# Land Resource and Hydrological Inventory of Kalakeri 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 - 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 Kalakeri Sub-watershed for Watershed Planning and Development

## Koppal Taluk, Koppal District, Karnataka (AESR 3.0)

# CONTENTS

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# How to read and use the Atlas

The Land Resource Inventory of Kalakeri 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.

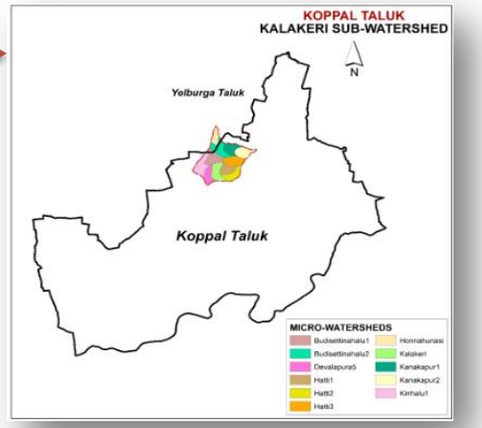
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

# 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.

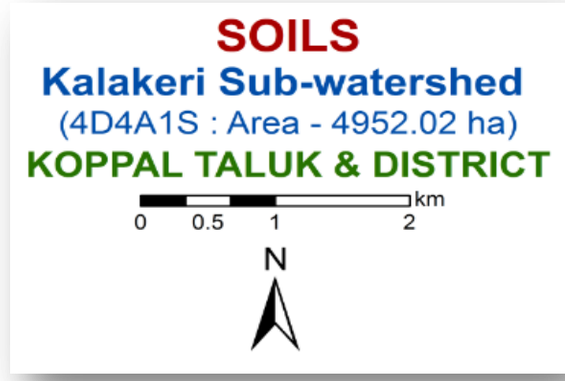
***Inset map***

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



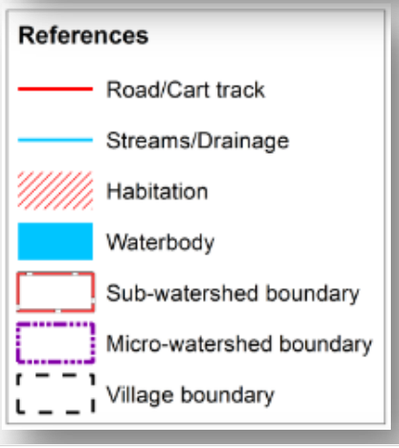

***Map title***

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



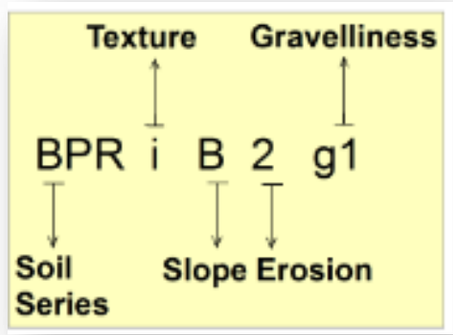

***Legends and symbols***

*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.*



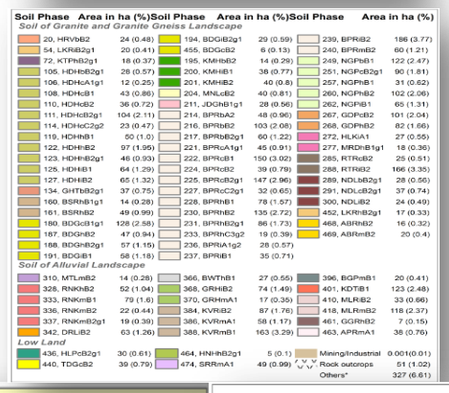

***Soil Units***

*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.*



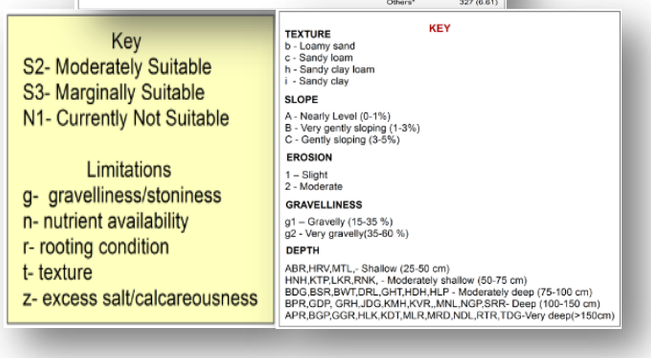

***Map colours***

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



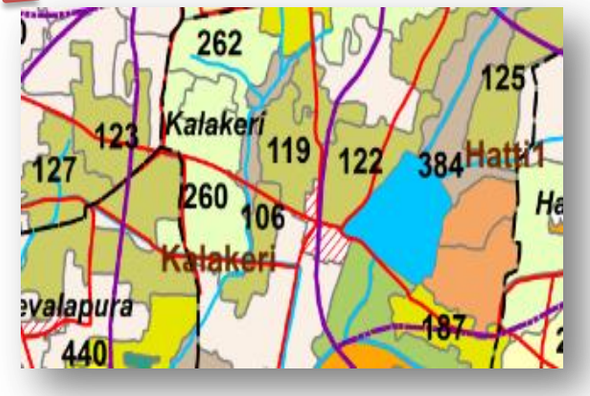

***Map key***

*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.*




***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.*



# 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 Kalakeri Sub-watershed covering an area of 4952.02 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.

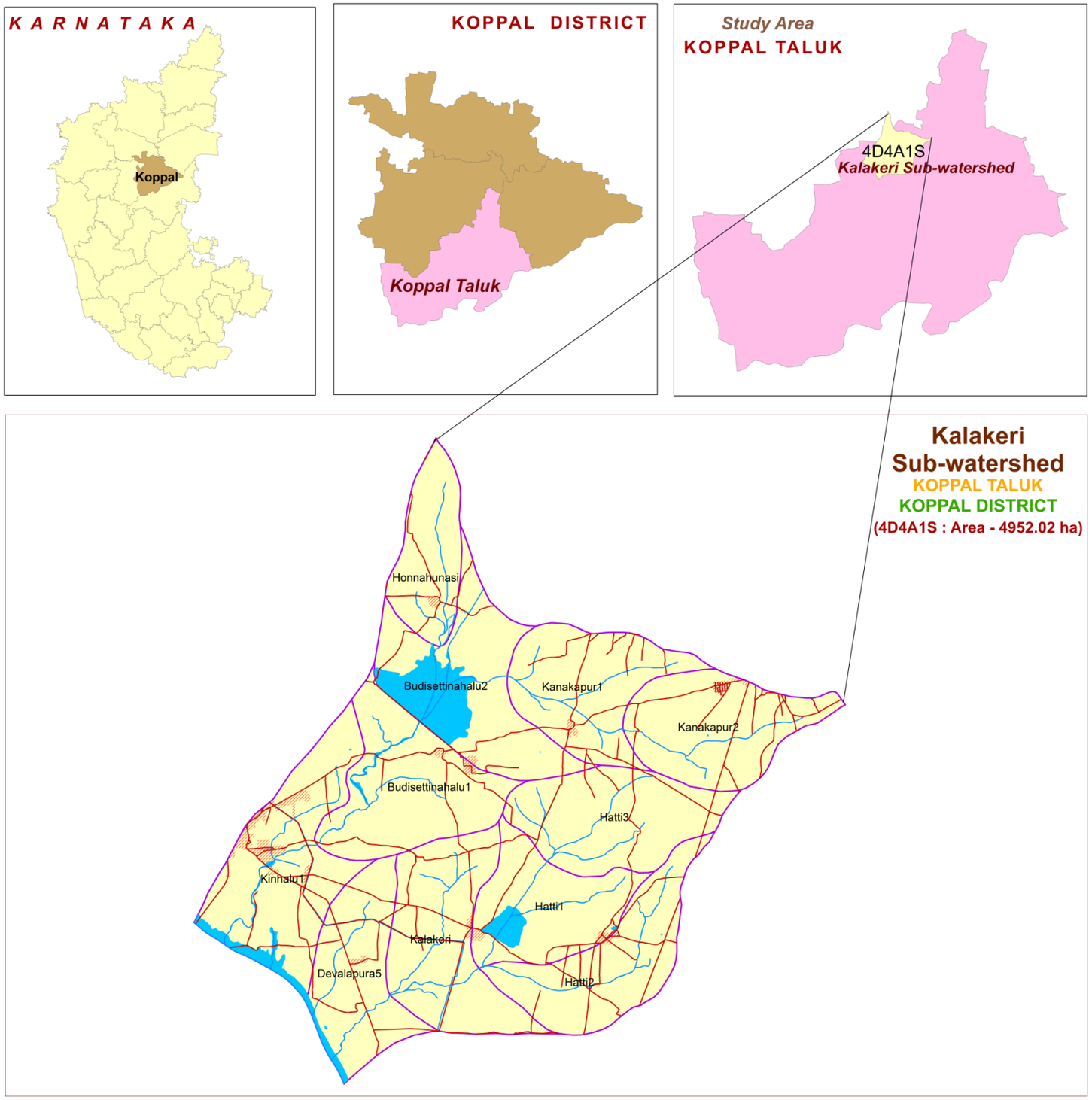
# 2. General Description of Sub-watershed

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 Kalakeri Sub-watershed in Koppal taluk, Koppal district. It was selected for data base generation under Sujala III project. Kalakeri Sub-watershed (code - (4D4A1S ) is covering an area of 4952.02 ha and spread across Budashettynala, Hatti, Kalakeri, Lebagiri, Thalakanapura, Yalamageri, Kinnala, Chilavadagi, Devalapura, Madhinura, Neregalla, Hanamanahalli, Irakallagada, Vaddarahatti, Chikkabidenala, Honne Hunasi, Kadhrahalli and KudhuriMole villages.

# LOCATION AND EXTENT

## LOCATION MAP OF KALAKERI SUB-WATERSHED




The Kalakeri Sub-watershed (Koppal taluk, Koppal district) is located in between $15^0$ 24' – $15^0$ 29' North latitudes and $75^0$ 13' – $75^0$ 8' East longitudes, covering an area of about 4952.02 ha. bounded by across Budashettynala, Hatti, Kalakeri, Lebagiri, Thalakanapura, Yalamageri, Kinnala, Chilavadagi, Devalapura, Madhinura, Neregalla, Hanamanahalli, Irakallagada, Vaddarahatti, Chikkabidenala, Honne Hunasi, Kadhrahalli and KudhuriMole villages.

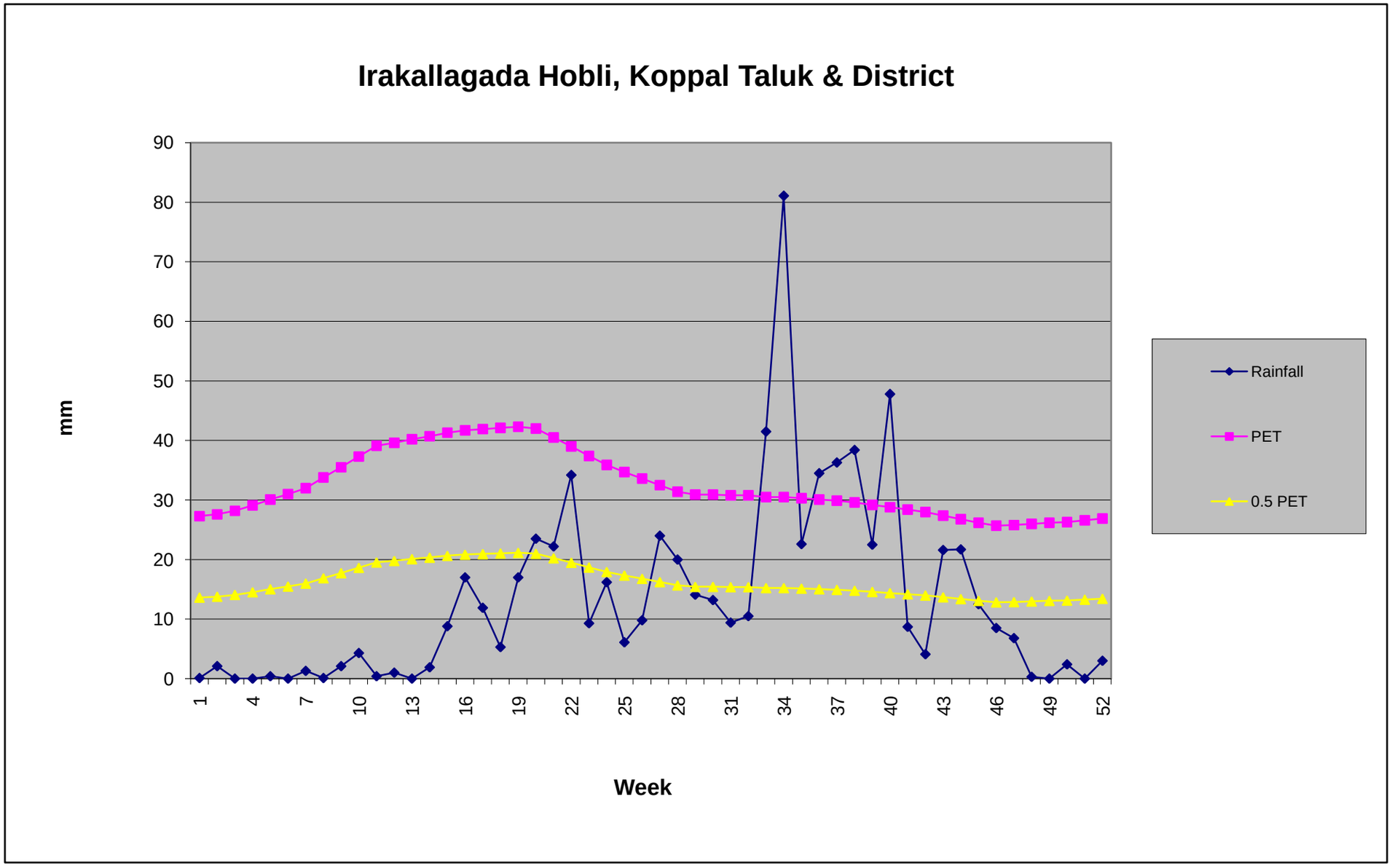
**Agro Ecological Region (AER) – 3: (Deccan plateau, hot arid ecosubregion)**

