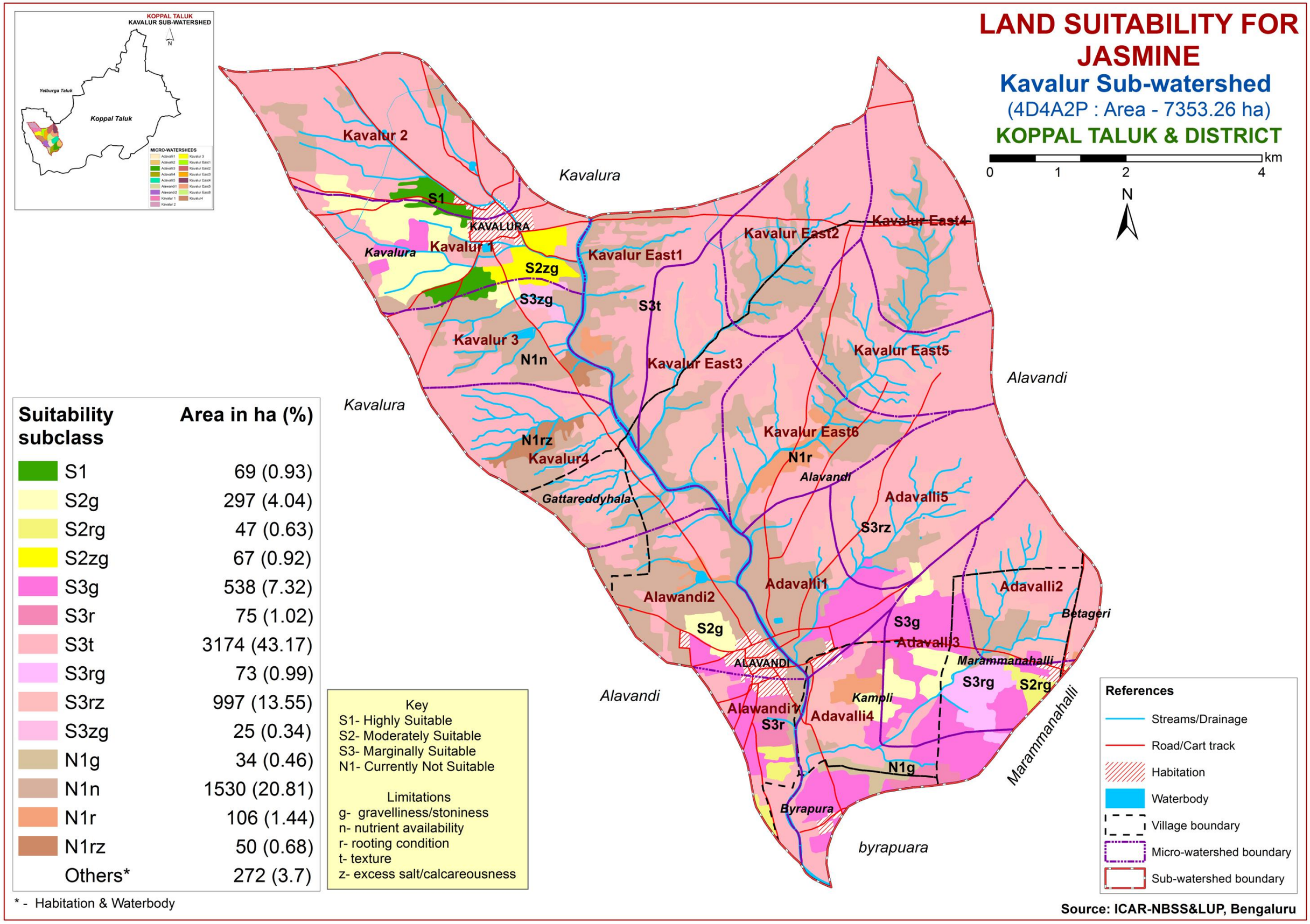
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

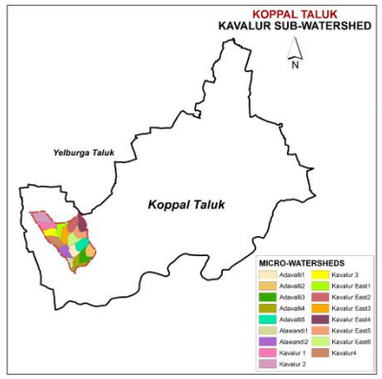
7.27. Land Suitability for Onion



7.28. Land Suitability for Jasmine



7.29. Land Suitability for Crossandra



LAND SUITABILITY FOR CROSSANDRA

Kavalur Sub-watershed

(4D4A2P : Area - 7353.26 ha)

KOPPAL TALUK & DISTRICT

0 1 2 4 km

N

Kavalura
Kavalur 2
S1
KAVALURA
Kavalura
Kavalur 1
S2rz
S3zg
Kavalur East1
Kavalur East2
Kavalur East4
S3t
Kavalur 3
N1n
Kavalur East3
Kavalur East5
Alavandi
Kavalura
Kavalur East6
N1rz
Kavalur4
N1r
Alavandi
Gattareddyhala
Adavalli5
S3rz
Adavalli1
Adavalli2
Alawandi2
Betageri
S2g
S3g
Adavalli3
ALAVANDI
Marammanahalli
S3rg
S2rg
Alavandi
Kampli
Alawandi1
S3r
Adavalli4
N1g
Marammanahalli
Byrapura
byrapuara

Suitability subclass	Area in ha (%)
S1	69 (0.93)
S2g	297 (4.04)
S2rg	47 (0.63)
S2rz	67 (0.92)
S3g	538 (7.32)
S3r	75 (1.02)
S3t	3174 (43.17)
S3rg	73 (0.99)
S3rz	997 (13.55)
S3zg	25 (0.34)
N1g	34 (0.46)
N1n	1530 (20.81)
N1r	106 (1.44)
N1rz	50 (0.68)
Others*	272 (3.7)

* - Habitation & Waterbody

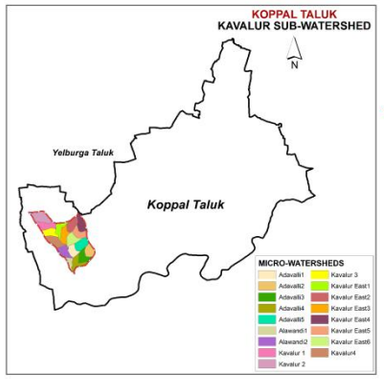
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

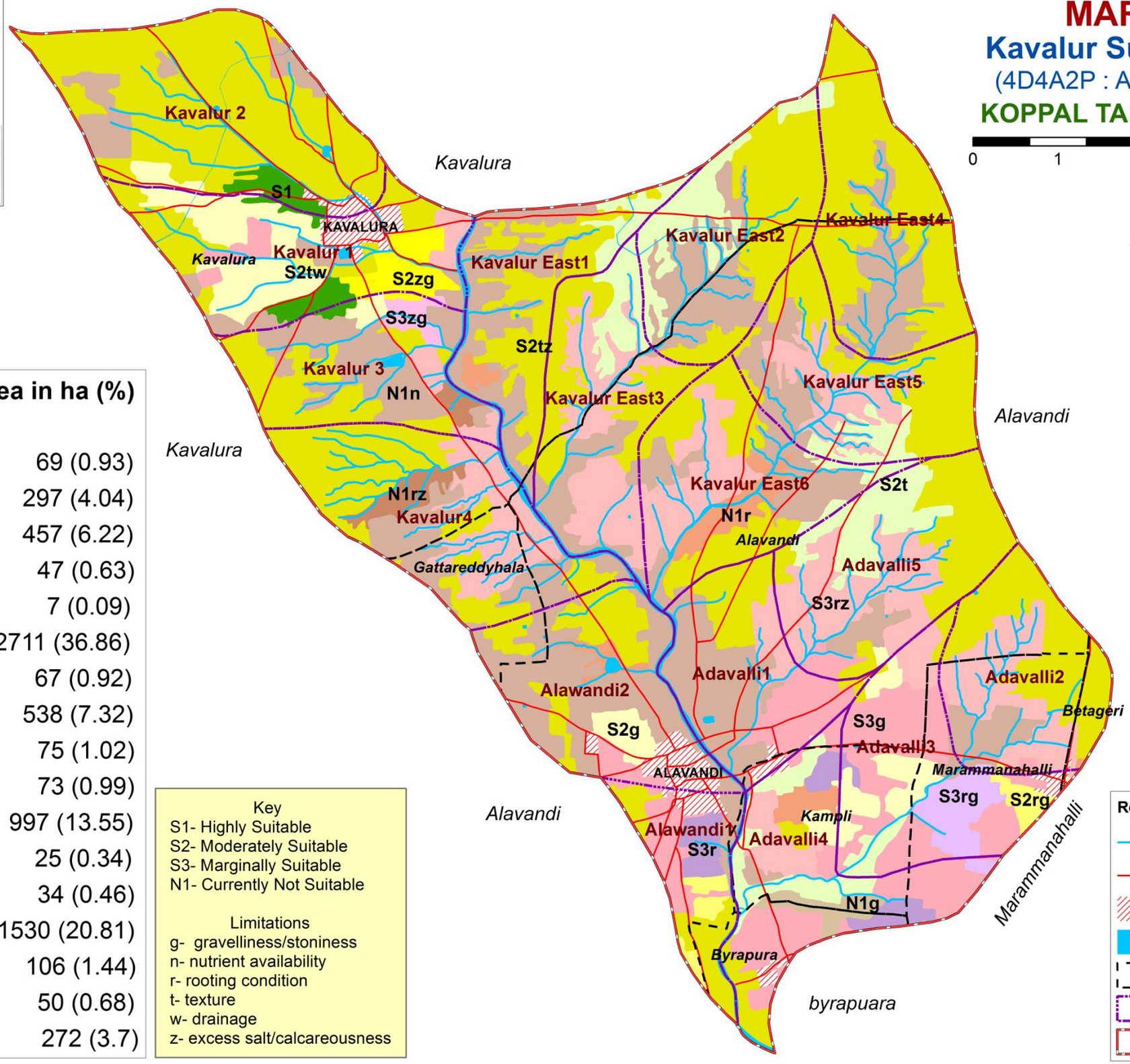
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

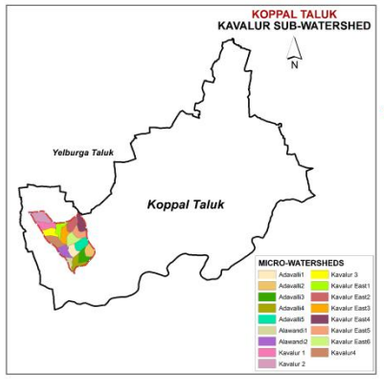
Source: ICAR-NBSS&LUP, Bengaluru

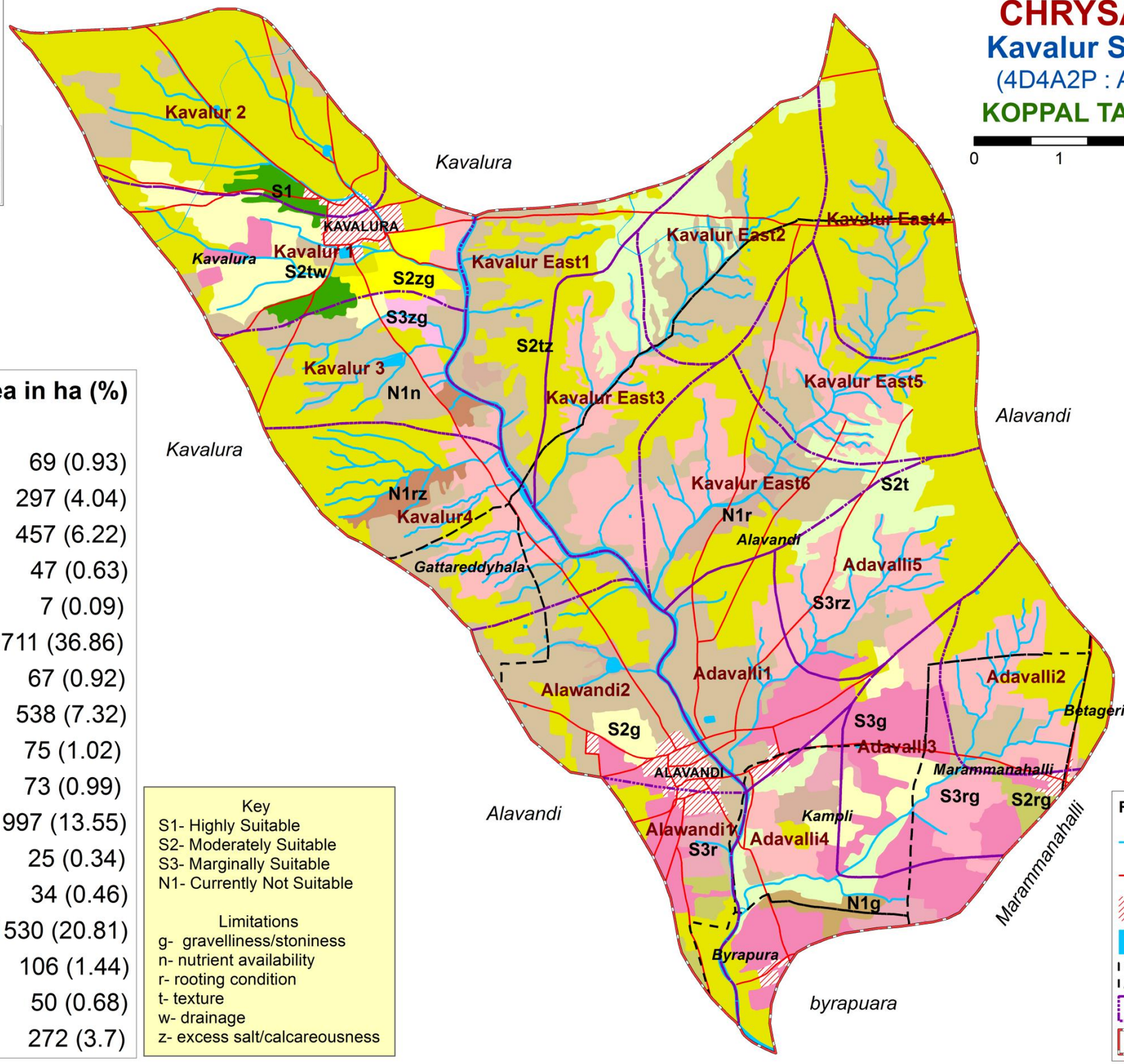
7.30. Land Suitability for Marigold





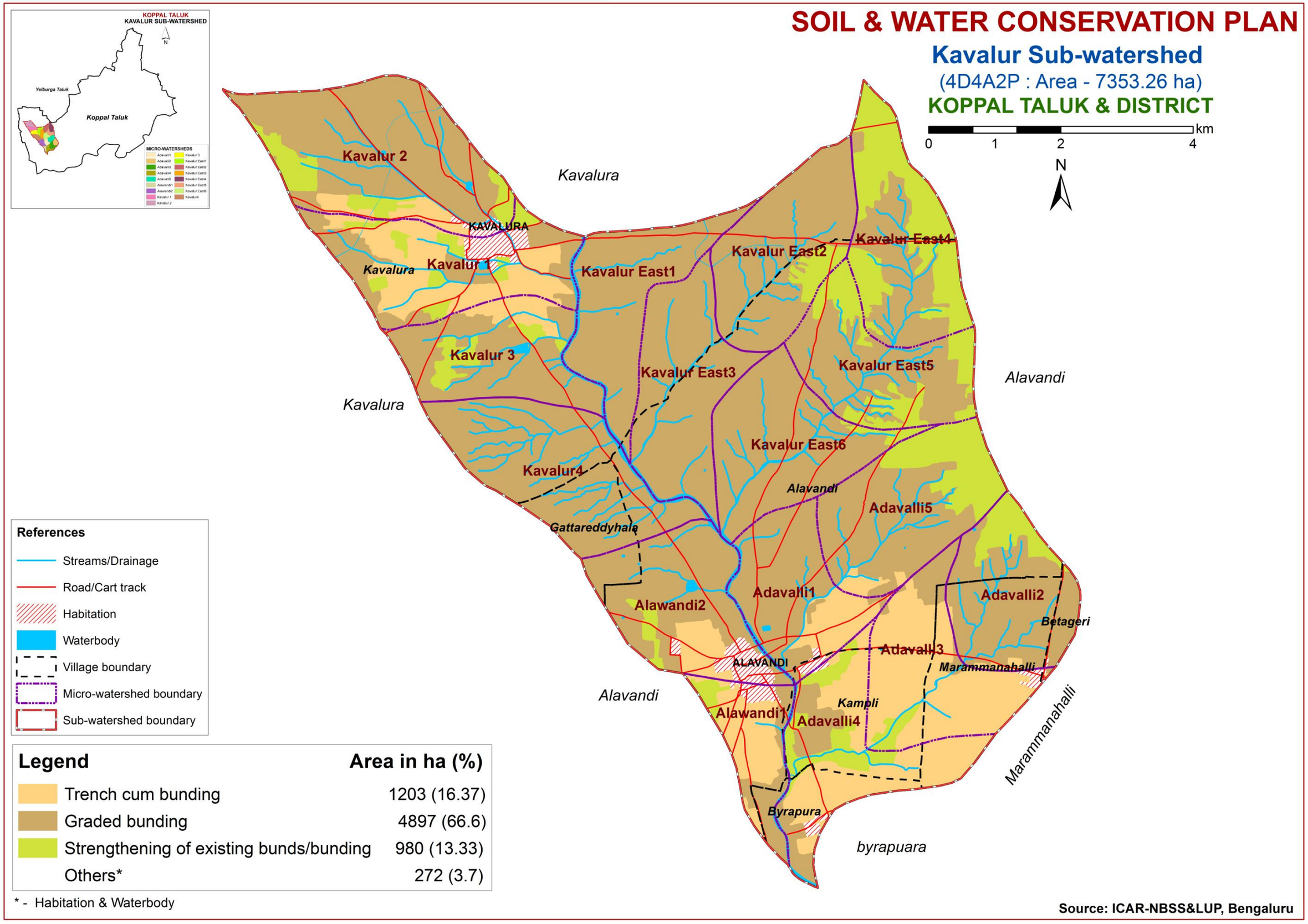
7.31. Land Suitability for Chrysanthemum





8. Soil and Water Conservation Measures

8.1. Soil & Water Conservation Plan



10.Table. Proposed Crop Plan for Kavalur Sub-watershed, Alavandi hobli, Koppal taluk, Koppal district based on soil-site–crop suitability assessment

LMU. No	Soil Map Units	Field Crops/Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	447.TSDmB2 (Very deep, lowland clay soils)	Maize, Sorghum, Groundnut, Sunflower, Bajra, Red gram, Mulberry	**Fruit crops**: Amla, Tamarind **Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal **Flowers:** Marigold, Chrysanthemum**,** Jasmine, Crossandra	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices
2	344 DRLmA1 348 DRLmB1 349 DRLmB1g1 350 DRLmB2 351 DRLmB2g1 352 DRLmB2g2 379 HDLmA1g1 380 HDLmB1 382 HDLmB2 384 KVRiB2 385 KVRiB2g1 386 KVRmA1 387 KVRmA1g1 388 KVRmB1 389 KVRmB1g1 390 KVRmB2g1 391 KVRmB2g2 403 KDTmA1 405 KDTmB2 406 KDTmB2g1 409 MLRhB1g1 412 MLRmA1g1 413 MLRmA2 415 MLRmB1 418 MLRmB2 419 MLRmB2g1 423 AWDmB1g1 424AWDmB2 428 BDRmA1 433 BDRmB2 (Moderately deep to very deep, black calcareous lay soils)	Maize, Sorghum, Sunflower, Bajra, Cotton, Red gram, Bengal gram, Soybean, Safflower, Linseed	**Fruit crops**: Pomegranate, Lime, Musambi, Custard apple **Vegetables:** Drumstick, Chillies, Bhendi, Coriander **Flowers:** Marigold, Chrysanthemum,	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices