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

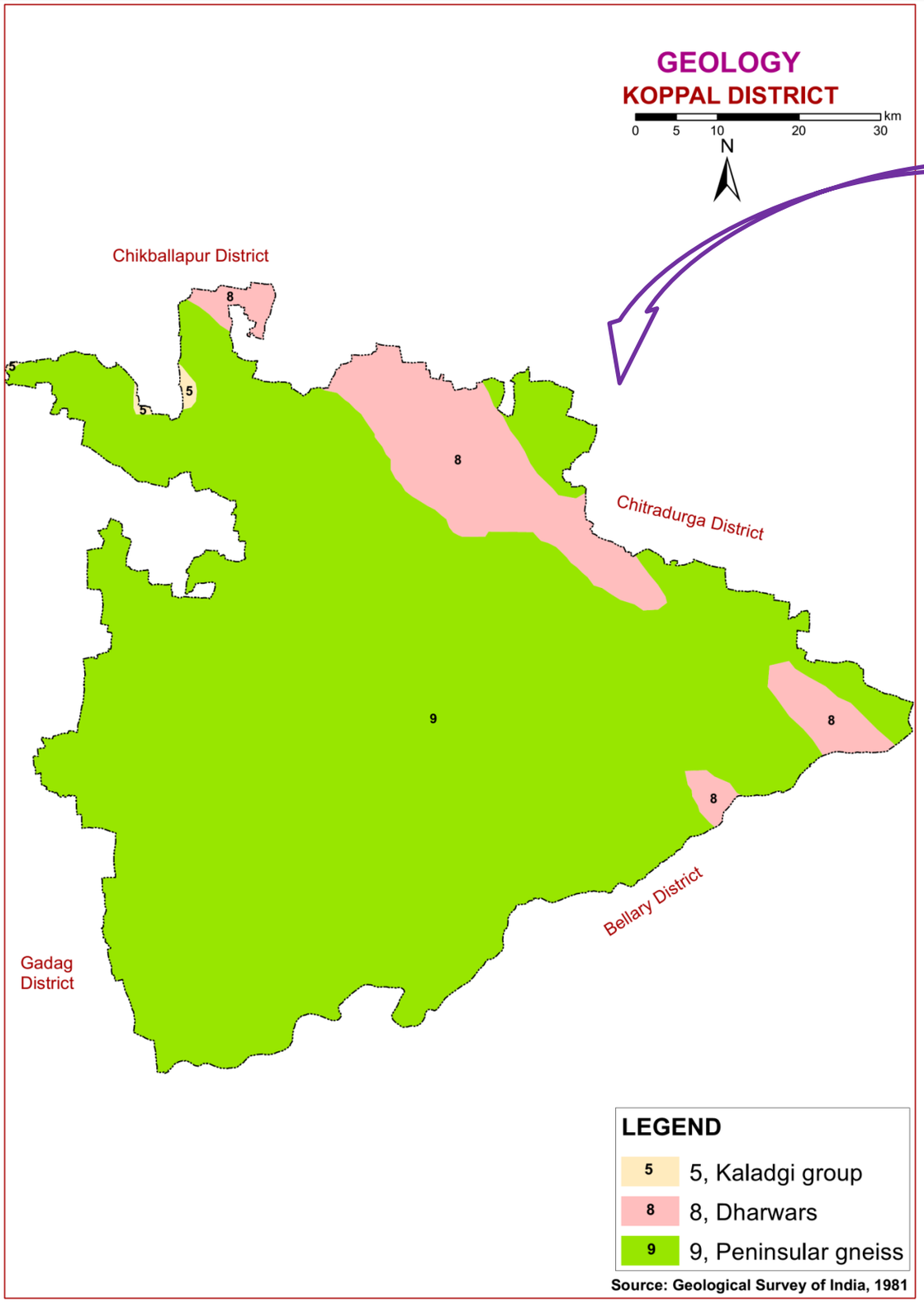


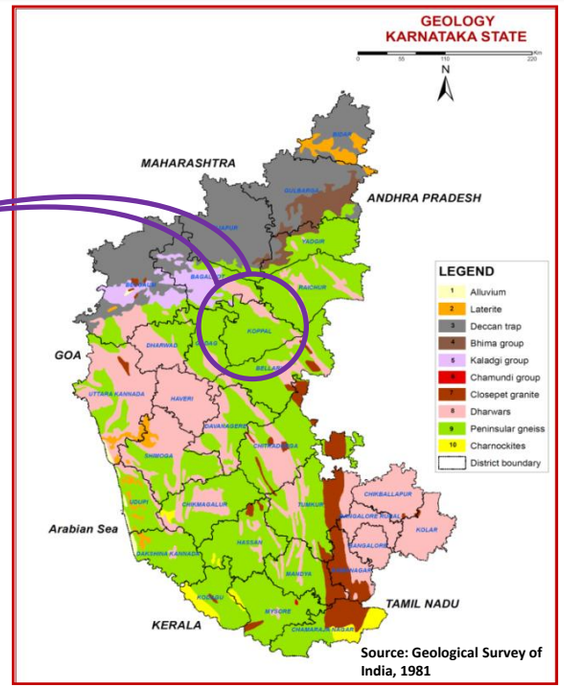

Length of Growing Period (LGP) is varying from July 1st week to last week of September (< 90 days)

Annual Rainfall : 701 mm. in the Irakallagada 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.

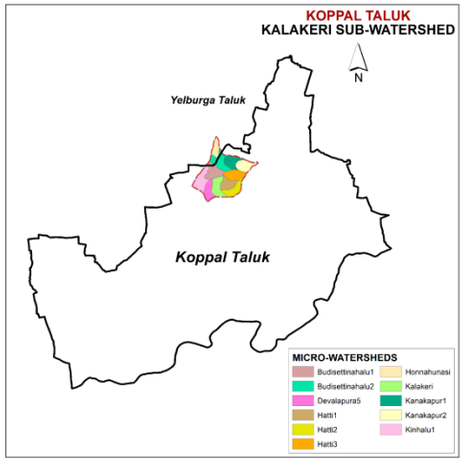
# 3. SURVEY METHODOLOGY

## 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




## Kalakeri Sub-watershed

(4D4A1S : Area - 4952.02 ha)

**KOPPAL TALUK & DISTRICT**

0 0.5 1 2 km

N

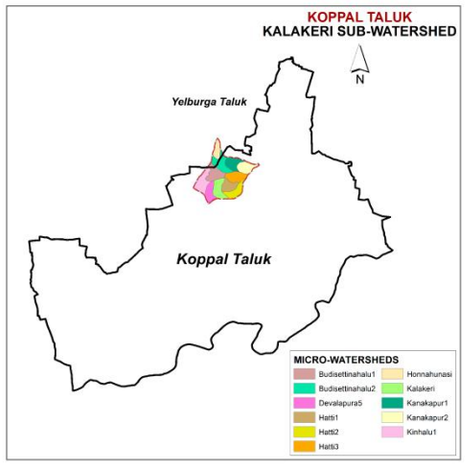
Kudhuri Mole
Kadhrahalli
HANAMANAHALLI
Honnahunasi
Honne Hunasi
Hanamanahalli
Vaddarahatti
Irakallagada
Chikkabidenala
Budisettinahalu2
Kanakapur1
Kanakapur2
Yalamageri
YALAMAGERI
KINNALA
Budisettinahalu1
Kinnala
Thalakanapura
Hatti3
Hatti
HATTI
Kinhalu1
Hatti1
Kalakeri
Madhinura
Devalapura5
Hatti2
Devalapura
Lebagiri
Neregalla
Chilavadagi
KALAKERI

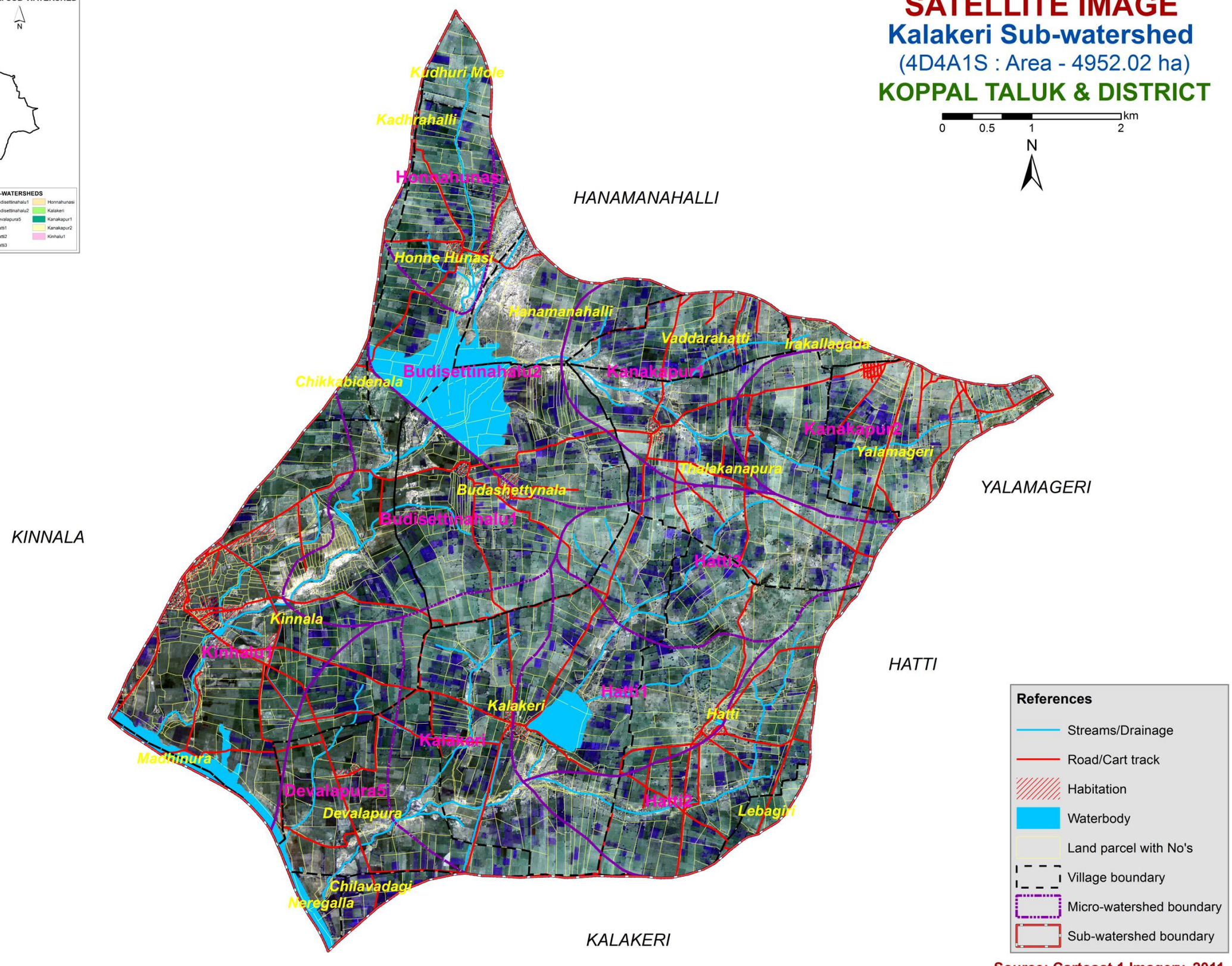
**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Land parcel with No's
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

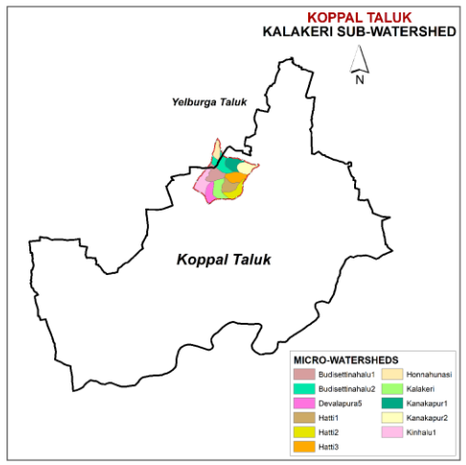
**Source: ICAR-NBSS&LUP, Bengaluru**

# 3.2. Database Used - Satellite Image



# 3.3. Current LandUse




## CURRENT LANDUSE (2018)

### Kalakeri Sub-watershed

(4D4A1S : Area - 4952.02 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

Kudhuri Mole
Kadhrahalli
Honnahunasi
Honne Hunasi
HANAMANAHALLI
Hanamanahalli
Kanakapur1
Irakallagada
Vaddarahatti
Kanakapur2
Yalamageri
YALAMAGERI
Chikkabidenala
Budisettinahalu2
Budashettynala
Budisettinahalu1
Thalakanapura
Hatti3
KINNALA
Kinnala
Kinhalu1
HATTI
Madhinura
Kalakeri
Hatti1
Hatti
Devalapura5
Devalapura
Hatti2
Lebagiri
Neregalla
Chilavadagi
KALAKERI

**References**

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

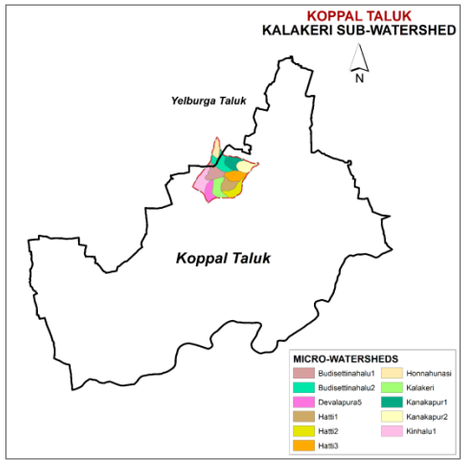
**Current LandUse**

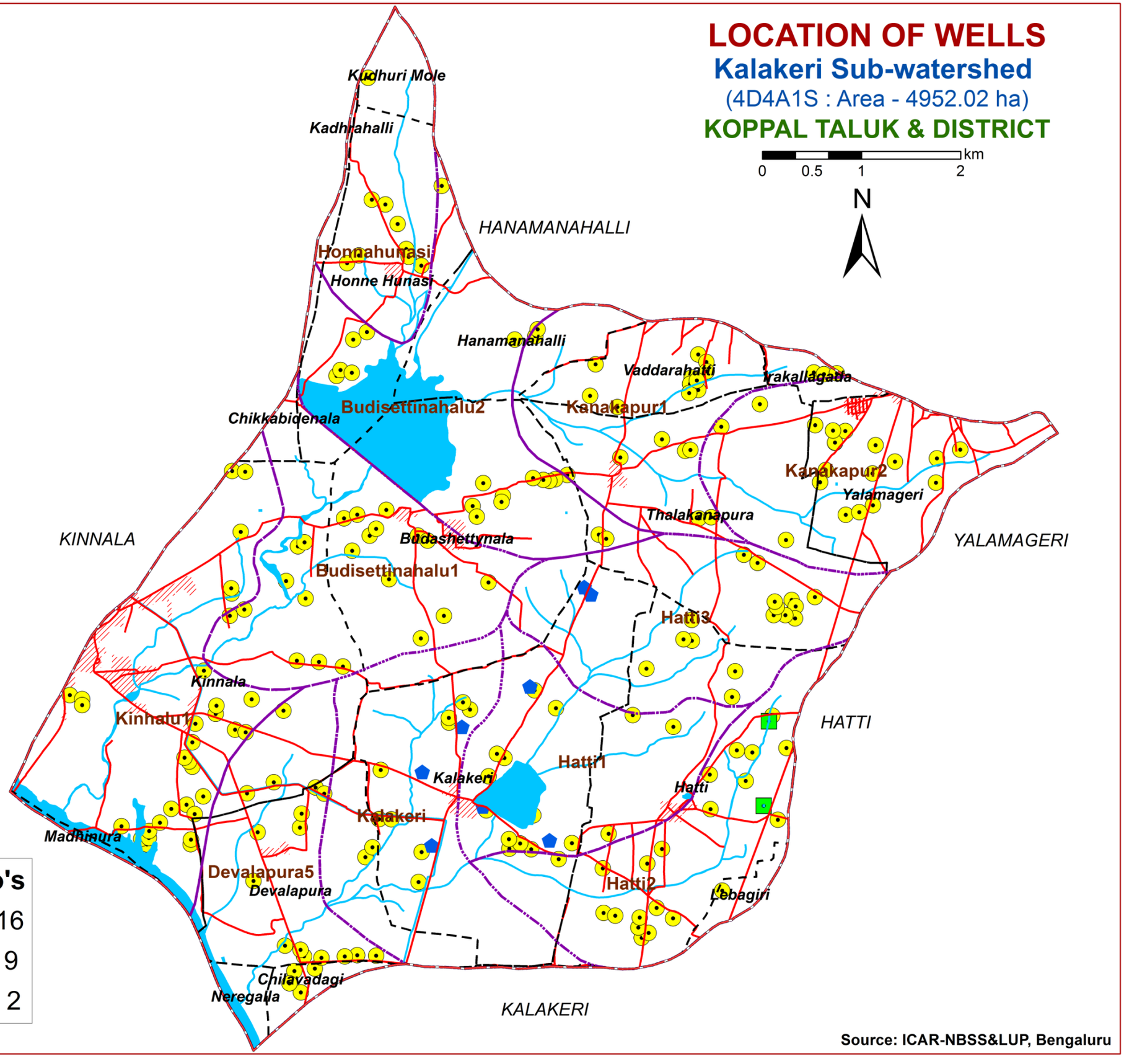
| | | | |
|---|---|---|---|
| Ba+Ch | Ch+Rg | Jw+CFL+Mz | Pd+Sf |
| Ba+Mz | Ct | Jw+Mz | Pd+Sl |
| Bf | Ct+Mz | Jw+Mz+Pd | Pd+Su |
| Bj | Ct+Mz+Rg | Jw+Mz+Rg | Pm |
| Bj+Ch | Ds | Lf+Br+Ch | Pm+Gn |
| Bj+Fl | Ds+Ch | Lf+Mz | Pm+Mz |
| Bj+Hg | Ds+Fl | Lf+Mz+Rg | Pm+Rg |
| Bj+Mz | Dy | Mn | Pm+Tm+Wm |
| Br | Eu | Mst+Mz+Rg | Rg |
| Br+Mz | Eu+Fl | Mst+Rg | Rg+Br |
| CFL | Eu+Mst | Mz | Rg+CaS |
| CFL+Mz | Fl | Mz+Cf | Rg+Cf |
| Ca | Fl+Gn+Mz+Rg | Mz+Cfl | Rg+Ch |
| Ca+Ms+Pd+Rg | Fl+Hb | Mz+Ch | Rg+Fl |
| Ca+Mz+Rg | Fl+Mz | Mz+Ds | Rg+Gn |
| Ca+Pm+Rg | Fl+Mz+Rg | Mz+Eu | Rg+Mz |
| Ca+Rg | Fl+Pd | Mz+Fl | Rg+Mz+Cf |
| Ca+mz+Rg | Fl+Pg | Mz+Gn | Rg+Mz+Dy |
| Cf | Fl+Rg | Mz+NG+Rg | Rg+Mz+Fl |
| Cf+Ct+Rg+Tm | Fl+Wb | Mz+Pd | Rg+Mz+Pd |
| Cf+Fl+Mz | Gg | Mz+Pg | Rg+Ng |
| Cf+Hb | Gn | Mz+Pm | Rg+Pd |
| Cf+Mn+Mz | Gn+Hb | Mz+Pm+Rg | Rg+Pm |
| Cf+Ms+Rg | Gn+Mz | Mz+Rg | Rg+Pm+Mz |
| Cf+Mst+Rg | Gn+Mz+Pd | Mz+Rg) | Rg+Sf |
| Cf+Mz | Gn+Mz+Pm | Mz+Rg+Fl | Rg+Tm |
| Cf+Mz+Pd | Gn+Mz+Pm+Rg | Mz+Rg+Hb | Rg+Tm+Wm |
| Cf+Mz+Pm | Gn+Mz+Rg | Mz+Rg+Tm | Rg+Veg |
| Cf+Mz+Pm+Rg+Tm | Gn+Mz+Rg+Sm | Mz+Rg+Veg | Rg+Wm |
| Cf+Mz+Rg | Gn+Mz+Sm | Mz+Sc | Sc |
| Cf+Pd | Gn+Pd | Mz+Wm | Sf |
| Cf+Pm | Gn+Pm | Pd | Sf+Pd |
| Cf+Pm+Rg | Gn+Pm+Rg | Pd+Cf | Sl+Fl |
| Cf+Rg | Gn+Rg | Pd+Ds | Su |
| Cf+Rg+Pm | Granite Outcrop | Pd+Fl | Tm |
| Ch | Gv | Pd+Mz | Tm+Crd |
| Ch+Gn+Mz | Hg | Pd+Pm | Wm+Tm+Rg+Pm+Mz |
| Ch+Mz+Pm | Hg+Mz+Rg | Pd+Pw | Road |
| Ch+Mz+Rg | Hg+Rg | Pd+Rg | NA |
| Ch+Pm+Rg | Jw | Pd+Sc | Habitation |
| | | | Waterbody |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 3.4. Location of Wells



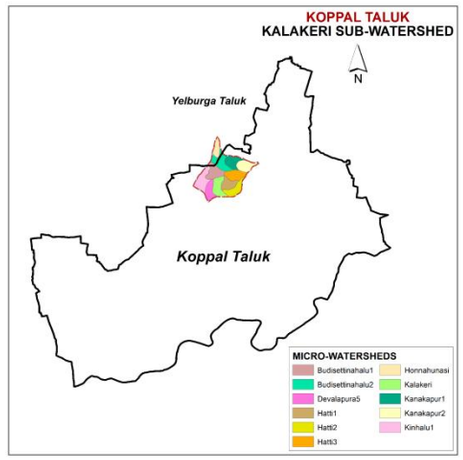

**References**

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

| Legend | No's |
|---|---|
| Borewell | 216 |
| Openwell | 9 |
| Farm pond | 2 |

Source: ICAR-NBSS&LUP, Bengaluru

# 4. The Soils




Texture Gravelliness

BPR i B 2 g1

Soil Series Slope Erosion

**KEY**

**TEXTURE**
b - Loamy sand
c - Sandy loam
h - Sandy clay loam
i - Sandy clay

**SLOPE**
A - Nearly Level (0-1%)
B - Very gently sloping (1-3%)
C - Gently sloping (3-5%)

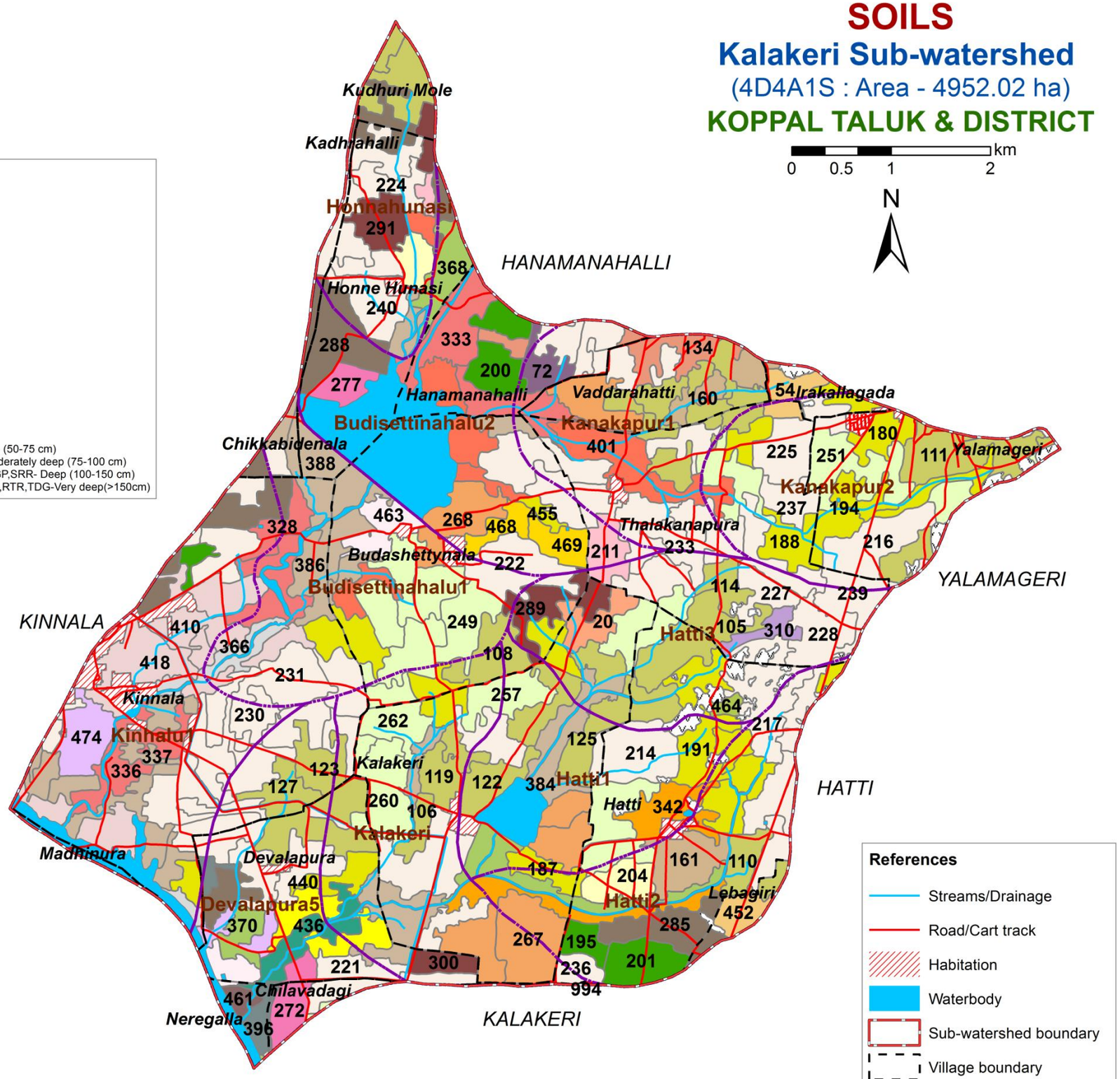
**EROSION**
1 – Slight
2 - Moderate

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

**DEPTH**
ABR,HRV,MTL,- Shallow (25-50 cm)
HNH,KTP,LKR,RNK, - Moderately shallow (50-75 cm)
BDG,BSR,BWT,DRL,GHT,HDH,HLP - Moderately deep (75-100 cm)
BPR,GDP, GRH,JDG,KMH,KVR,,MNL,NGP,SRR- Deep (100-150 cm)
APR,BGP,GGR,HLK,KDT,MLR,MRD,NDL,RTR,TDG-Very deep(>150cm)

| Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) |
|---|---|---|---|---|---|
| *Soil of Granite and Granite Gneiss Landscape* | | | | | |
| 20, HRVbB2 | 24 (0.48) | 194, BDGiB2g1 | 29 (0.59) | 239, BPRiB2 | 186 (3.77) |
| 54, LKRiB2g1 | 20 (0.41) | 455, BDGcB2 | 6 (0.13) | 240, BPRmB2 | 60 (1.21) |
| 72, KTPhB2g1 | 18 (0.37) | 195, KMHbB2 | 14 (0.29) | 249, NGPbB1 | 122 (2.47) |
| 105, HDHbB2g1 | 28 (0.57) | 200, KMHiB1 | 38 (0.77) | 251, NGPcB2g1 | 90 (1.81) |
| 106, HDHcA1g1 | 12 (0.25) | 201, KMHiB2 | 40 (0.8) | 257, NGPhB1 | 31 (0.62) |
| 108, HDHcB1 | 43 (0.86) | 204, MNLcB2 | 40 (0.81) | 260, NGPhB2 | 102 (2.06) |
| 110, HDHcB2 | 36 (0.72) | 211, JDGhB1g1 | 28 (0.56) | 262, NGPiB1 | 65 (1.31) |
| 111, HDHcB2g1 | 104 (2.11) | 214, BPRbA2 | 48 (0.96) | 267, GDPcB2 | 101 (2.04) |
| 114, HDHcC2g2 | 23 (0.47) | 216, BPRbB2 | 103 (2.08) | 268, GDPhB2 | 82 (1.66) |
| 119, HDHhB1 | 50 (1.0) | 217, BPRbB2g1 | 60 (1.22) | 272, HLKiA1 | 27 (0.55) |
| 122, HDHhB2 | 97 (1.95) | 221, BPRcA1g1 | 45 (0.91) | 277, MRDhB1g1 | 18 (0.36) |
| 123, HDHhB2g1 | 46 (0.93) | 222, BPRcB1 | 150 (3.02) | 285, RTRcB2 | 25 (0.51) |
| 125, HDHiB1 | 64 (1.29) | 224, BPRcB2 | 39 (0.79) | 288, RTRiB2 | 166 (3.35) |
| 127, HDHiB2 | 65 (1.32) | 225, BPRcB2g1 | 147 (2.96) | 289, NDLbB2g1 | 28 (0.56) |
| 134, GHTbB2g1 | 37 (0.75) | 227, BPRcC2g1 | 32 (0.65) | 291, NDLcB2g1 | 37 (0.74) |
| 160, BSRhB1g1 | 14 (0.28) | 228, BPRhB1 | 78 (1.57) | 300, NDLiB2 | 24 (0.49) |
| 161, BSRhB2 | 49 (0.99) | 230, BPRhB2 | 135 (2.72) | 452, LKRhB2g1 | 17 (0.33) |
| 180, BDGcB1g1 | 128 (2.58) | 231, BPRhB2g1 | 86 (1.73) | 468, ABRhB2 | 16 (0.32) |
| 187, BDGhB2 | 47 (0.94) | 233, BPRhC3g2 | 19 (0.39) | 469, ABRmB2 | 20 (0.4) |
| 188, BDGhB2g1 | 57 (1.15) | 236, BPRiA1g2 | 28 (0.57) | | |
| 191, BDGiB1 | 58 (1.18) | 237, BPRiB1 | 35 (0.71) | | |
| *Soil of Alluvial Landscape* | | | | | |
| 310, MTLmB2 | 14 (0.28) | 366, BWThB1 | 27 (0.55) | 396, BGPmB1 | 20 (0.41) |
| 328, RNKhB2 | 52 (1.04) | 368, GRHiB2 | 74 (1.49) | 401, KDTiB1 | 123 (2.48) |
| 333, RNKmB1 | 79 (1.6) | 370, GRHmA1 | 17 (0.35) | 410, MLRiB2 | 33 (0.66) |
| 336, RNKmB2 | 22 (0.44) | 384, KVRiB2 | 87 (1.76) | 418, MLRmB2 | 118 (2.37) |
| 337, RNKmB2g1 | 19 (0.39) | 386, KVRmA1 | 58 (1.17) | 461, GGRhB2 | 7 (0.15) |
| 342, DRLiB2 | 63 (1.26) | 388, KVRmB1 | 163 (3.29) | 463, APRmA1 | 38 (0.76) |
| *Low Land* | | | | | |
| 436, HLPcB2g1 | 30 (0.61) | 464, HNHhB2g1 | 5 (0.1) | Mining/Industrial | 0.001(0.01) |
| 440, TDGcB2 | 39 (0.79) | 474, SRRmA1 | 49 (0.99) | Rock outcrops | 51 (1.02) |
| | | | | Others* | 327 (6.61) |