To be continued…

LMU. No	Soil Map Units	Survey Number	Field Crops/Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
3	332 RNKmA1g1 334 RNKmB1g1 336 RNKmB2 337 RNKmB2g1 338 RNKmB2g2 353 NSPcB1g1 360 NSPmB1 362 NSPmB2 363 NSPmB2g1 373 GRHmB2 374 GRHmB2g1 375 GRHmB2g2 395 BGPmA1 396 BGPmB1 397 BGPmB2g1 (Sodic soils)		-	**Agri-Silvi-Pasture:** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage
4	273.HLKiB1 (Very deep, red clay soils)		Maize, Sorghum, Sunflower, Bajra, Mulberry, Cotton, Red gram, Horse gram, Field bean	**Fruit crops** :Mango, Sapota, Guava, Tamarind, Pomegranate, Lime, Musambi Cashew, Jackfruit, Jamun Custard apple, Amla **Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal, Curry leaves **Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
5	192.BDGiB1g1 193.BDGiB1g2 231BPRhB2g1 238BPRiB1g1 239BPRiB2 263NGPiB1g1 264NGPiB1g2 (Moderately deep to deep, red gravelly Sandy clay to clay soils)		Maize, Sorghum, Sunflower, Groundnut, Bajra, Cotton, Red gram	**Fruit crops** : Sapota, Pomegranate, Amla, Cashew, Guava, Custard apple, Jack fruit, Jamun, Lime, Musambi **Vegetables:** Tomato, Chilli, Drumstick, Onion, Bhendi, Brinjal, Curry leaves **Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)

To be continued…

LMU. No	Soil Map Units	Survey Number	Field Crops/Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
6	135 GHTcB1g1 136 GHTcB1g2 139 GHThA1g2 141 GHThB1g1 143 GHTiA1g1 145 GHTiB1g1 146 GHTiB1g2 148 TGRiB1 149 TGRiB1g1 150 TGRiB1g2 157 BMKmB2g2 176 CKMhB2g1 207 MNLiB1g1 275 MRDcA1g1 276 MRDcB1g2 277 MRDhB1g1 278 MRDhB1g2 280 MRDiA1 281 MRDiA1g1 283 MRDiB2 (Moderately deep to very deep, red sandy clay to sandy clay loam soils)		Maize, Sorghum, Groundnut, Sunflower, Bajra, Mulberry, Cotton, Red gram, Horse gram, Field bean	**Fruit crops** : Mango, Sapota, Guava, Tamarind, Pomegranate, Lime, Musambi Cashew, Jackfruit, Jamun Custard apple, Amla **Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal, Curry leaves **Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra	Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc)
7	71 KTPcB1g1 93 HTIcB2g2 98 HTIiB1g1 (Moderately shallow sandy clay soils)		Maize, Sorghum, Groundnut, Bajra, Cotton, Horse gram, Castor	**Fruit crops** : Amla, Custard apple **Vegetables:** Tomato, Chilli, Onion, Bhendi, Brinjal ,Curry leaves **Flowers:**Marigold, Chrysanthemum, Jasmine, Crossandra	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

To be continued…

LMU. No	Soil Map Units	Survey Number	Field Crops/Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
8	43 LKRcB2g1 44 LKRcB2g2 51 LKRiB1g1 77 MKHcB2g1 81 MKHhB1 82 MKHhB1g1 85 MKHhB2g1 90 MKHiB2g1 91 MKHiB2g2 (Moderately shallow, red gravelly sandy clay soils		Bajra, Groundnut, Horse gram, Castor	**Fruit crops** : Amla, Custard apple **Vegetables:** Curry leaves **Flowers:** Marigold, Chrysanthemum	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
9	3 DVHiB2g2 14 KGPcB1g1 17 KGPhB2g1 18 KGPhB2g2 19 KGPiB1g1 28 HRVhB2g3 31 HRViB2g1 (Shallow to very shallow red soils)		-	Hybrid Napier, Glyricidia, Simaruba, Dhaincha, Sunhemp, *Styloxanthes scabra*, *Styloxanthes hamata*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers
10	9 BGTmB2 10 BGTmB2g1 306 MTLmA1g2 308 MTLmB1g1 310 MTLmB2 311 MTLmB2g1 312 MTLmB2g2 313 MTLmB2g3 316 MTLmB3g3 (Shallow to very shallow black soils)		-	Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope

PART-B

Hydrological Inventory of Kavalur Sub-watershed, Koppal Taluk, Koppal District, Karnataka for Watershed Planning and Development

Sujala - III
Karnataka Watershed Development Project-II
Watershed Development Department
Government of Karnataka

THE WORLD BANK

Hydrological Inventory of Kavalur Sub-watershed, Koppal Taluk, Koppal District, Karnataka for Watershed Planning and Development

Prepared by
ICAR-National Bureau of Soil Survey and Land Use Planning
Regional Centre, Hebbal, Bangalore - 560 024

ICAR - NBSS & LUP

Phone:080-23412242

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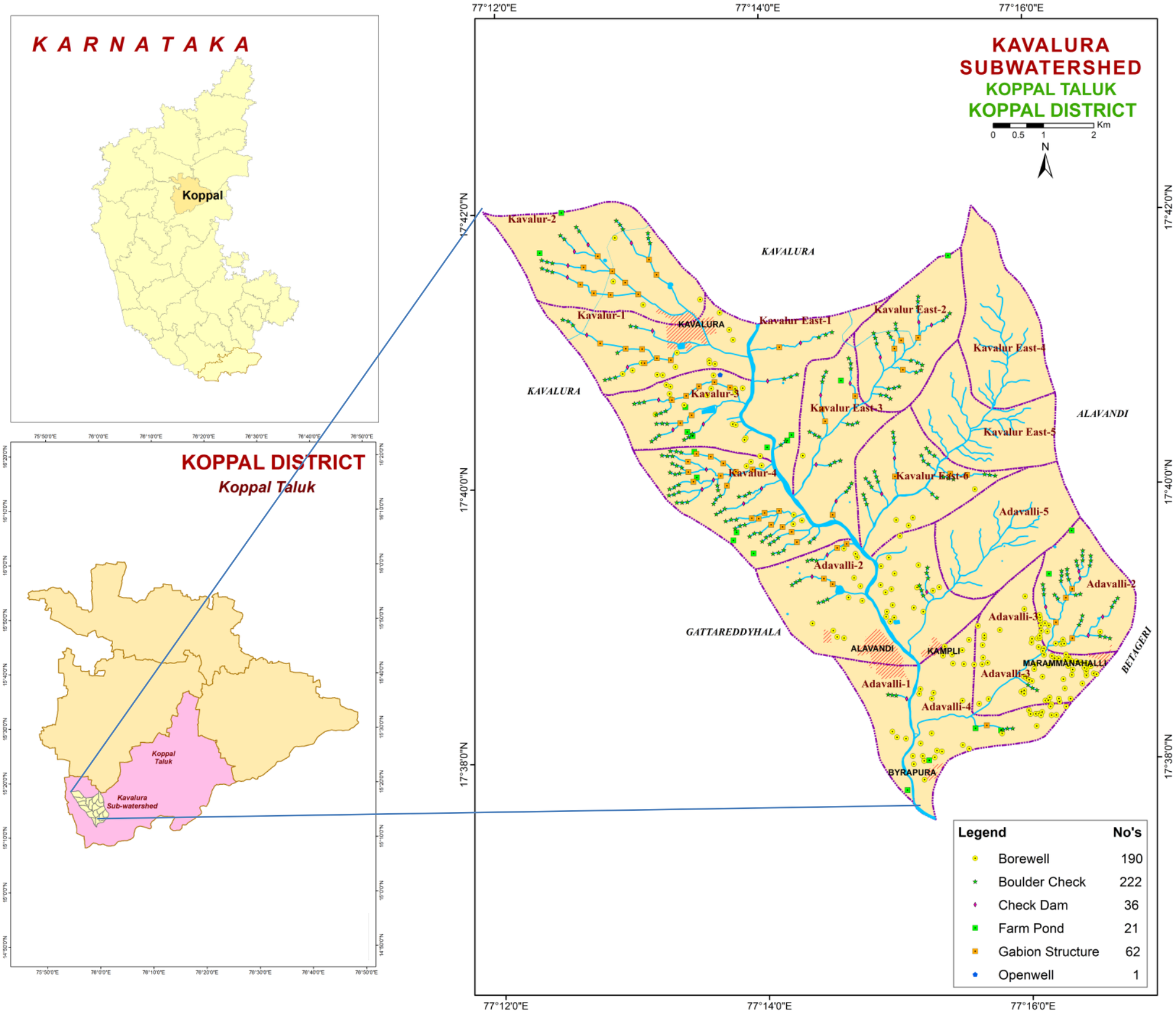
Dr. S. Srinivas	Principal Scientist
Dr. K .V. Niranjana	Chief Technical Officer
Sh. R.S.Reddy	Consultant
Sh. A.G.Devendra Prasad	Consultant
Smt. K.Karunya Lakshmi	Research Associate
Ms. Seema, K.V.	Senior Research Fellow
Dr. Sekhar Muddu (Reviewed and approved)	Professor & Lead Scientist, Dept. of Civil Engineering & ICWaR, IISc, Bangalore
	Email: hd_rcb.nbsslup@icar.gov.in nbssrcb@gmail.com **Phone: Office:** 080-23412242,23410993 **Fax:** 080-23510350

INTRODUCTION

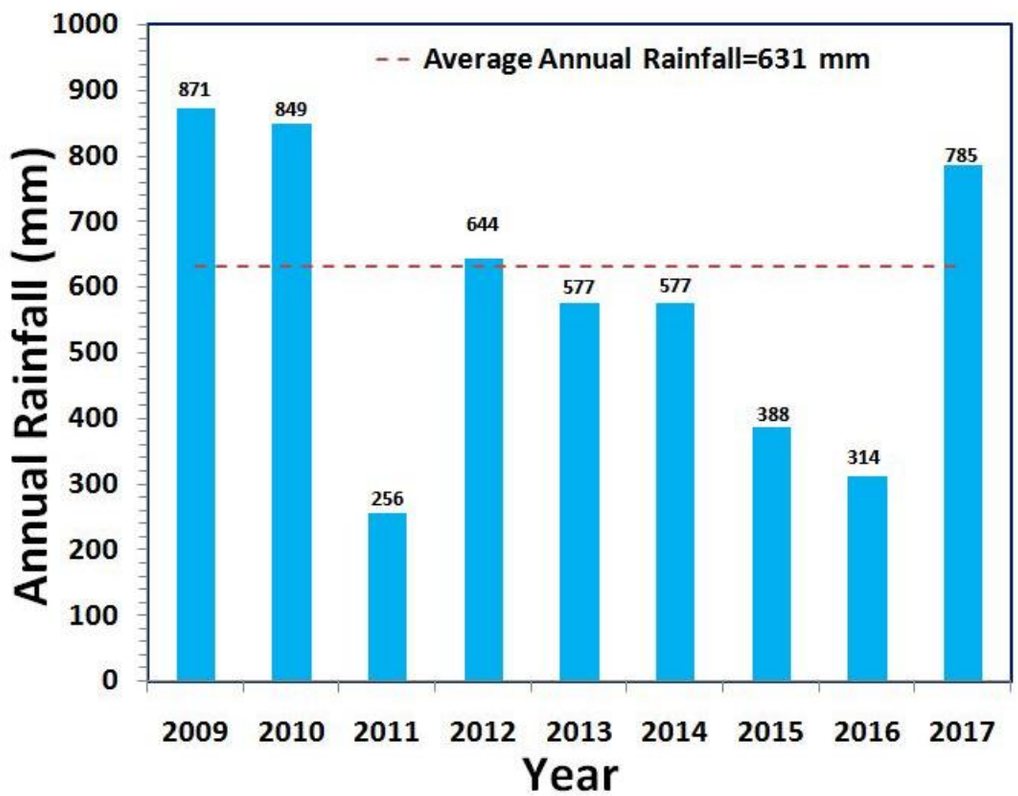
- The inventory and documentation of spatial and temporal changes in hydrological components of Kavalur sub-watershed (4D4A2P) in Koppal taluk & district, has been undertaken for integrated planning, development and management at the level of soil mapping units.
- Kavalur sub-watershed (Koppal taluk & district) is located in between $15^0$11'43.15''–$15^0$18'57.4'' North latitudes and $75^0$53'45.92''–$76^0$1'59.93'' East longitudes, covering an area of about 7341 ha.
- This sub watershed encompasses of 17 micro-watersheds namely, Adavalli-1 (4D4A2P3b), Adavalli-2 (4D4A2P3c), Adavalli-3 (4D4A2P3d), Adavalli-4 (4D4A2P3e), Adavalli-5 (4D4A2P3a), Alawandi-1 (4D4A2P1f), Alawandi-2 (4D4A2P1e), Kavalur East-1 (4D4A2P2a), Kavalur East-2 (4D4A2P2b), Kavalur East-3 (4D4A2P2c), Kavalur East-4 (4D4A2P2d), Kavalur East-5 (4D4A2P2e), Kavalur East-6 (4D4A2P2f), Kavalur-1 (4D4A2P1b), Kavalur-2 (4D4A2P1a), Kavalur-3 (4D4A2P1c) and Kavalur-4 (4D4A2P1d) micro watersheds. Land Resource Inventory (LRI) was generated for thirteen among the seventeen micro-watersheds.
- Average annual rainfall (1960-2014) of the Hobli (Block) pertaining to the sub-watershed is 631 mm.
- In this sub-watershed major *kharif* crops are Maize, Cotton, Sunflower, Bajra, Groundnut, Redgram and major *rabi* crops are Sorghum, Bengalgram, Safflower.
- Hydrological components namely rainfall (annual, *kharif*, *rabi* and summer), PET, AET, runoff, surface soil moisture, ground water status and water balance are presented.

LOCATION MAP OF KAVALUR SUB-WATERSHED



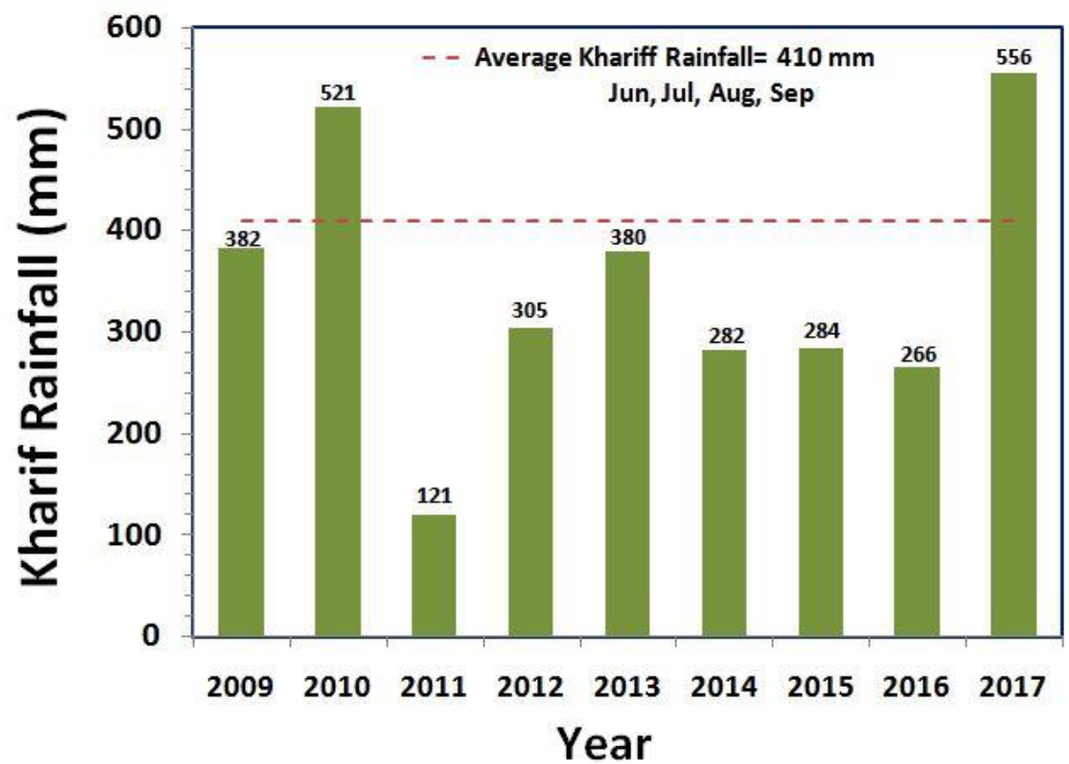
Soil & Water Conservation Structures in Kavalur Sub-watershed, Koppal taluk, Koppal district

RAINFALL INDEX

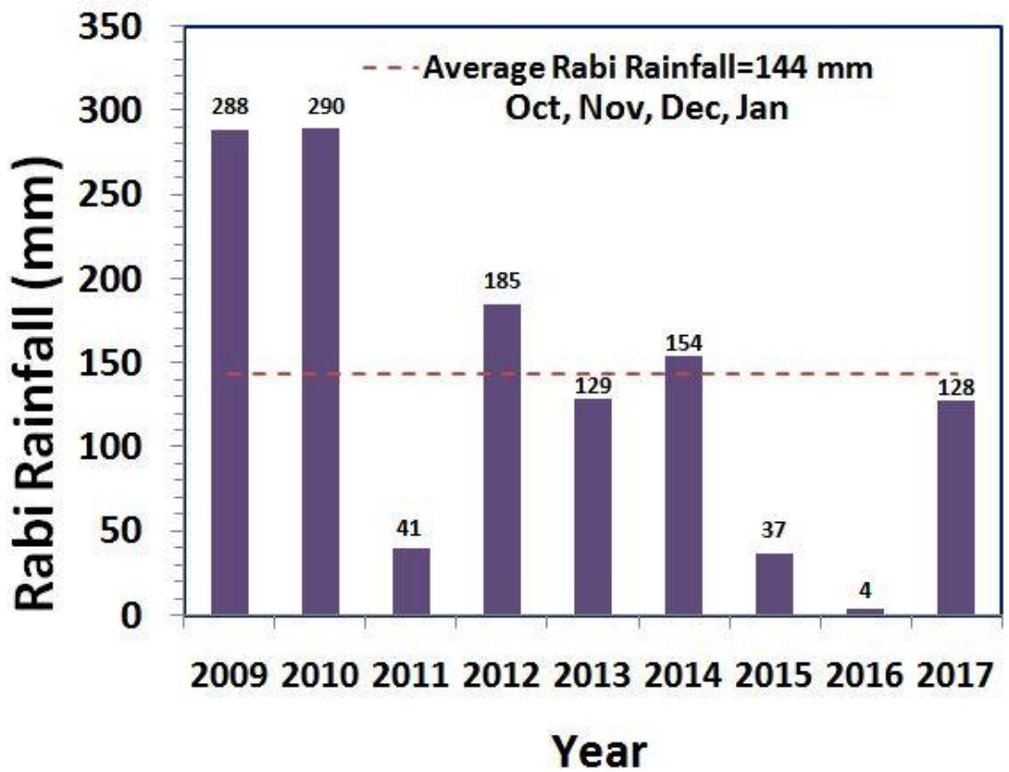


The average annual rainfall (1960-2014) recorded at the he Koppal station, Koppal taluk, Koppal district is 631 mm. The annual rainfall at Alavandi station (Hobli H.Q.) is presented. During the years 2011, 2013, 2014, 2015 and 2016 the annual rainfall was deficient by 59%, 9%, 9%, 39% and 50% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 60% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2009, 2011, 2012, 2013, 2014, 2015 and 2016 the *kharif* rainfall was deficient by 7%, 70%, 26%, 7%, 31%, 31% and 35% respectively.