* - Habitation & Waterbody




**Source: ICAR-NBSS&LUP, Bengaluru**

## 4.1 Mapping unit description of Kalakeri (4D4A1S ) Sub-watershed in Koppal taluk, Koppal district

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite Gneiss Landscape** | | | | |
| | ABR | Abbigere soils are shallow (25-50 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation. | | **36(0.72)** |
| 468 | | ABRhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 16 (0.32) |
| 469 | | ABRmB2 | Clay surface, slope 1-3%, moderate erosion | 20 (0.4) |
| | 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 | | **24 (0.48)** |
| 20 | | HRVbB2 | Loamy sand surface, slope 1-3%, moderate erosion | 24 (0.48) |
| | 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 | | **37(0.74)** |
| 452 | | LKRhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 17 (0.33) |
| 54 | | LKRiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 20 (0.41) |
| | 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 | | **18 (0.37)** |
| 72 | | KTPhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 18 (0.37) |
| | HNH | Honnenahalli soils are moderately shallow (50-75 cm), moderately well drained, have brown to dark brown sandy clay soils occurring on nearly level to very gently sloping lowlands under cultivation | | **5 (0.1)** |
| 464 | | HNHhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 5 (0.1) |
| | HDH | Hooradhahalli soils are moderately deep (75-100 cm), well drained, dark red to dark reddish brown, red gravelly sandy clay to clay soils occurring on nearly level to moderately sloping uplands under cultivation | | **568(11.47)** |
| 105 | | HDHbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 28 (0.57) |
| 106 | | HDHcA1g1 | Sandy loam surface, slope 0-1%, slight erosion, gravelly (15-35%) | 12 (0.25) |
| 108 | | HDHcB1 | Sandy loam surface, slope 1-3%, slight erosion | 43 (0.86) |
| 110 | | HDHcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 36 (0.72) |
| 111 | | HDHcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 104 (2.11) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite Gneiss Landscape** | | | | |
| 114 | | HDHcC2g2 | Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%) | 23 (0.47) |
| 119 | | HDHhB1 | Sandy clay loam surface, slope 1-3%, slight erosion | 50 (1.0) |
| 122 | | HDHhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 97 (1.95) |
| 123 | | HDHhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 46 (0.93) |
| 125 | | HDHiB1 | Sandy clay surface, slope 1-3%, slight erosion | 64 (1.29) |
| 127 | | HDHiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 65 (1.32) |
| | 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 | | **37 (0.75)** |
| 134 | | GHTbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 37 (0.75) |
| | BSR | Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation | | **63(1.27)** |
| 160 | | BSRhB1g1 | Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 14 (0.28) |
| 161 | | BSRhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 49 (0.99) |
| | 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 | | **325(6.57)** |
| 180 | | BDGcB1g1 | Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 128 (2.58) |
| 187 | | BDGhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 47 (0.94) |
| 188 | | BDGhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 57 (1.15) |
| 191 | | BDGiB1 | Sandy clay surface, slope 1-3%, slight erosion | 58 (1.18) |
| 194 | | BDGiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 29 (0.59) |
| 455 | | BDGcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 6 (0.13) |
| | KMH | Kumchahalli soils are deep (100-150cm), well drained, have dark reddish brown to dark red sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation | | **92(1.86)** |
| 195 | | KMHbB2 | Loamy sand surface, slope 1-3%, moderate erosion | 14 (0.29) |
| 200 | | KMHiB1 | Sandy clay surface, slope 1-3%, slight erosion | 38 (0.77) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite Gneiss Landscape** | | | | |
| 201 | | KMHiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 40 (0.8) |
| | HLP | Huliyapura soils are moderately deep (75-100 cm), well drained, have dark- strong brown to dark yellowish brown sandy clay loam soils occurring on very gently sloping low lands under cultivation | | **30 (0.61)** |
| 436 | | HLPcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 30 (0.61) |
| | SRR | Sirur soils are deep (100-150cm), moderately well drained, very dark grayish brown to grayish brown calcareous cracking clay soils occuring on nearly level to very gently sloping lowlands under cultivation | | **49 (0.99)** |
| 474 | | SRRmA1 | Clay surface, slope 0-1%, slight erosion | 49 (0.99) |
| | 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 | | **1251 (25.26)** |
| 214 | | BPRbA2 | Loamy sand surface, slope 0-1%, moderate erosion | 48 (0.96) |
| 216 | | BPRbB2 | Loamy sand surface, slope 1-3%, moderate erosion | 103 (2.08) |
| 217 | | BPRbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 60 (1.22) |
| 221 | | BPRcA1g1 | Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 45 (0.91) |
| 222 | | BPRcB1 | Sandy loam surface, slope 1-3%, slight erosion | 150 (3.02) |
| 224 | | BPRcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 39 (0.79) |
| 225 | | BPRcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 147 (2.96) |
| 227 | | BPRcC2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 32 (0.65) |
| 228 | | BPRhB1 | Sandy clay loam surface, slope 1-3%, slight erosion | 78 (1.57) |
| 230 | | BPRhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 135 (2.72) |
| 231 | | BPRhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 86 (1.73) |
| 233 | | BPRhC3g2 | Sandy clay loam surface, slope 1-3%, severe erosion, very gravelly (35-60%) | 19 (0.39) |
| 236 | | BPRiA1g2 | Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%) | 28 (0.57) |
| 237 | | BPRiB1 | Sandy clay surface, slope 1-3%, slight erosion | 35 (0.71) |
| 239 | | BPRiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 186 (3.77) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite Gneiss Landscape** | | | | |
| 240 | | BPRmB2 | Clay surface, slope 1-3%, moderate erosion | 60 (1.21) |
| | 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 | | **410(8.27)** |
| 251 | | NGPcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 90 (1.81) |
| 257 | | NGPhB1 | Sandy clay loam surface, slope 1-3%, slight erosion | 31 (0.62) |
| 260 | | NGPhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 102 (2.06) |
| 262 | | NGPiB1 | Sandy clay surface, slope 1-3%, slight erosion | 65 (1.31) |
| | 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 | | **40 (0.81)** |
| 204 | | MNLcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 40 (0.81) |
| | JDG | Jedigere soils are deep (100-150 cm), well drained, have dark brown to dark reddish brown red sandy clay to clay soils occurring on nearly level to very gently sloping uplands under cultivation | | **28 (0.56)** |
| 211 | | JDGhB1g1 | Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 28 (0.56) |
| | GDP | Giddadapalya soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on very gently sloping uplands under cultivation | | **183(3.7)** |
| 267 | | GDPcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 101 (2.04) |
| 268 | | GDPhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 82 (1.66) |
| | 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 | | **27 (0.55)** |
| 272 | | HLKiA1 | Sandy clay surface, slope 0-1%, slight erosion | 27 (0.55) |
| | 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 | | **18 (0.36)** |
| 277 | | MRDhB1g1 | Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 18 (0.36) |
| | RTR | Ranatur soils are very deep (>150 cm), well drained, have dark reddish brown to dark red clay soils occurring on nearly level to very gently sloping uplands under cultivation | | **191(3.86)** |
| 285 | | RTRcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 25 (0.51) |
| 288 | | RTRiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 166 (3.35) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite Gneiss Landscape** | | | | |
| | NDL | Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown red gravelly sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation | | **89(1.79)** |
| 289 | | NDLbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 28 (0.56) |
| 291 | | NDLcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 37 (0.74) |
| 300 | | NDLiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 24 (0.49) |
| | TDG | Thondigere soils are very deep (>150 cm), well drained, have dark brown to dark yellowish brown, sandy clay loam soils occurring on nearly level to very gently sloping lowlands under cultivation | | **39 (0.79)** |
| 440 | | TDGcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 39 (0.79) |
| **Soils of Alluvial Landscape** | | | | |
| | 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 | | **14 (0.28)** |
| 310 | | MTLmB2 | Clay surface, slope 1-3%, moderate erosion | 14 (0.28) |
| | 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 | | **172(3.47)** |
| 328 | | RNKhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 52 (1.04) |
| 333 | | RNKmB1 | Clay surface, slope 1-3%, slight erosion | 79 (1.6) |
| 336 | | RNKmB2 | Clay surface, slope 1-3%, moderate erosion | 22 (0.44) |
| 337 | | RNKmB2g1 | Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 19 (0.39) |
| | 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 | | **63 (1.26)** |
| 342 | | DRLiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 63 (1.26) |
| | BWT | Bedwatti soils are moderately deep (75-100 cm), moderately well drained, dark brown to dark gray and very dark gray, black calcareous gravelly sandy clay to clay soils occurring on very gently sloping plains under cultivation | | **27 (0.55)** |
| 366 | | BWThB1 | Sandy clay loam surface, slope 1-3%, slight erosion | 27 (0.55) |
| | 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 | | **91(1.84)** |
| 368 | | GRHiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 74 (1.49) |
| 370 | | GRHmA1 | Clay surface, slope 0-1%, slight erosion | 17 (0.35) |

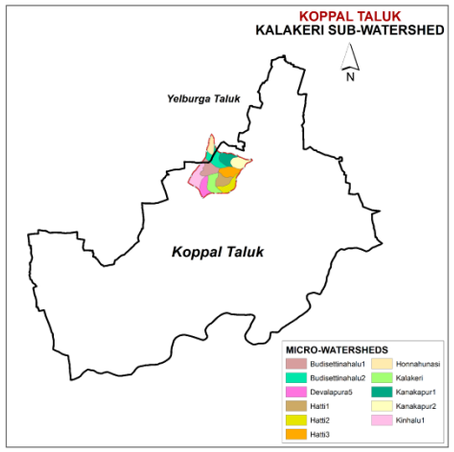
*To be continued...*

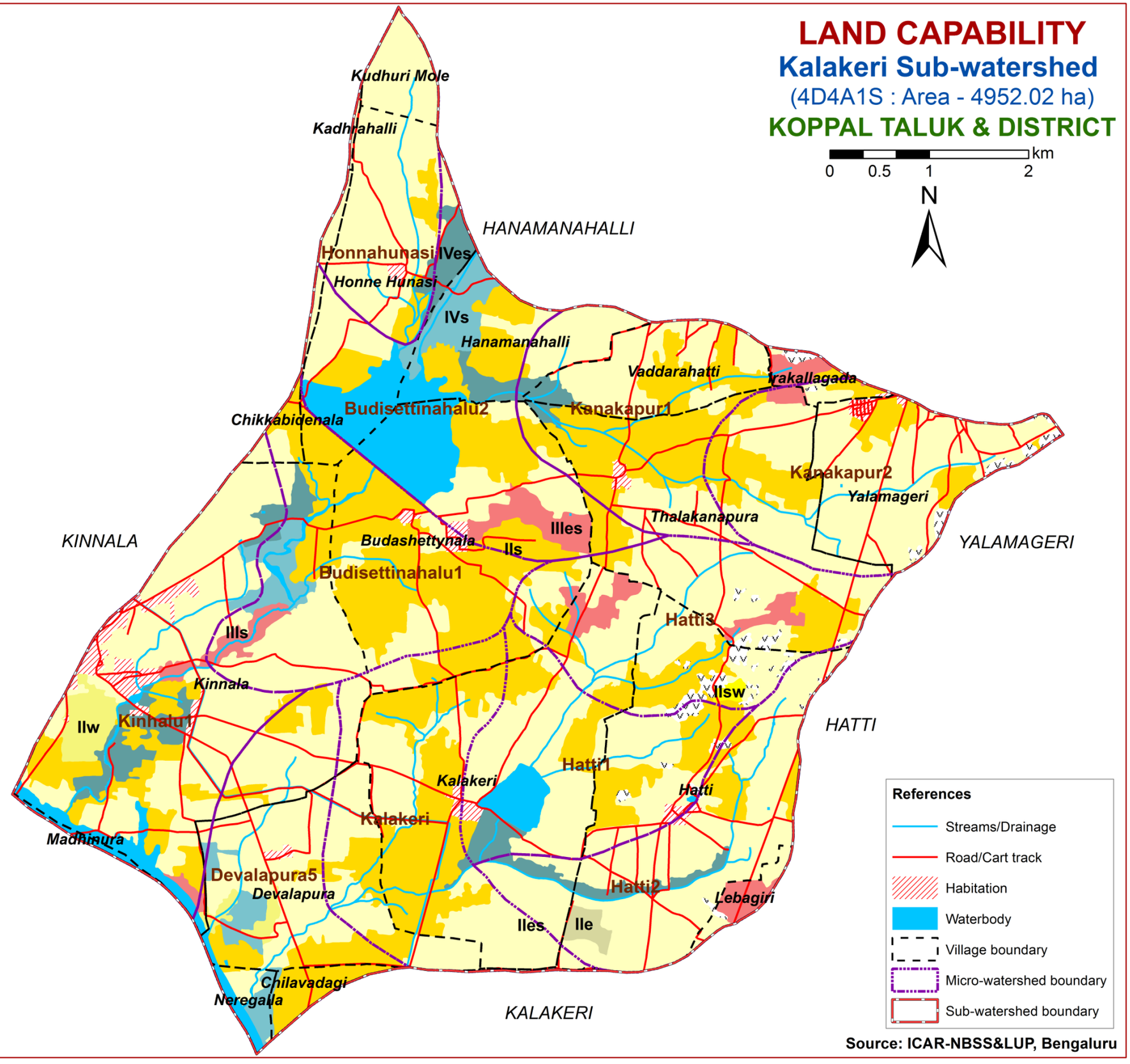
| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Alluvial Landscape** | | | | |
| | KVR | Kavalur soils are deep (100-150 cm), moderately well drained, have dark yellowish brown to very dark grayish brown, calcareous cracking black clay soils occurring on nearly level to very gently sloping plains under cultivation | | **308(6.22)** |
| 384 | | KVRiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 87 (1.76) |
| 386 | | KVRmA1 | Clay surface, slope 0-1%, slight erosion | 58 (1.17) |
| 388 | | KVRmB1 | Clay surface, slope 1-3%, slight erosion | 163 (3.29) |
| | 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 | | **20 (0.41)** |
| 396 | | BGPmB1 | Clay surface, slope 1-3%, slight erosion | 20 (0.41) |
| | 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 | | **123 (2.48)** |
| 401 | | KDTiB1 | Sandy clay surface, slope 1-3%, slight erosion | 123 (2.48) |
| | 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 | | **151(3.03)** |
| 410 | | MLRiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 33 (0.66) |
| 418 | | MLRmB2 | Clay surface, slope 1-3%, moderate erosion | 118 (2.37) |
| | GGR | Gudigeri soils are very deep (>150 cm), moderately well drained, have very dark gray to very dark garyish brown and black clayey stratified sandy soils in some sub horizons soils occurring on very gently sloping plains under cultivation | | **7 (0.15)** |
| 461 | | GGRhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 7 (0.15) |
| | APR | Allipura soils are very deep (>150 cm), moderately well drained, have gray to dark gray, black clayey stratified sandy soils in some sub horizons occurring on nearly level sloping plains under cultivation | | **38 (0.76)** |
| 463 | | APRmA1 | Clay surface, slope 0-1%, slight erosion | 38 (0.76) |
| 994 | Mining/Industrial | | | **0.39(0.007)** |
| 999 | Rock outcrops | Rock lands, both massive and bouldery with little or no soil | | **51 (1.02)** |
| 1000 | Others | Habitation and water body | | **327 (6.61)** |

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

# 5. Soil Survey Interpretations

## 5.1. Land Capability Classification

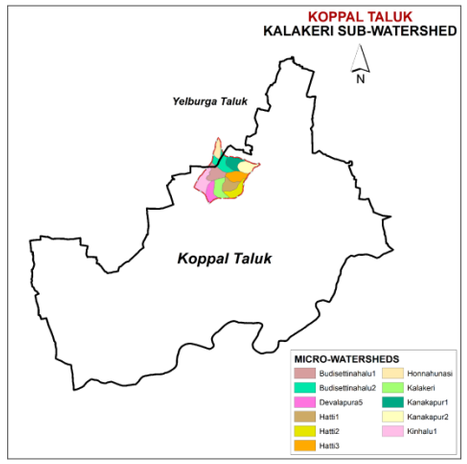



| Capability subclass | Area in ha (%) |
|---|---|
| IIe | 14 (0.29) |
| IIs | 1387 (28.01) |
| IIw | 49 (0.99) |
| IIes | 2698 (54.48) |
| IIsw | 5 (0.1) |
| IIIs | 27 (0.55) |
| IIIes | 110 (2.22) |
| IVs | 117 (2.36) |
| IVes | 167 (3.37) |
| Mining/Industrial | 0.4 (0.01) |
| Rock outcrops | 51 (1.02) |
| Others * | 327 (6.61) |

* - Habitation & Waterbody

# 5.2. Soil Depth




## SOIL DEPTH

### Kalakeri Sub-watershed

(4D4A1S : Area - 4952.02 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

Kudhuri Mole
Kadhrahalli
Honnahunasi
Honne Hunasi
HANAMANAHALLI
Hanamanahalli
Vaddarahatti
Yakallagada
Budisettinahalu2
Chikkabidenala
Kanakapur1
Kanakapur2
Yalamageri
YALAMAGERI
Thalakanapura
Budashettynala
Budisettinahalu1
Hatti3
KINNALA
Kinnala
Kinnalu1
HATTI
Kalakeri
Hatti1
Hatti
Kalakeri
Madhinura
Devalapura5
Devalapura
Hatti2
Lebagiri
Chilavadagi
Neregalla
KALAKERI

**References**

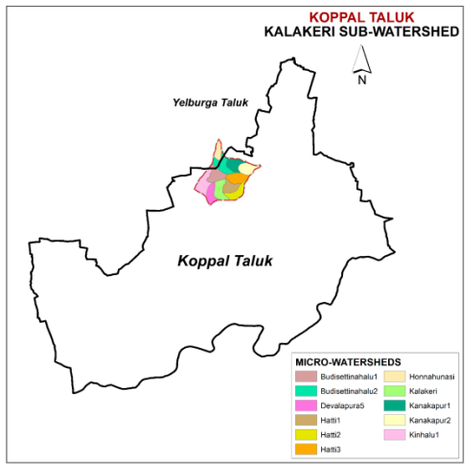
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Depth Class | Area in ha (%) |
|---|---|
| Shallow (25-50 cm) | 73 (1.48) |
| Moderately shallow (50-75 cm) | 232 (4.69) |
| Moderately deep (75-100 cm) | 1113 (22.48) |
| Deep (100-150 cm) | 2453 (49.53) |
| Very deep (>150 cm) | 702 (14.18) |
| Mining/Industrial | 0.4 (0.01) |
| Rock outcrops | 51 (1.02) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.3. Surface Soil Texture




## SURFACE SOIL TEXTURE

### Kalakeri Sub-watershed

(4D4A1S : Area - 4952.02 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

Kudhuri Mole
Kadhirahalli
Honnahunasi
Honne Hunasi
HANAMANAHALLI
Hanamanahalli
Vaddarahatti
Irakallagada
Budisettinahalu2
Kanakapur1
Chikkabidenala
Kanakapur2
Yalamageri
Thalakanapura
YALAMAGERI
Budashettynala
Budisettinahalu1
Hatti3
KINNALA
Kinnala
Kinhalu1
HATTI
Hatti1
Kalakeri
Hatti
Kalakeri
Madhinura
Devalapura5
Devalapura
Hatti2
Lebagiri
Chilavadagi
Neregalla
KALAKERI

**References**

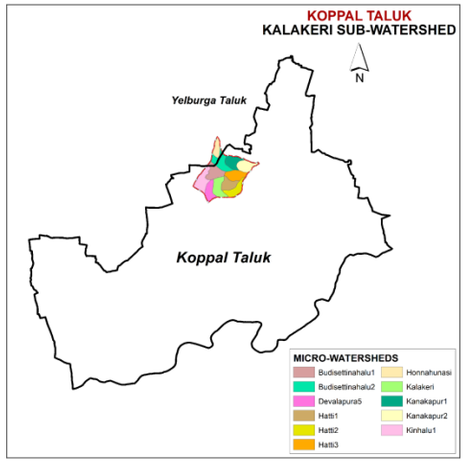
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Texture Class | Area in ha(%) |
|---|---|
| Loamy sand | 464 (9.37) |
| Sandy loam | 1127 (22.77) |
| Sandy clay loam | 1079 (21.79) |
| Sandy clay | 1226 (24.76) |
| Clay | 677 (13.67) |
| Mining/Industrial | 0.4 (0.01) |
| Rock outcrops | 51 (1.02) |
| Others* | 327 (6.61) |

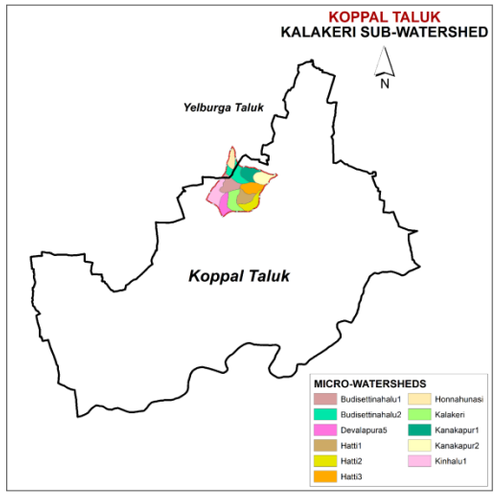
* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.4. Surface Soil Gravelliness



# 5.5. Available Water Capacity




**References**

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

## AVAILABLE WATER CAPACITY

### Kalakeri Sub-watershed

(4D4A1S : Area - 4952.02 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

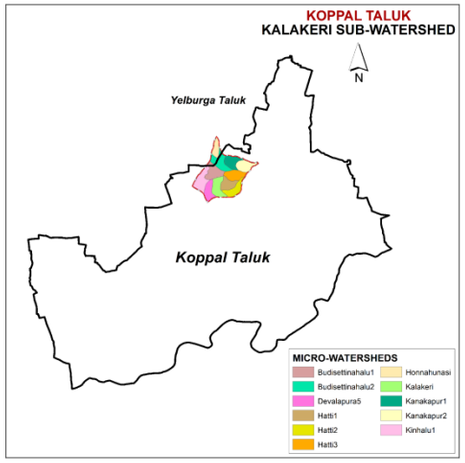
Kudhuri Mole
Kadhrahalli
Honnahunasi
Honne Hunasi
HANAMANAHALLI
Hanamanahalli
Vaddarahatti
Irakallagada
Chikkabidenala
Budisettinahalu2
Kanakapur1
Kanakapur2
Yalamageri
YALAMAGERI
Thalakanapura
Budashettynala
Budisettinahalu1
Hatti3
KINNALA
Kinnala
Kinhalu1
HATTI
Hatti1
Kalakeri
Hatti
Kalakeri
Madhinura
Devalapura5
Devalapura
Hatti2
Lebagiri
Chilavadagi
Neregala
KALAKERI

| Available Water Capacity | Area in ha (%) |
|---|---|
| Very Low (<50 mm/m) | 96 (1.94) |
| Low (51-100 mm/m) | 3016 (60.91) |
| Medium (101-150 mm/m) | 399 (8.07) |
| High (151-200 mm/m) | 236 (4.76) |
| Very high (>200 mm/m) | 826 (16.68) |
| Mining/Industrial | 0.4 (0.01) |
| Rock outcrops | 51 (1.02) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

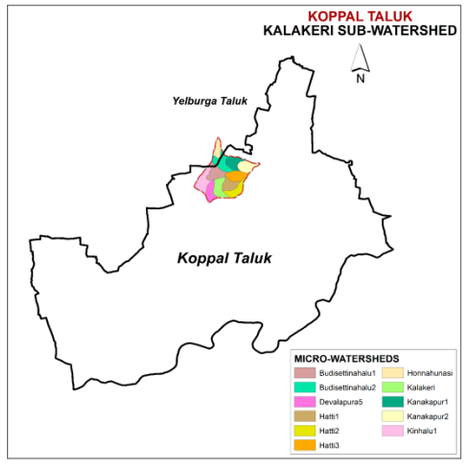
# 5.6.Slope




**References**

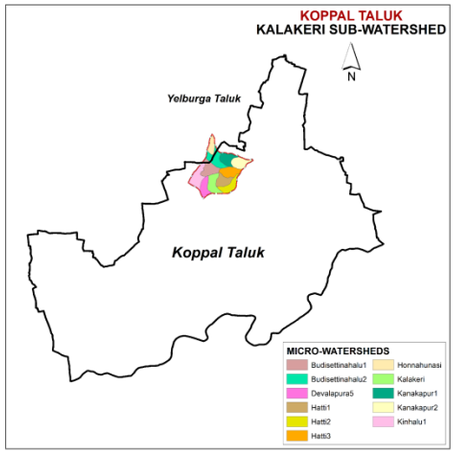
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

# 5.7.Soil Erosion



# 6. Soil Fertility Status

## 6.1. Soil Reaction (pH)







# SOIL REACTION (pH) (2018)

## Kalakeri Sub-watershed

(4D4A1S : Area - 4952.02 ha)

## KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

**References**

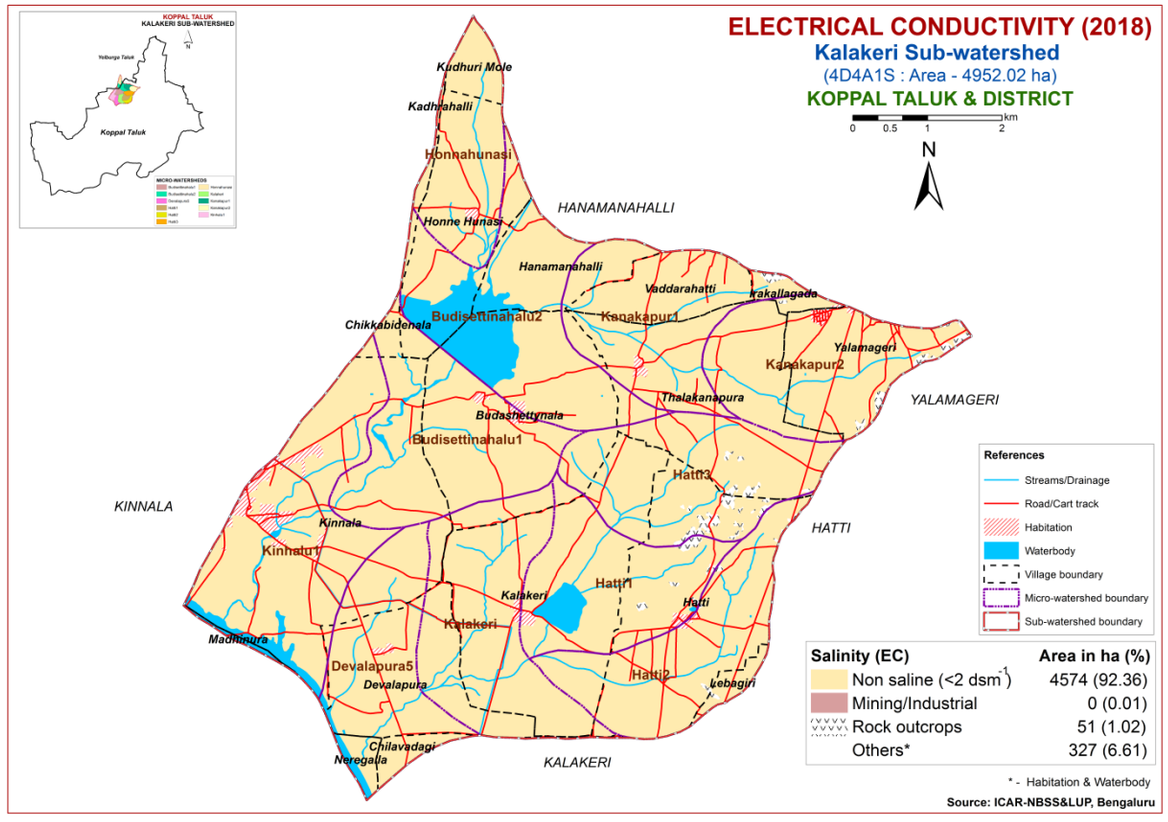
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Reaction Class | Area in ha (%) |
|---|---|
| Moderately acid (pH 5.5 – 6.0) | 740 (14.94) |
| Slightly acid (pH 6.0 – 6.5) | 1120 (22.62) |
| Neutral (pH 6.5 – 7.3) | 823 (16.62) |
| Slightly alkaline (pH 7.3 – 7.8) | 769 (15.54) |
| Moderately alkaline (pH 7.8 – 8.4) | 556 (11.23) |
| Strongly alkaline (pH 8.4 – 9.0) | 478 (9.65) |
| Very strongly alkaline (pH > 9.0) | 88 (1.78) |
| Mining/Industrial | 0.4 (0.01) |
| Rock outcrops | 51 (1.02) |
| Others* | 327 (6.61) |

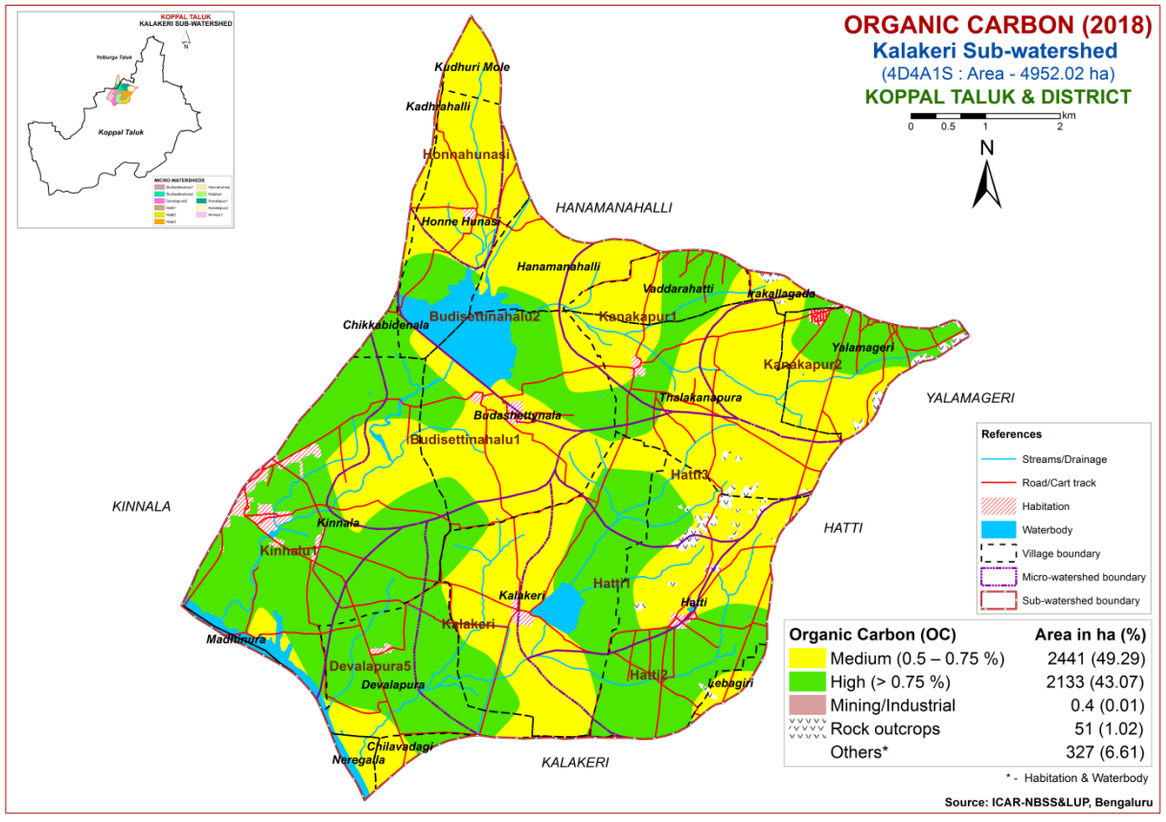
* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

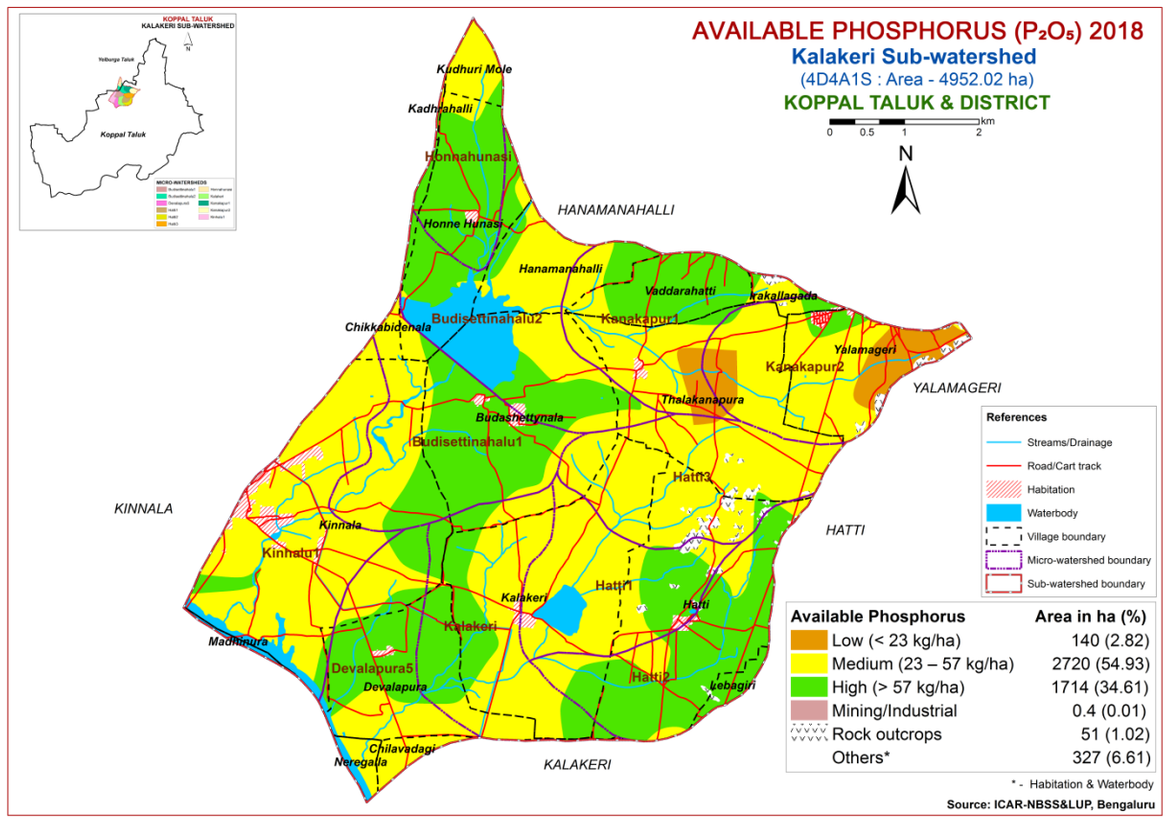
## 6.2. Electrical Conductivity (EC)