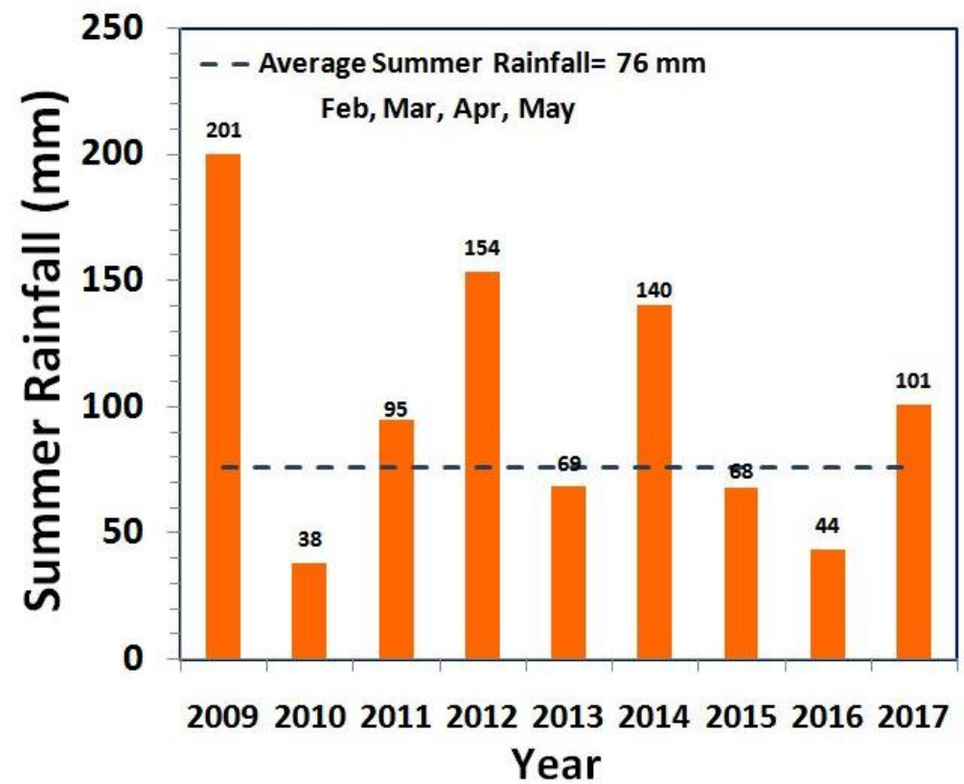


RAINFALL INDEX

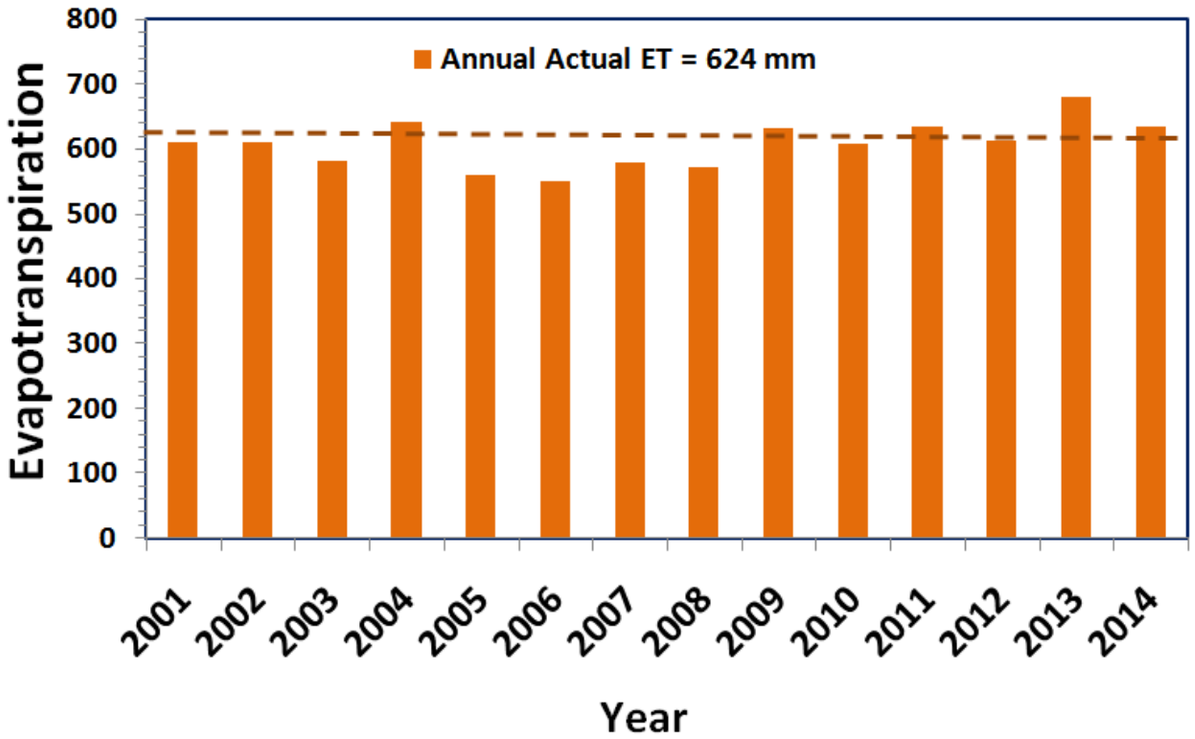


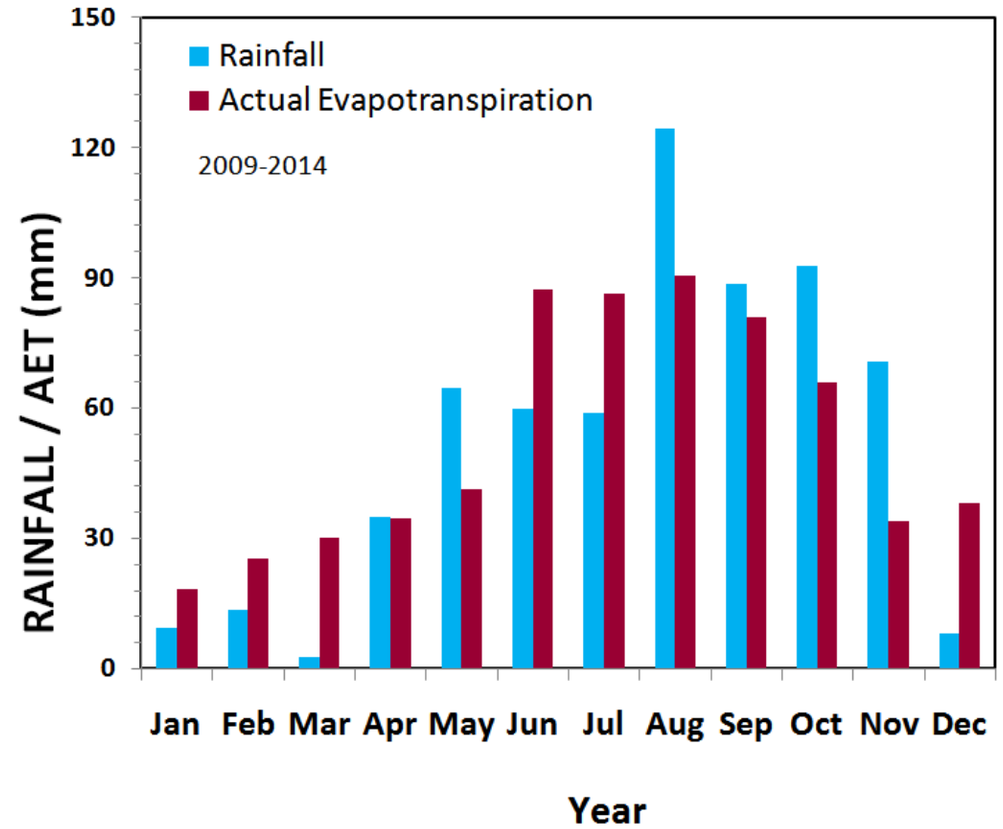
The average *rabi* rainfall (Oct-Jan) is about 21% of the average annual rainfall. During the years 2011, 2013, 2015, 2016 and 2017 the *kharif* rainfall was deficient by 72%, 10%, 74%, 97% and 11% respectively.