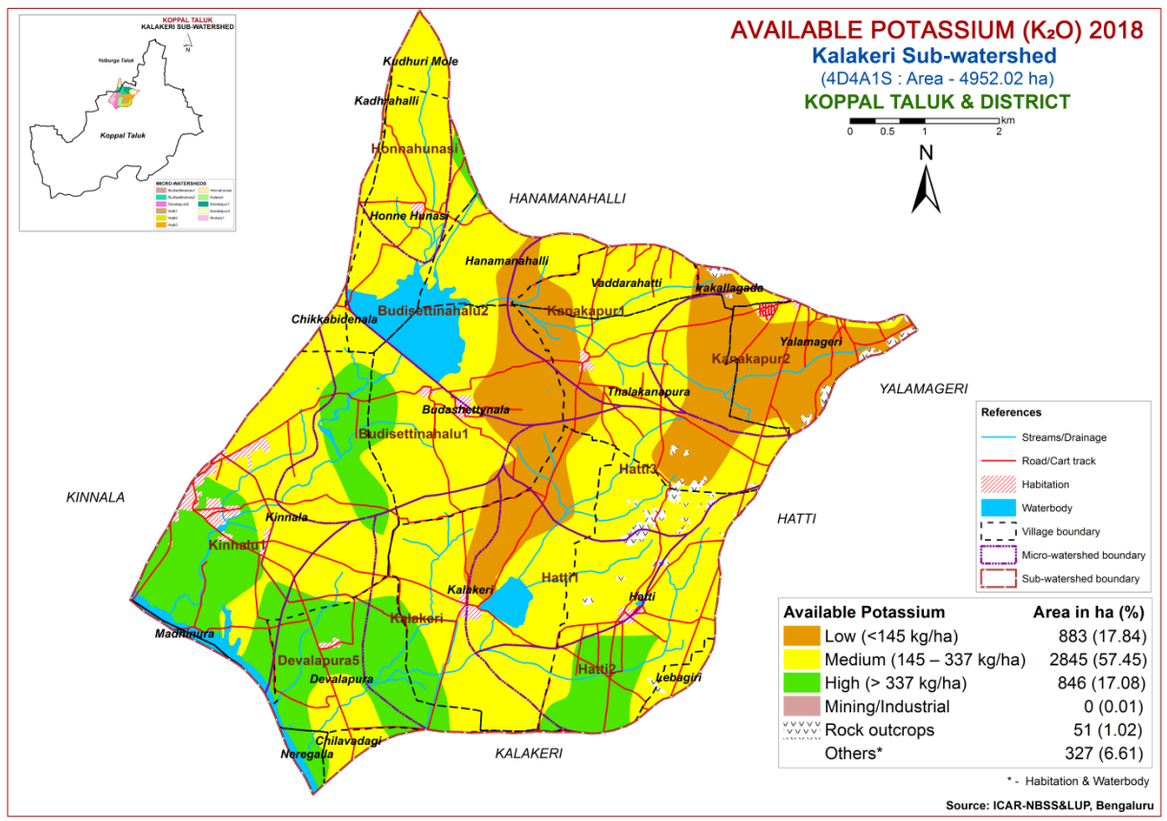

## 6.3. Organic Carbon



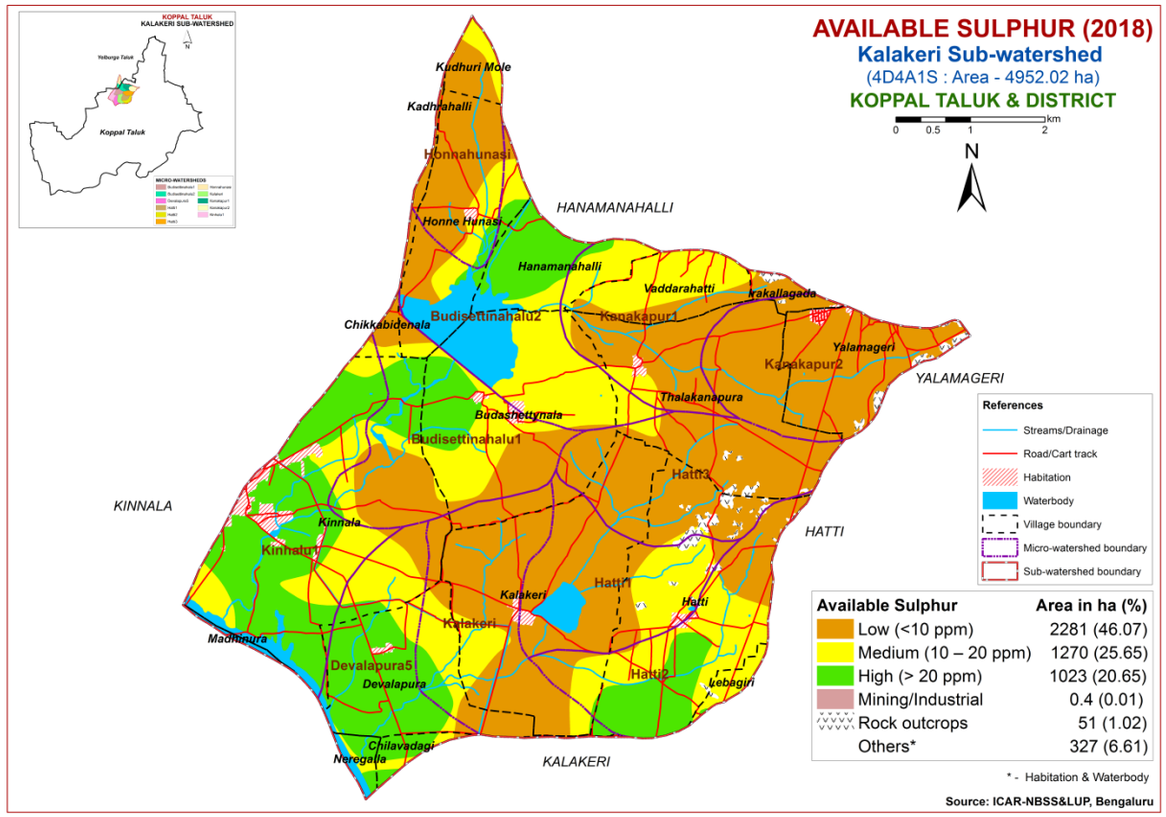

## 6.4. Available Phosphorus



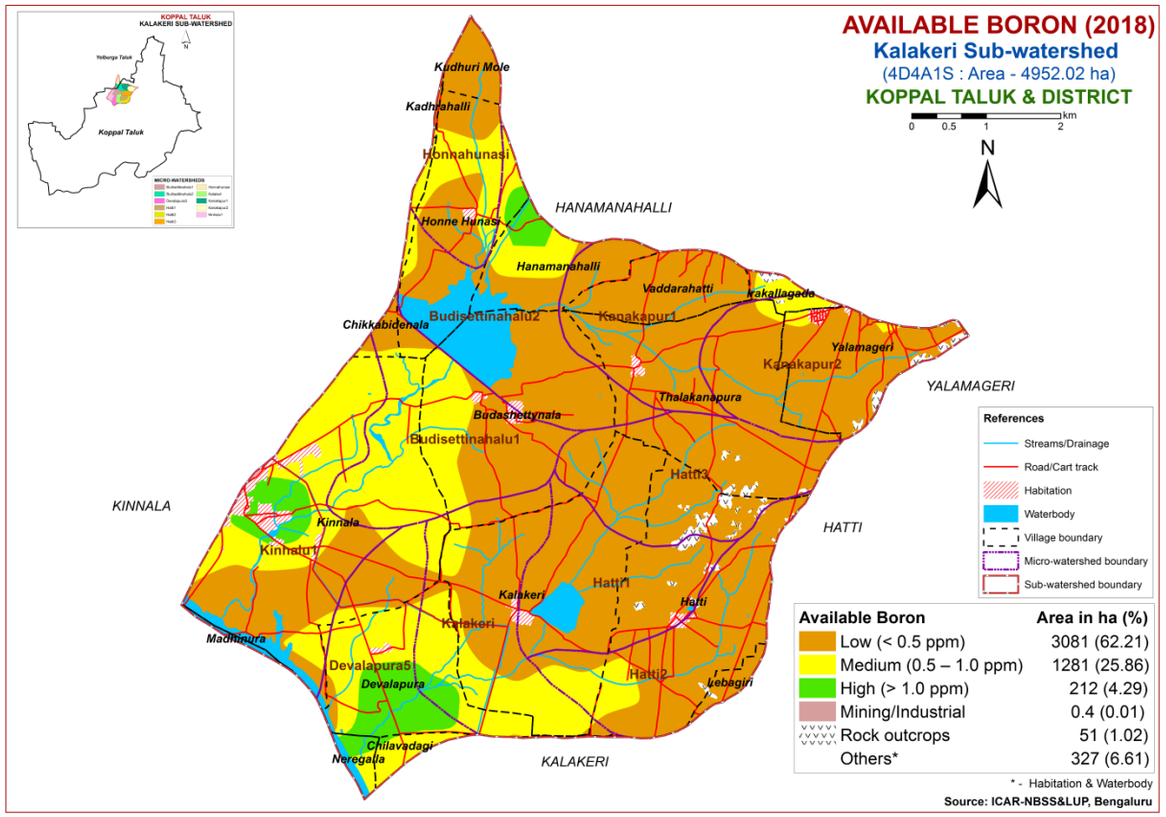

## 6.5. Available Potassium



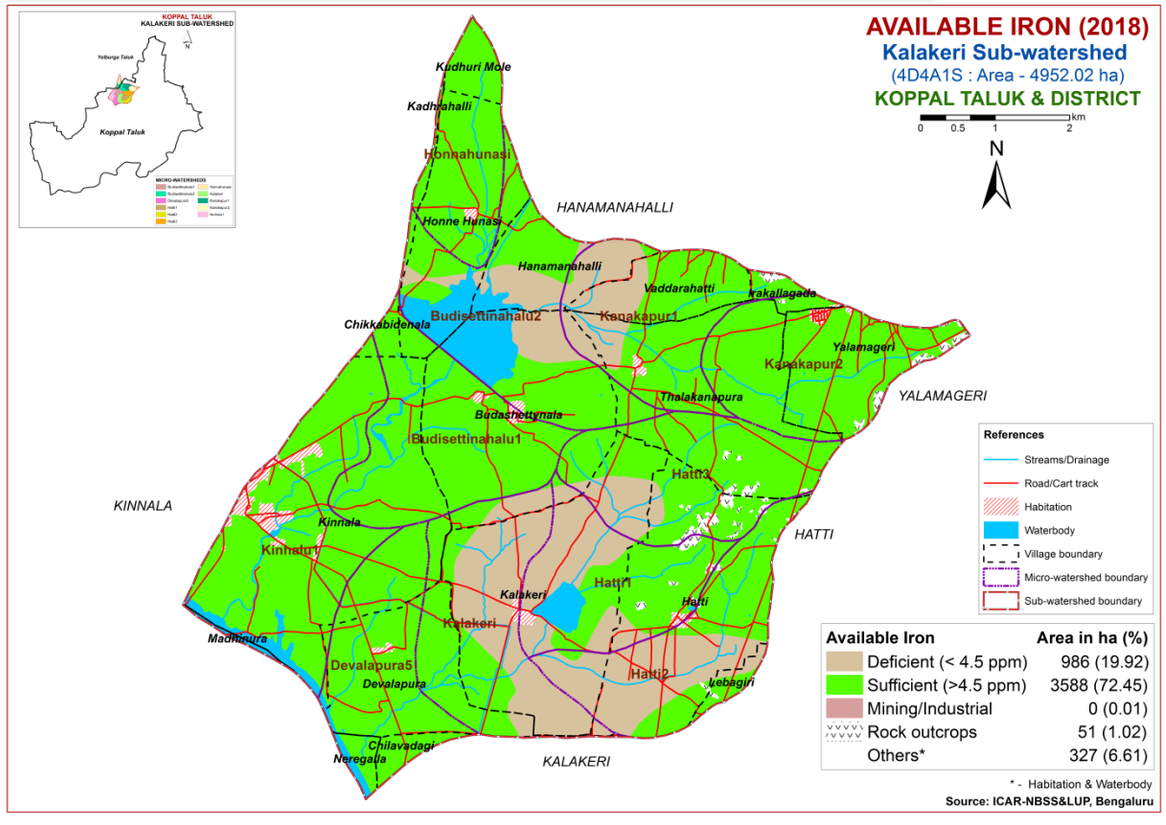
## 6.6. Available Sulphur



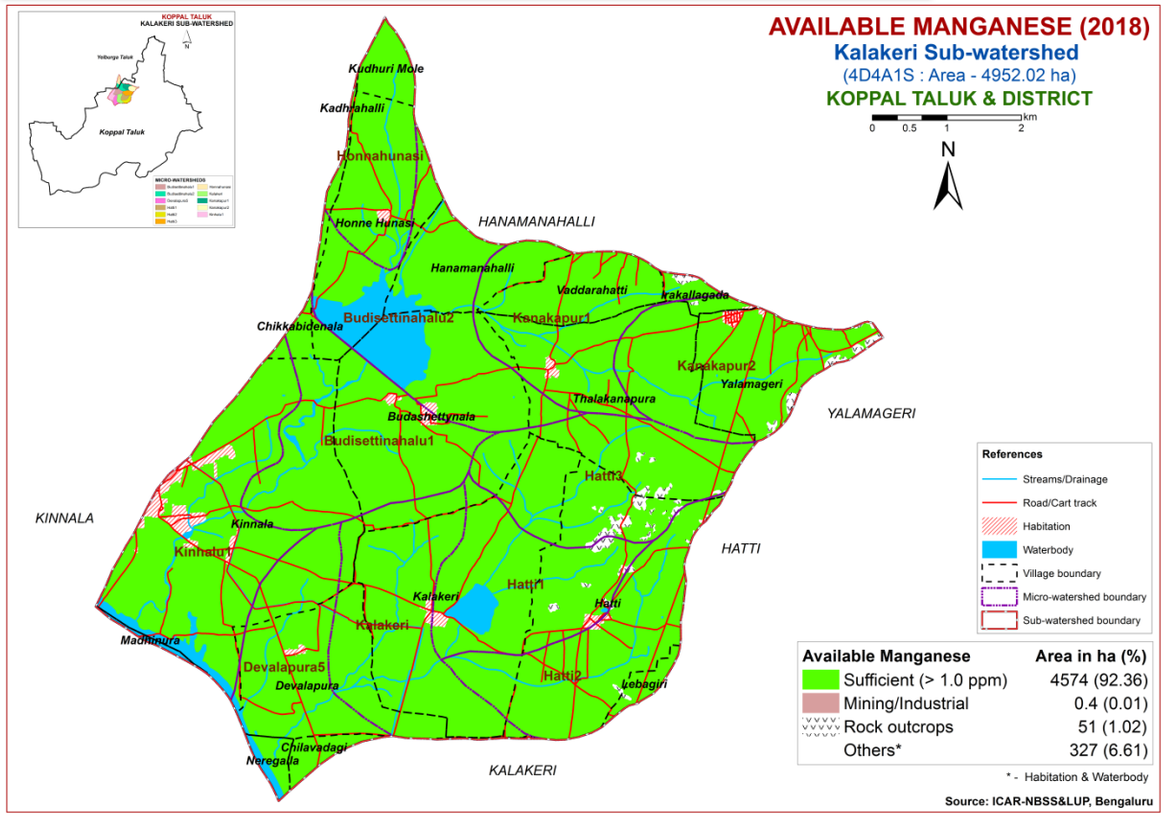

## 6.7. Available Boron



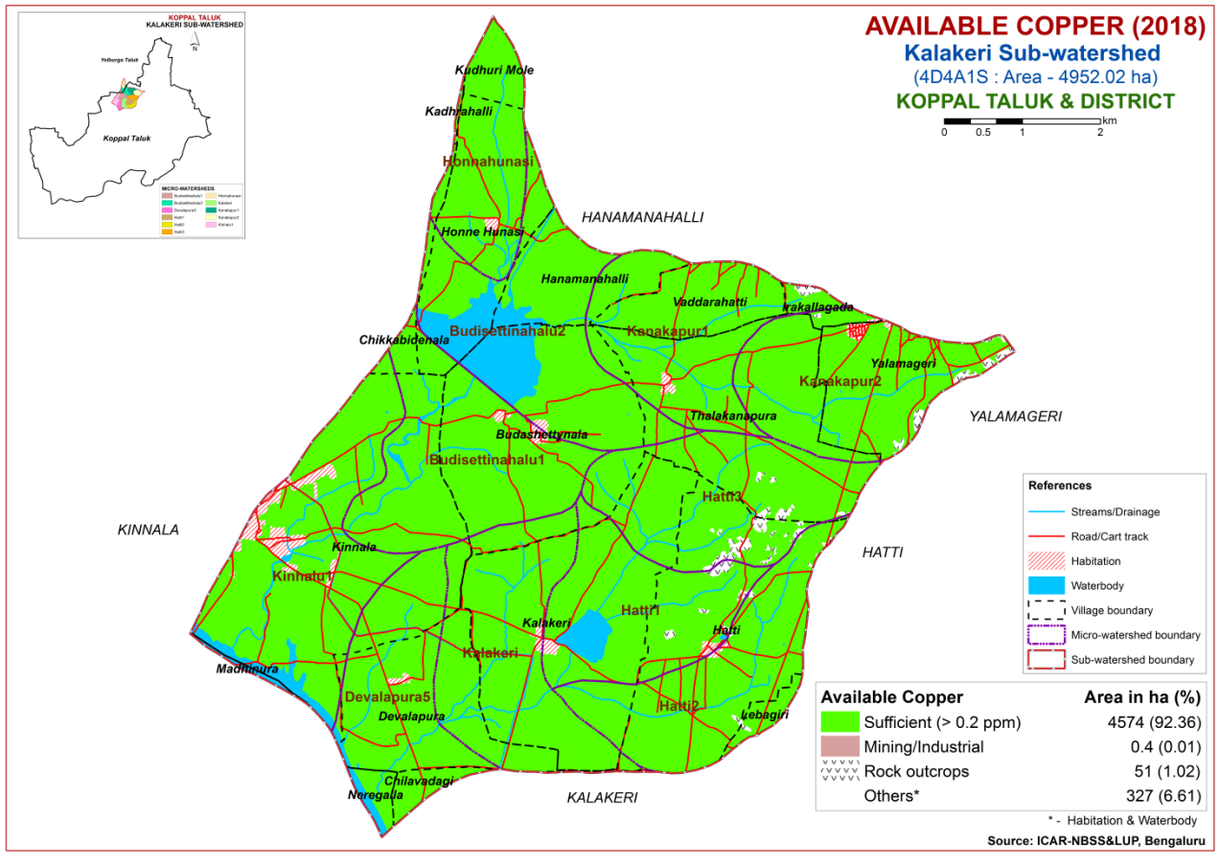

## 6.8. Available Iron



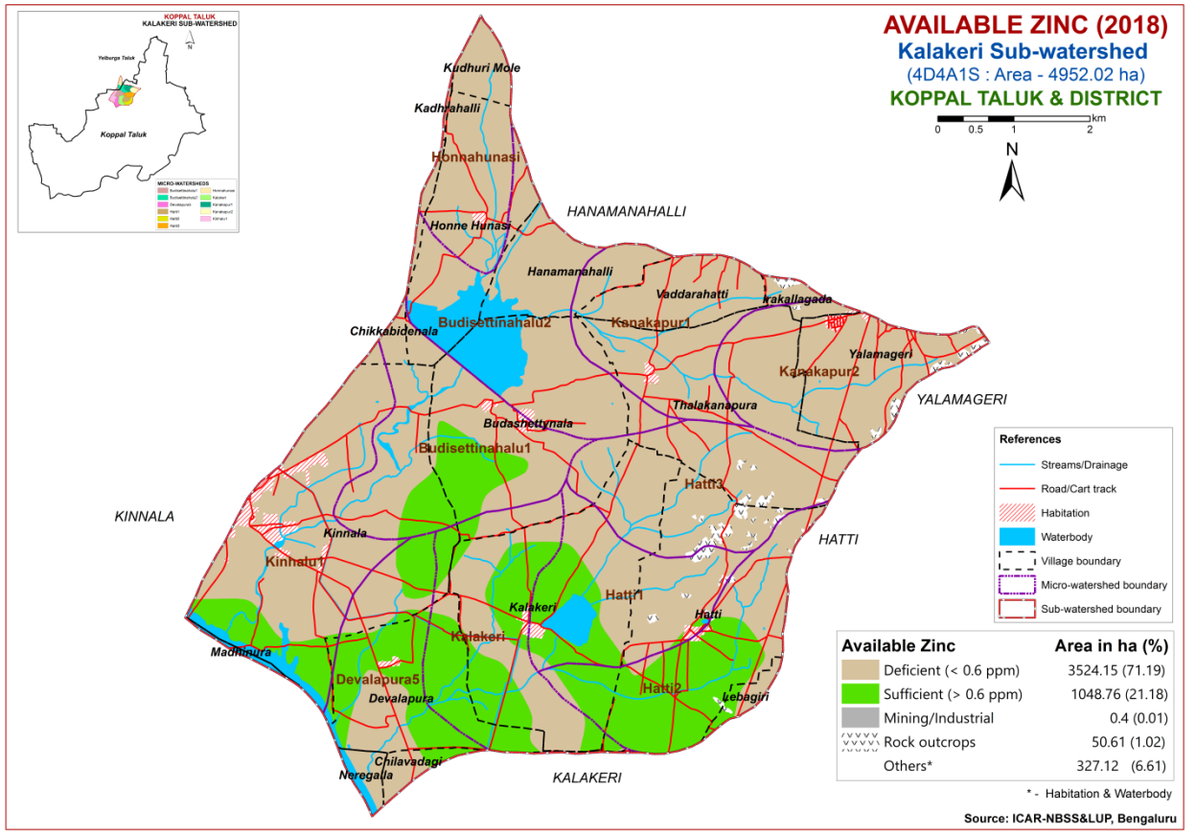

## 6.9. Available Manganese



## 6.10. Available Copper




## 6.11. Available Zinc



## 6.12. Correcting the Soil Nutrient Deficiencies

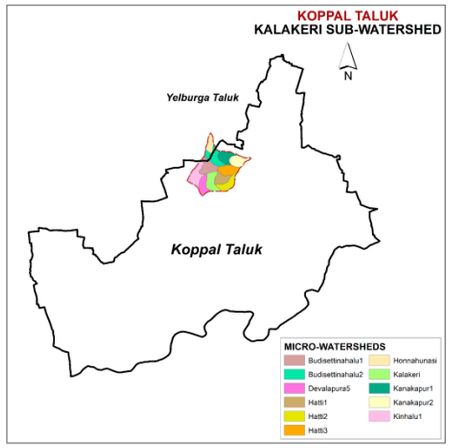
1. Reclamation of Salt affected soils
   a) When the soil is having neutral pH (6.5-7.5), no need of adding amendments (lime or gypsum)
   b) If the soil pH is <6.5, apply burnt lime to soil as per specifically recommended dosage and again after 2 years proper change has to be made based on soil test 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

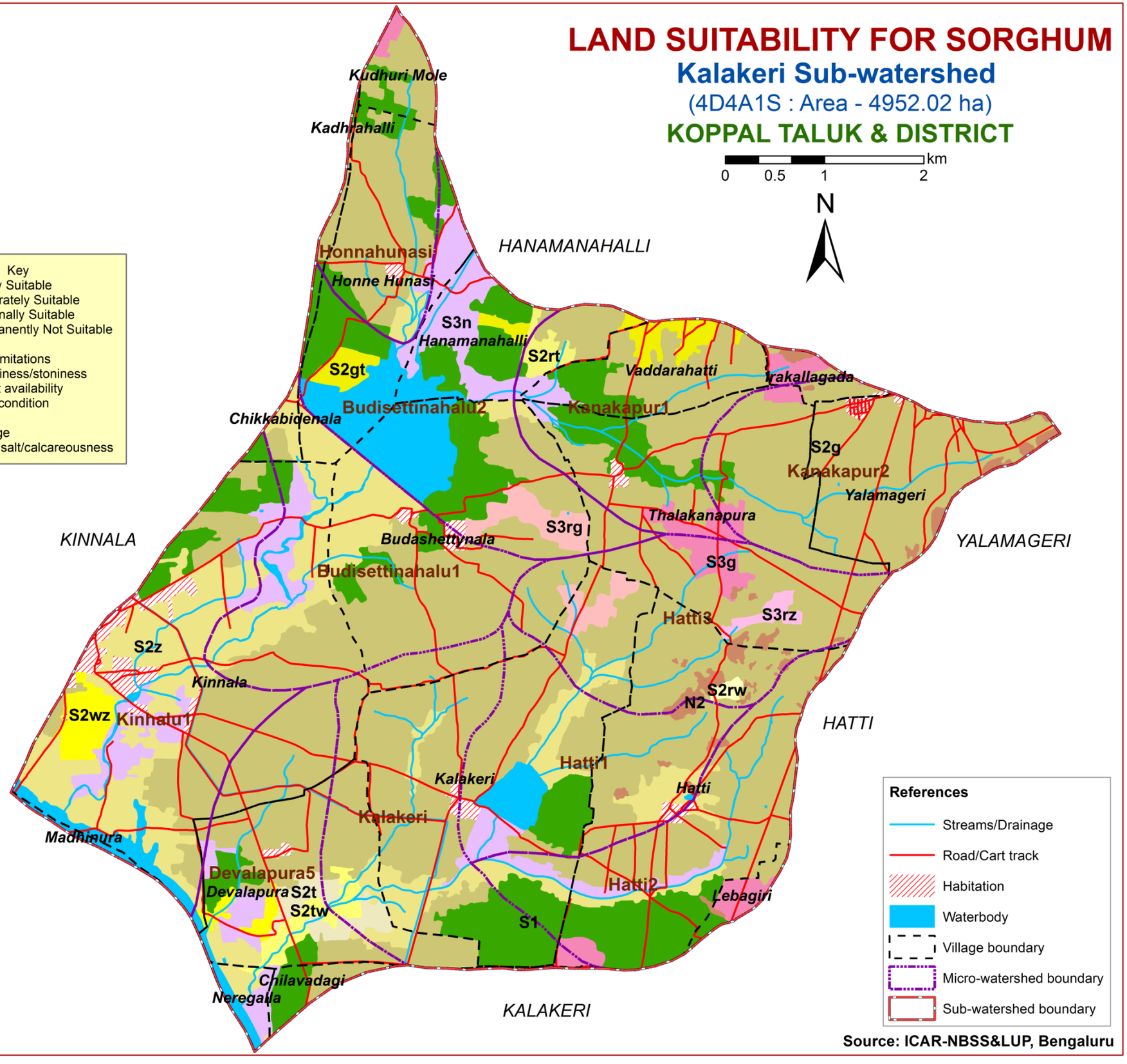



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

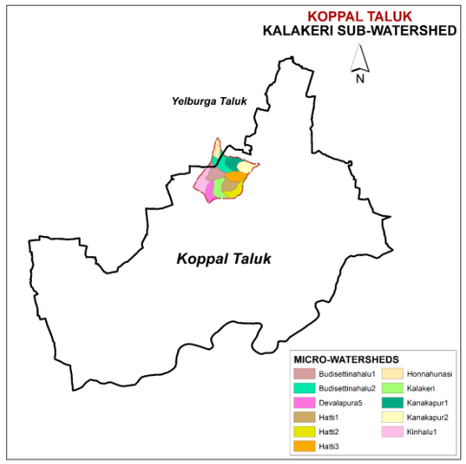
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 616 (12.44) |
| S2g | 2703 (54.59) |
| S2t | 39 (0.79) |
| S2z | 593 (11.98) |
| S2gt | 55 (1.12) |
| S2rt | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tw | 30 (0.61) |
| S2wz | 49 (0.99) |
| S3g | 108 (2.18) |
| S3n | 284 (5.73) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.2. Land Suitability for Maize

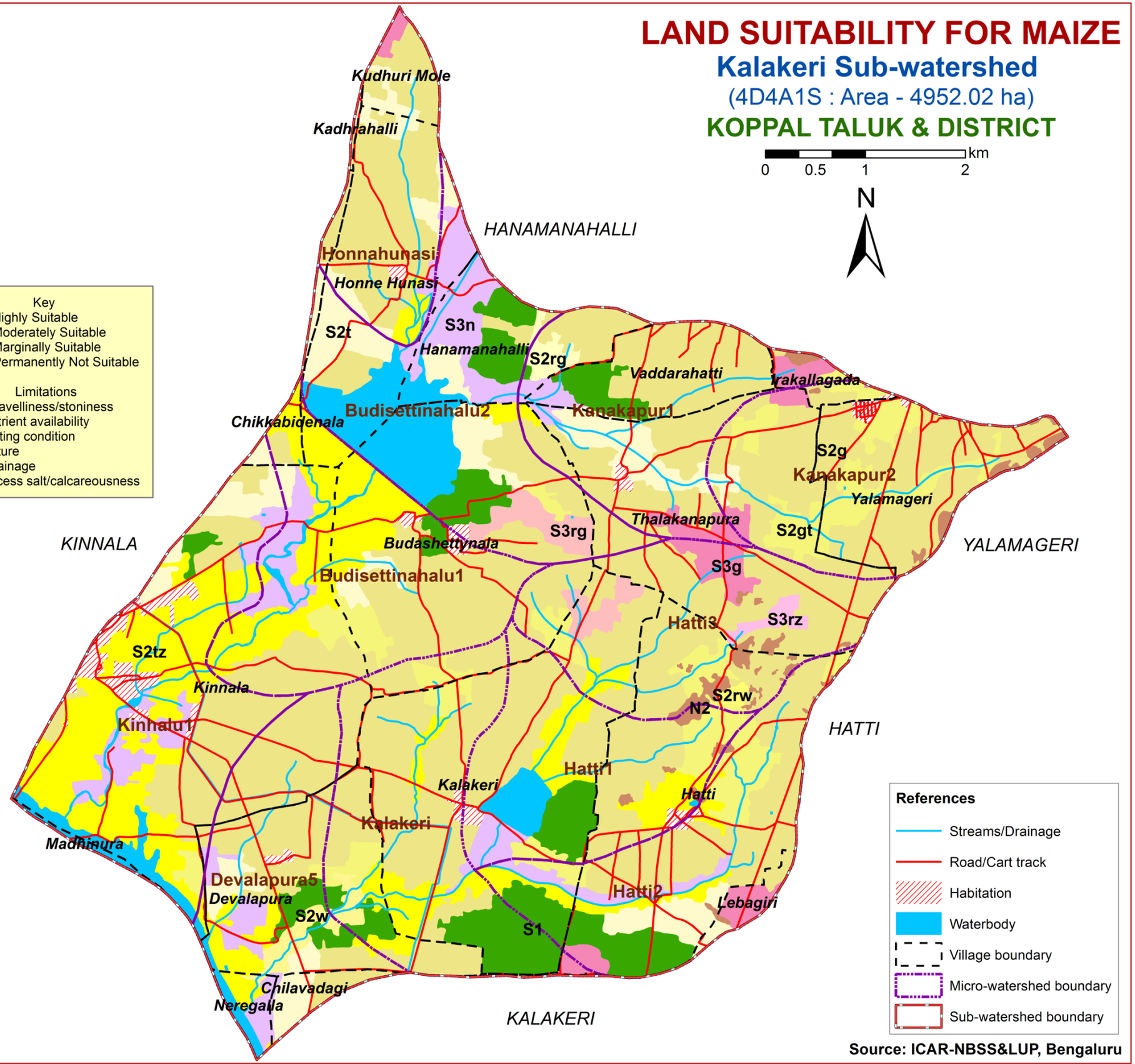



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

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

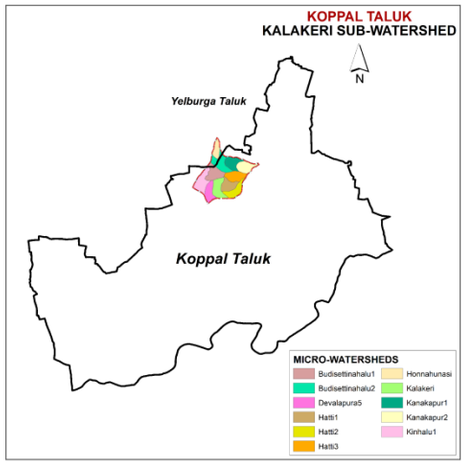
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 314 (6.34) |
| S2g | 2434 (49.14) |
| S2t | 341 (6.88) |
| S2w | 30 (0.61) |
| S2gt | 325 (6.56) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tz | 642 (12.96) |
| S3g | 108 (2.18) |
| S3n | 284 (5.73) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.3. Land Suitability for Redgram

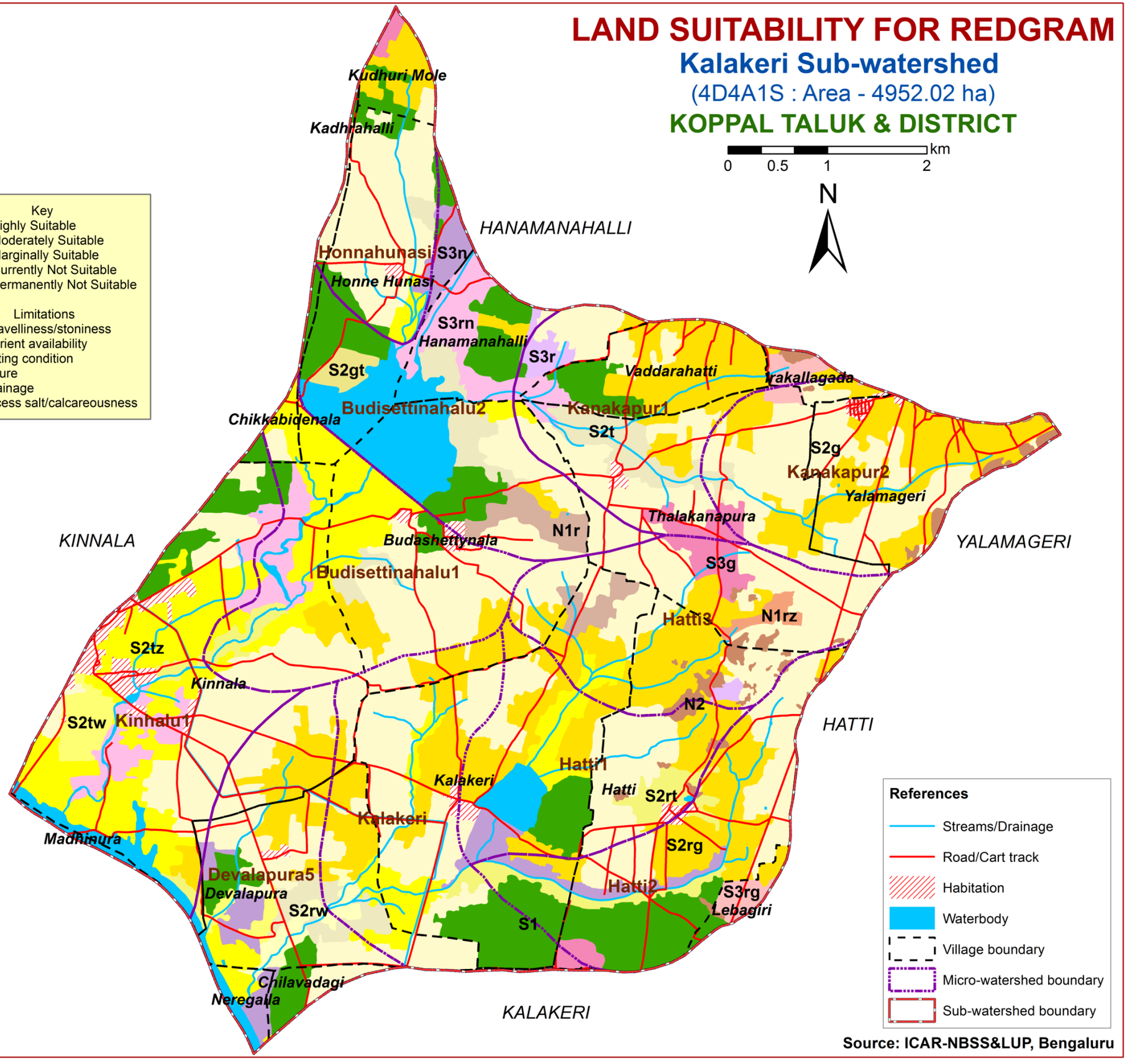



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

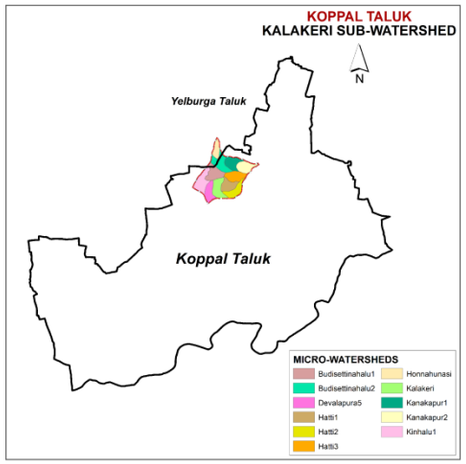
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 493 (9.95) |
| S2g | 1771 (35.75) |
| S2t | 162 (3.27) |
| S2gt | 18 (0.36) |
| S2rg | 970 (19.59) |
| S2rt | 90 (1.81) |
| S2rw | 30 (0.61) |
| S2tw | 49 (0.99) |
| S2tz | 503 (10.17) |
| S3g | 71 (1.43) |
| S3n | 112 (2.26) |
| S3r | 23 (0.47) |
| S3rg | 37 (0.74) |
| S3rn | 172 (3.47) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.4. Land Suitability for Bajra