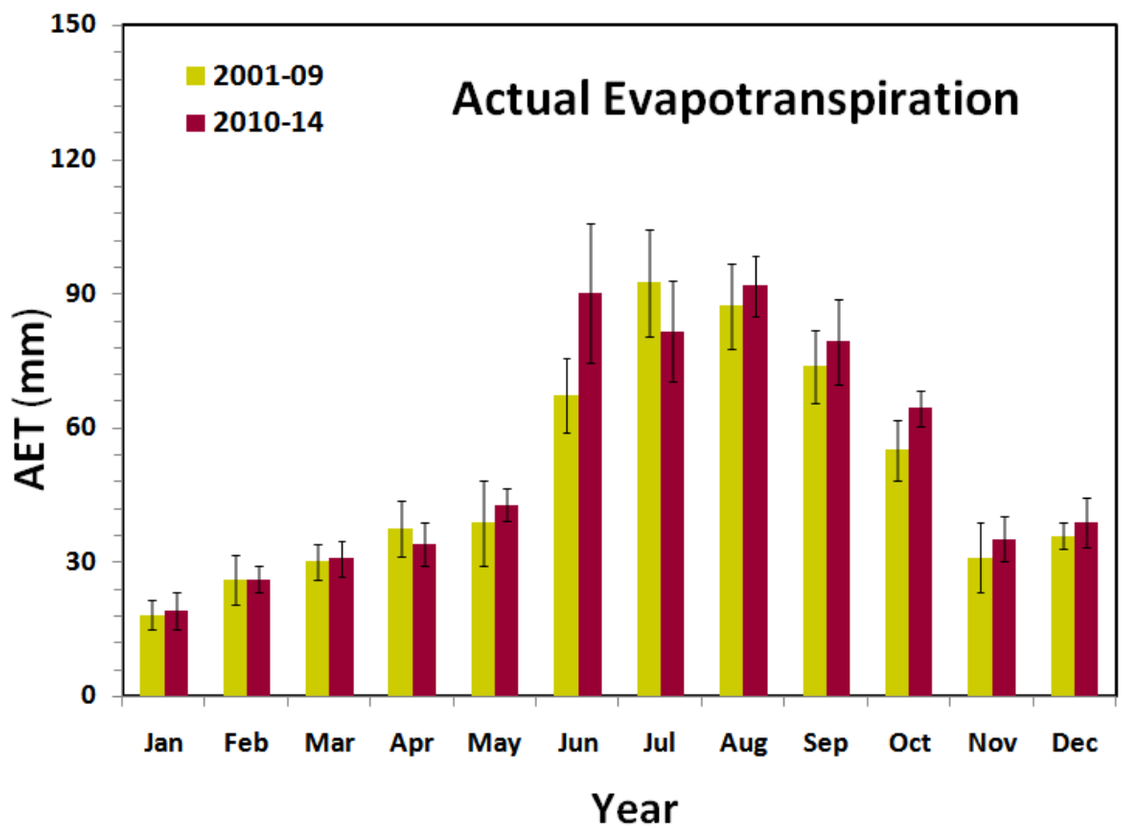
The average summer rainfall (Feb-May) is about 19% of the average annual rainfall.



EVAPOTRANSPIRATION

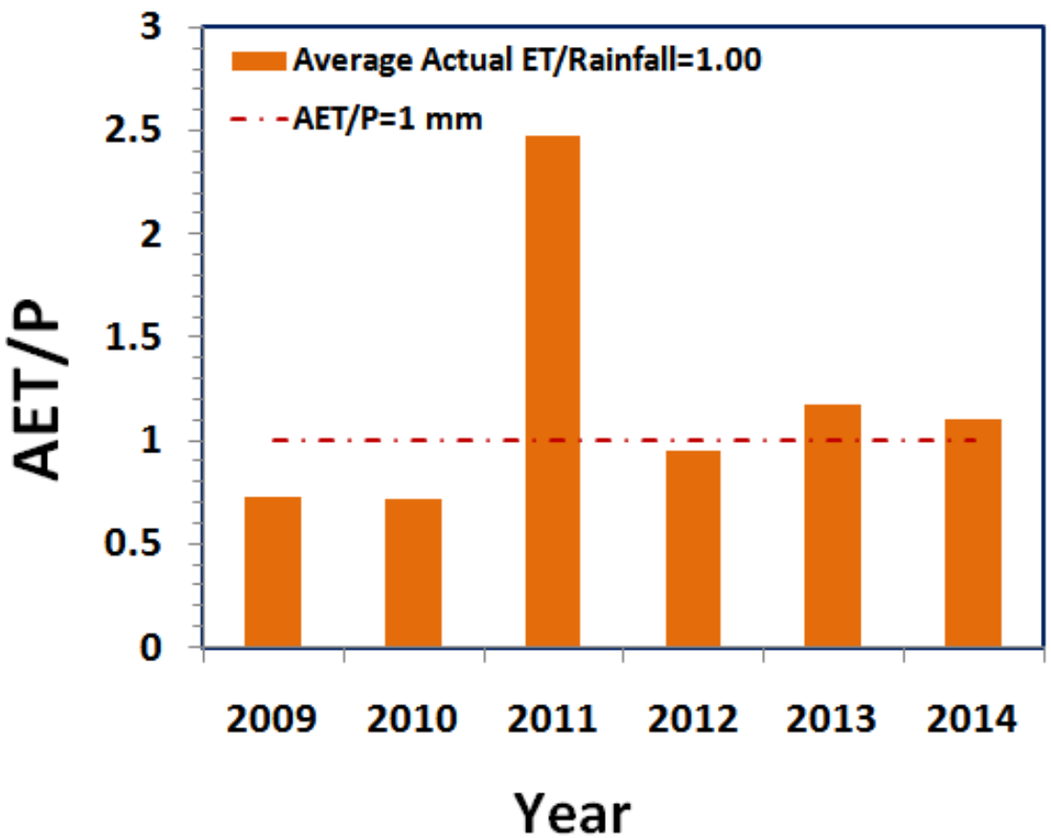


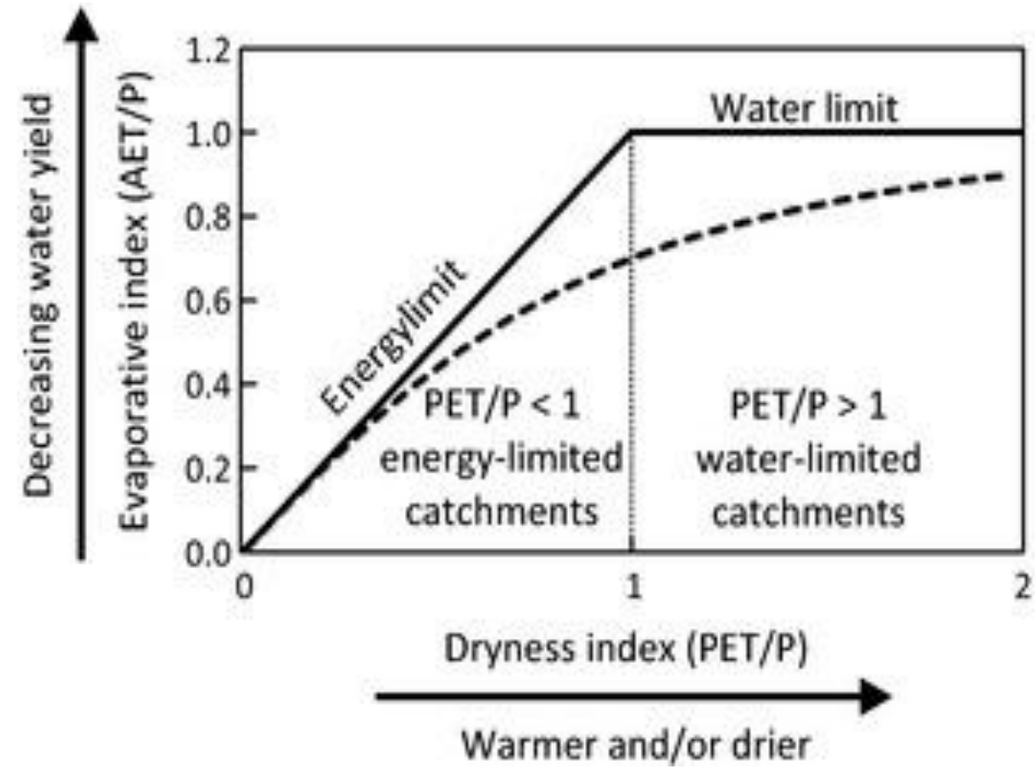




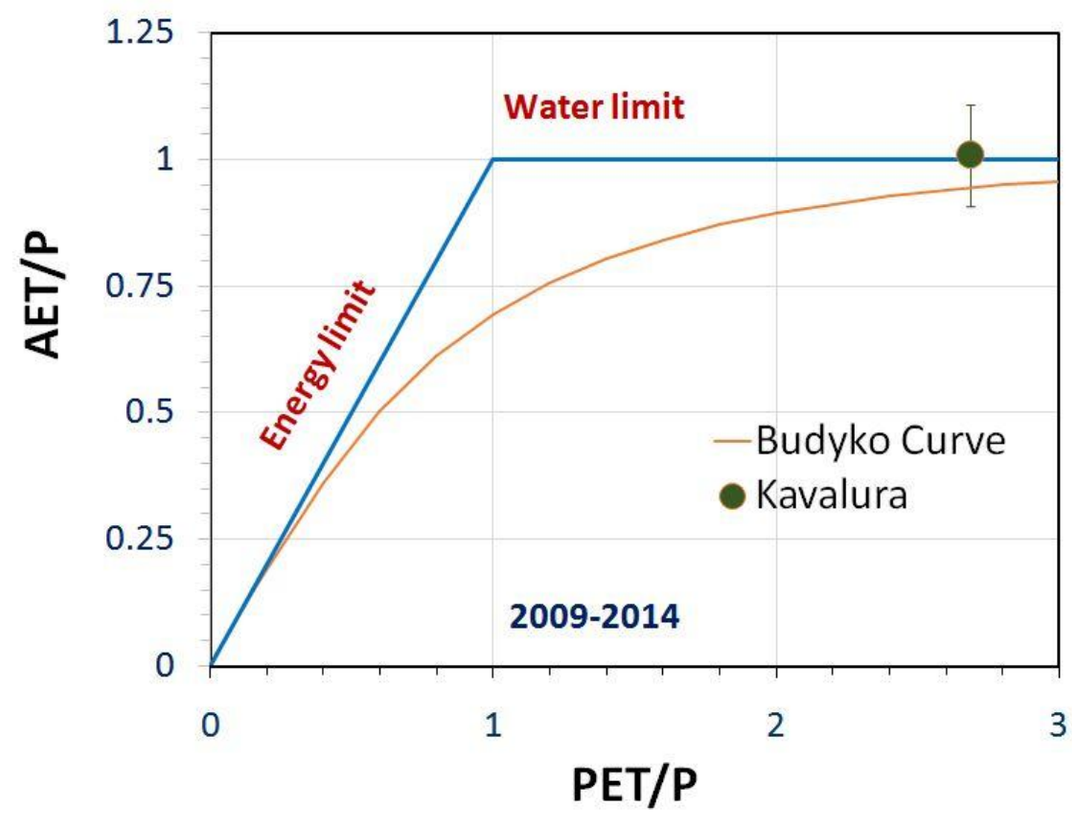
The average annual actual ET is lower than the average rainfall. During *kharif*, average rainfall and ET was found to be 344 mm and 345 mm respectively, whereas in *rabi* it was about 139 mm and 156 mm. In comparison to the 2001-2009, the annual ET increased by 6% during 2010-2014.

EVAPOTRANSPIRATION INDEX

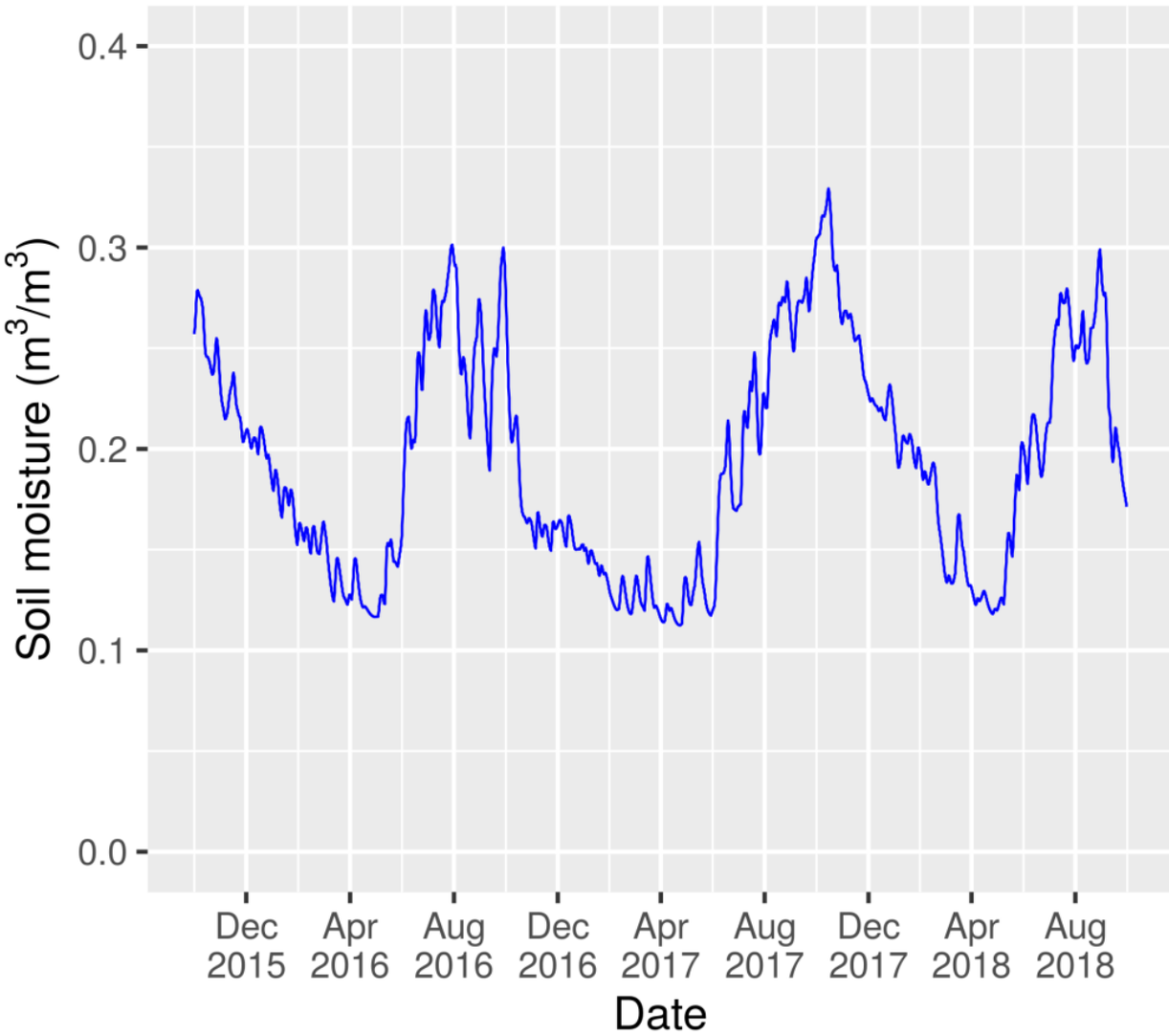




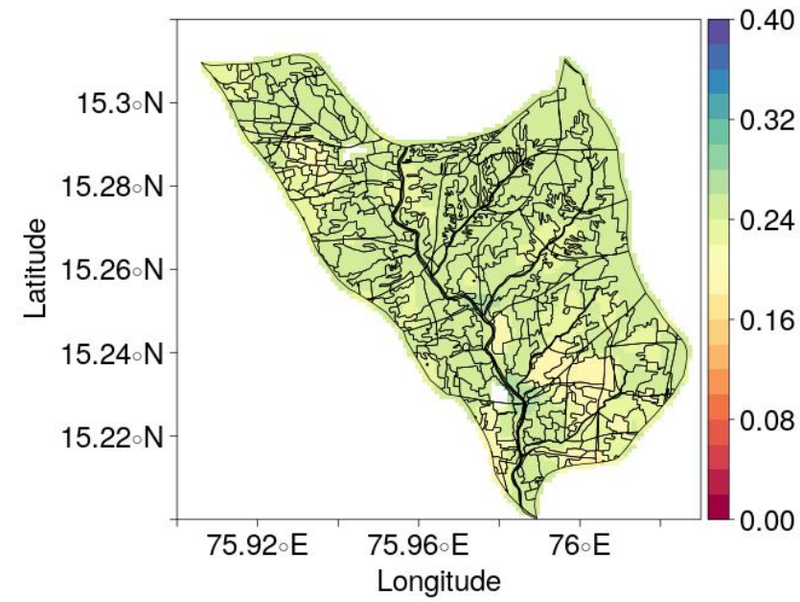
The average AET/P ratio was about 100%, which is higher than the sustainable limit of about 80%. Even during extremely lower rainfall year of 2011, AET was 624 mm. This suggests the presence of water storage and utilization from other sources such as groundwater, which buffered the lower rainfall.



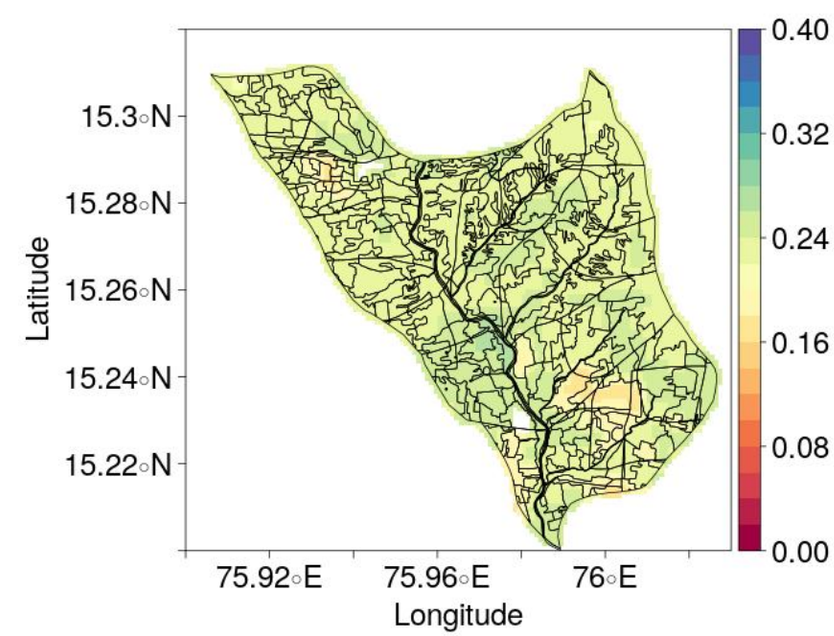
SATELLITE RETRIEVED SOIL MOISTURE



Kavalur– *rabi* Soil Moisture



Kavalur – *kharif* Soil Moisture

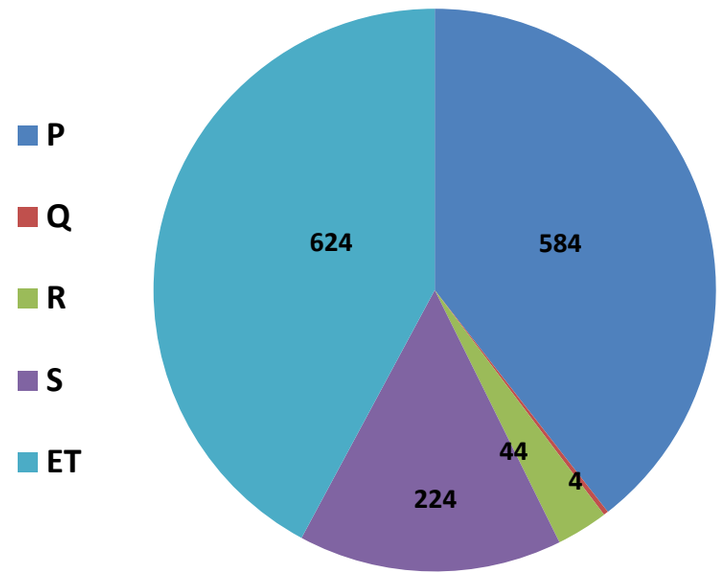


The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 15-28 % in *kharif* and 15-30 % in *rabi* seasons of 2016 and 12-25 % in *kharif* and 23-31% in *rabi* seasons of 2017.

WATER BALANCE

$$Q = P - E - R - S$$

- Q = Runoff
- P = Precipitation
- E = Evapotranspiration
- R = Groundwater recharge
- S = Soil moisture storage change

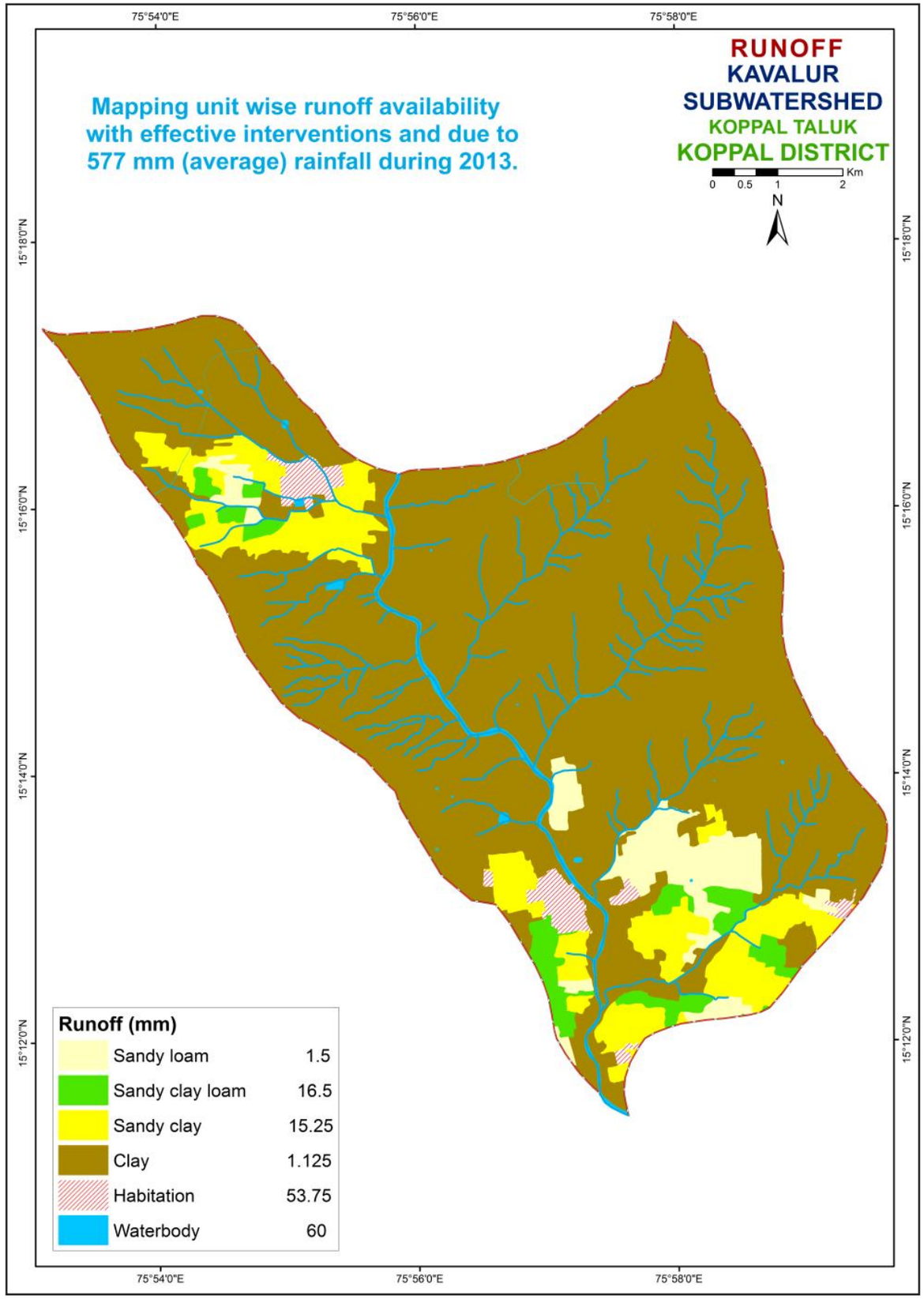


During August-September months, Precipitation is slightly higher than Evapotranspiration, hence Slight Runoff can occur in the watershed.

P = 584 mm (average of 2009-2017) ET = 624 mm R = 44 mm S = 224 mm Q = 4 mm

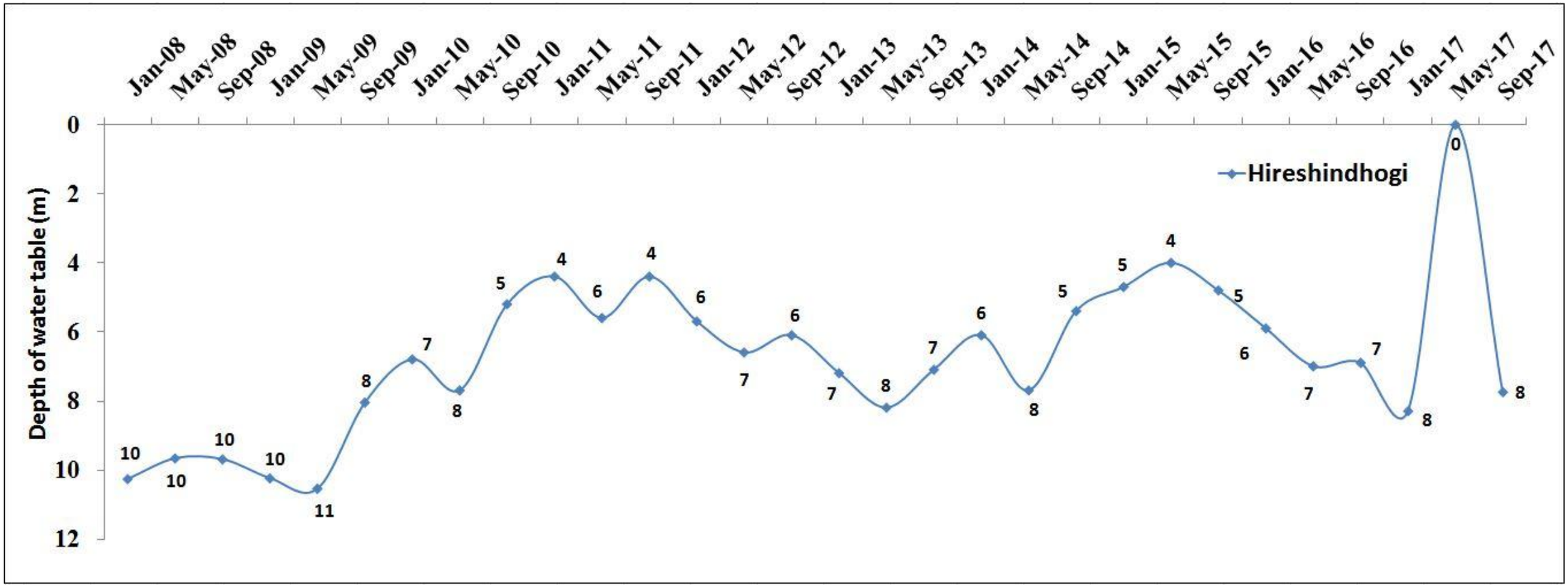
Sl. No.	Parameters	Average_ 2013 (mm)
1.	Rainfall	577
2.	Runoff availability with existing conditions	40
3.	Runoff availability with effective interventions	5
4.	Runoff allowed as environmental flow at the outlet	1
5.	Runoff excess for harvesting by construction of structures	4

RUNOFF


RUNOFF
KAVALUR
SUBWATERSHED
KOPPAL TALUK
KOPPAL DISTRICT
Mapping unit wise runoff availability with effective interventions and due to 577 mm (average) rainfall during 2013.
0 0.5 1 2 Km
N
75°54'0"E
75°56'0"E
75°58'0"E
15°18'0"N
15°16'0"N
15°14'0"N
15°12'0"N
Runoff (mm)
Sandy loam 1.5
Sandy clay loam 16.5
Sandy clay 15.25
Clay 1.125
Habitation 53.75
Waterbody 60

GROUND WATER STATUS

HIRESINDHOGI STATION



The total number of wells present in Kavalur Sub-watershed as per LRI data are 191 (190 Borewells & 1-Openwell). The groundwater level was found from the data obtained from KSNDMC for the nearest station Hireshindhogi. The above graph depicts the groundwater levels during the years 2008-2016 were slightly varying. Deepest level was found in 2009 year.

SUMMARY

- The average annual rainfall of 631 mm in the Kavalur sub-watershed as recorded from the Alavandi station data by KSNDMC.
- 60%, 21% and 19% of the annual rainfall occurs during *kharif*, *rabi* and summer seasons respectively and exhibited a higher temporal variability.
- The evapotranspiration estimation tool developed indicates that the watershed water balance is in deficit. The cropping & irrigation choices are inappropriate and needed to be altered.
- The estimated runoff available to use is 4 mm for an average annual rainfall of 584 mm (2009-2017). The utilizable groundwater is 31 mm (70% of 44 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (224 mm) and utilizable runoff plus recharge is 259 (=224+31+4)
- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the kharif and rabi seasons is 502 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 627 mm (i.e 125% of AET). This demand for the two seasons is higher by 368 mm, i.e. (627-259). The AET in June-Sept months is more than rainfall. Hence, there is a less opportunity to harvest the excess water through watershed management practices for utilizing during rabi season.
- The total number of wells present in Kavalur Sub-watershed as per LRI data are 191 (190-Borewells & 1-Openwell). The groundwater level was found from the data obtained from KSNDMC for the nearest station Hireshindhogi. Deepest level was found in 2009 year.