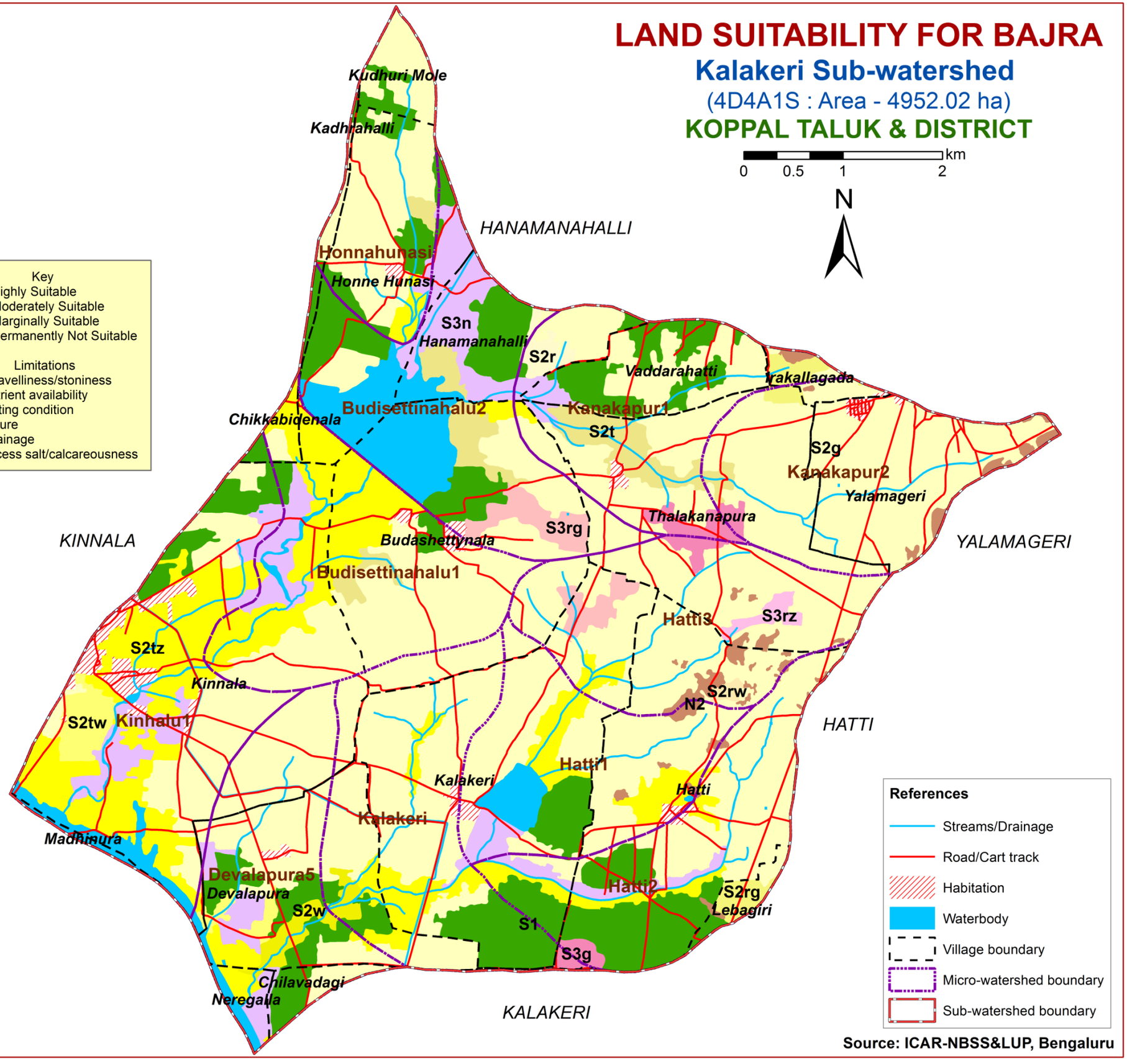



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

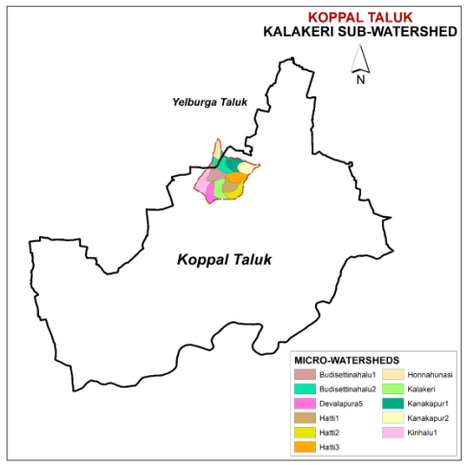
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 623 (12.58) |
| S2g | 2691 (54.34) |
| S2r | 18 (0.37) |
| S2t | 123 (2.48) |
| S2w | 30 (0.61) |
| S2rg | 37 (0.74) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S2tz | 593 (11.98) |
| S3g | 48 (0.96) |
| S3n | 284 (5.73) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.5. Land Suitability for Drumstick

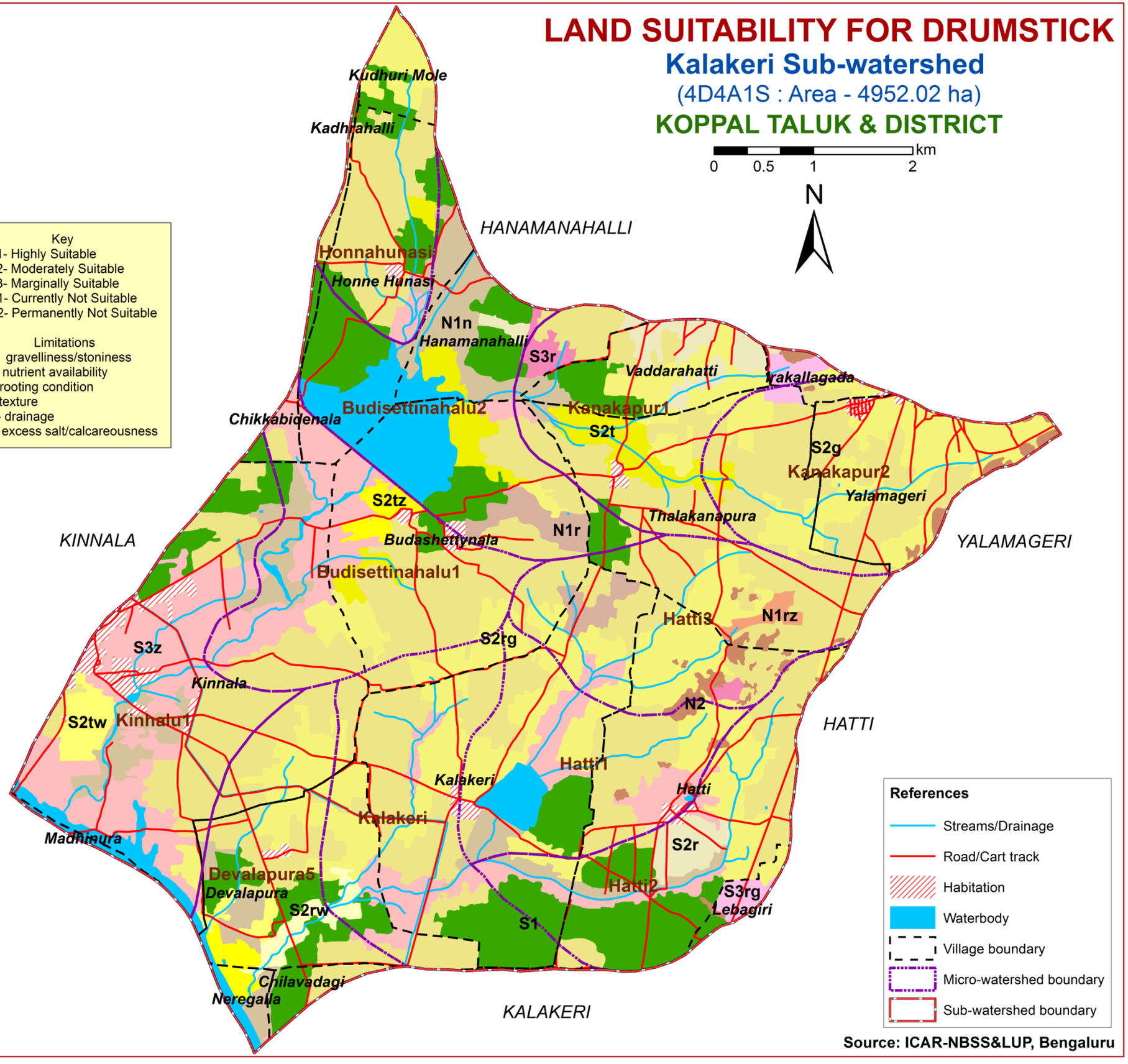



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

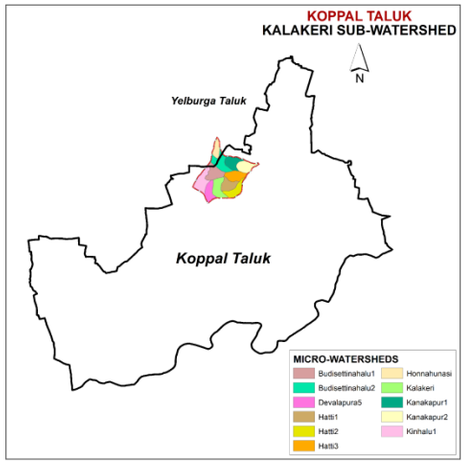
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 618 (12.47) |
| S2g | 1750 (35.35) |
| S2r | 100 (2.02) |
| S2t | 123 (2.48) |
| S2rg | 893 (18.04) |
| S2rw | 30 (0.61) |
| S2tw | 49 (0.99) |
| S2tz | 45 (0.91) |
| S3r | 23 (0.47) |
| S3z | 548 (11.07) |
| S3rg | 37 (0.74) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.6. Land Suitability for Sunflower

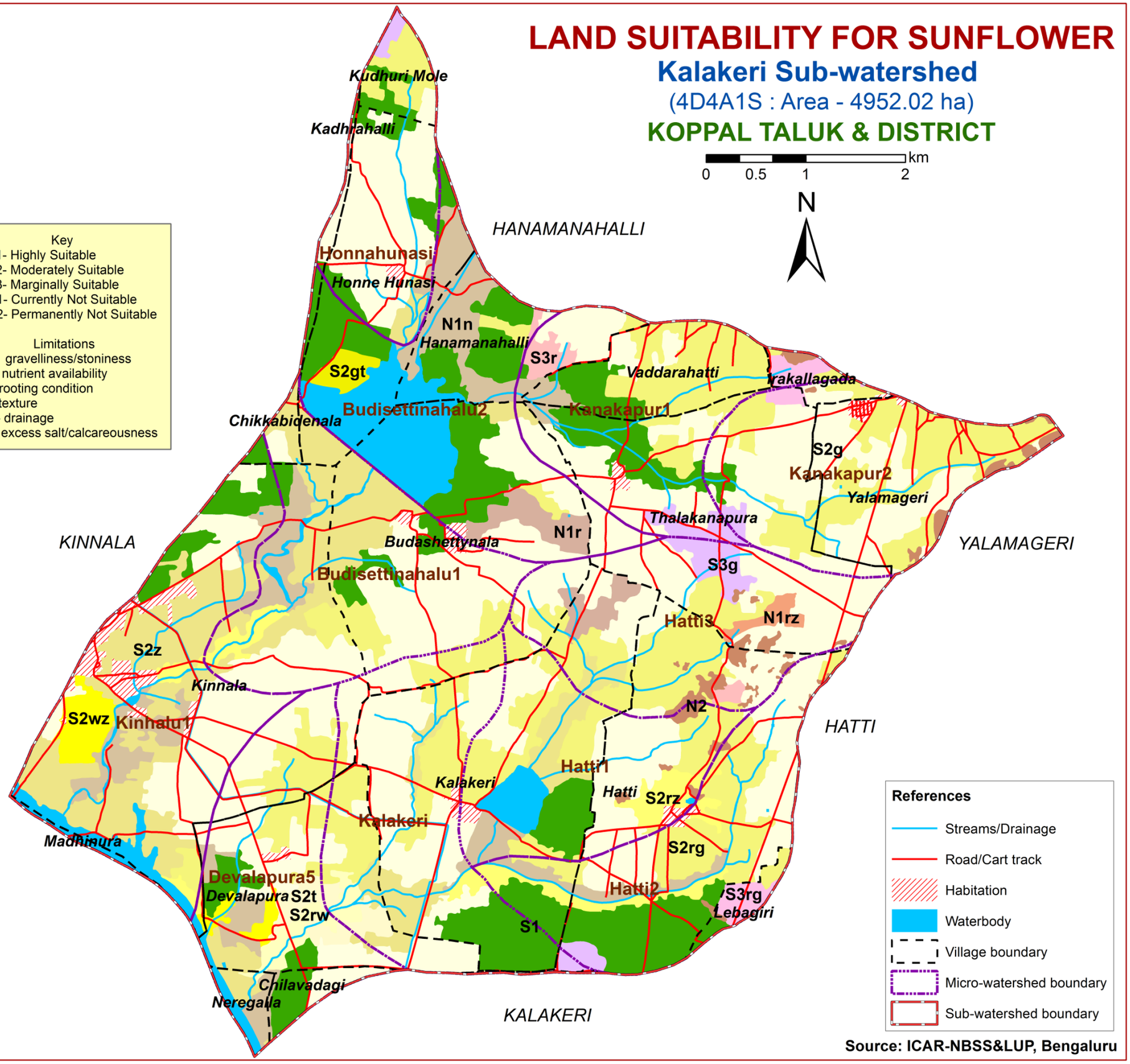



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

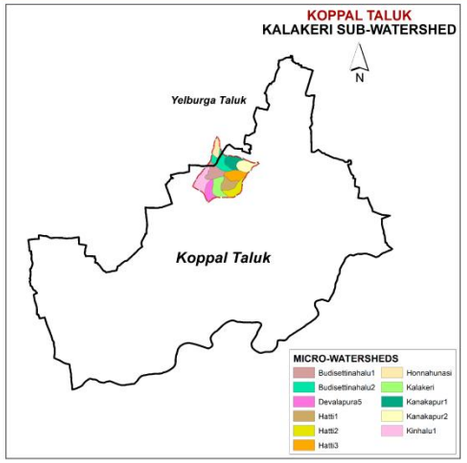
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 616 (12.44) |
| S2g | 1771 (35.75) |
| S2t | 39 (0.79) |
| S2z | 503 (10.17) |
| S2gt | 18 (0.36) |
| S2rg | 970 (19.59) |
| S2rw | 30 (0.61) |
| S2rz | 90 (1.81) |
| S2wz | 49 (0.99) |
| S3g | 71 (1.43) |
| S3r | 23 (0.47) |
| S3rg | 37 (0.74) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.7. Land Suitability for Cotton

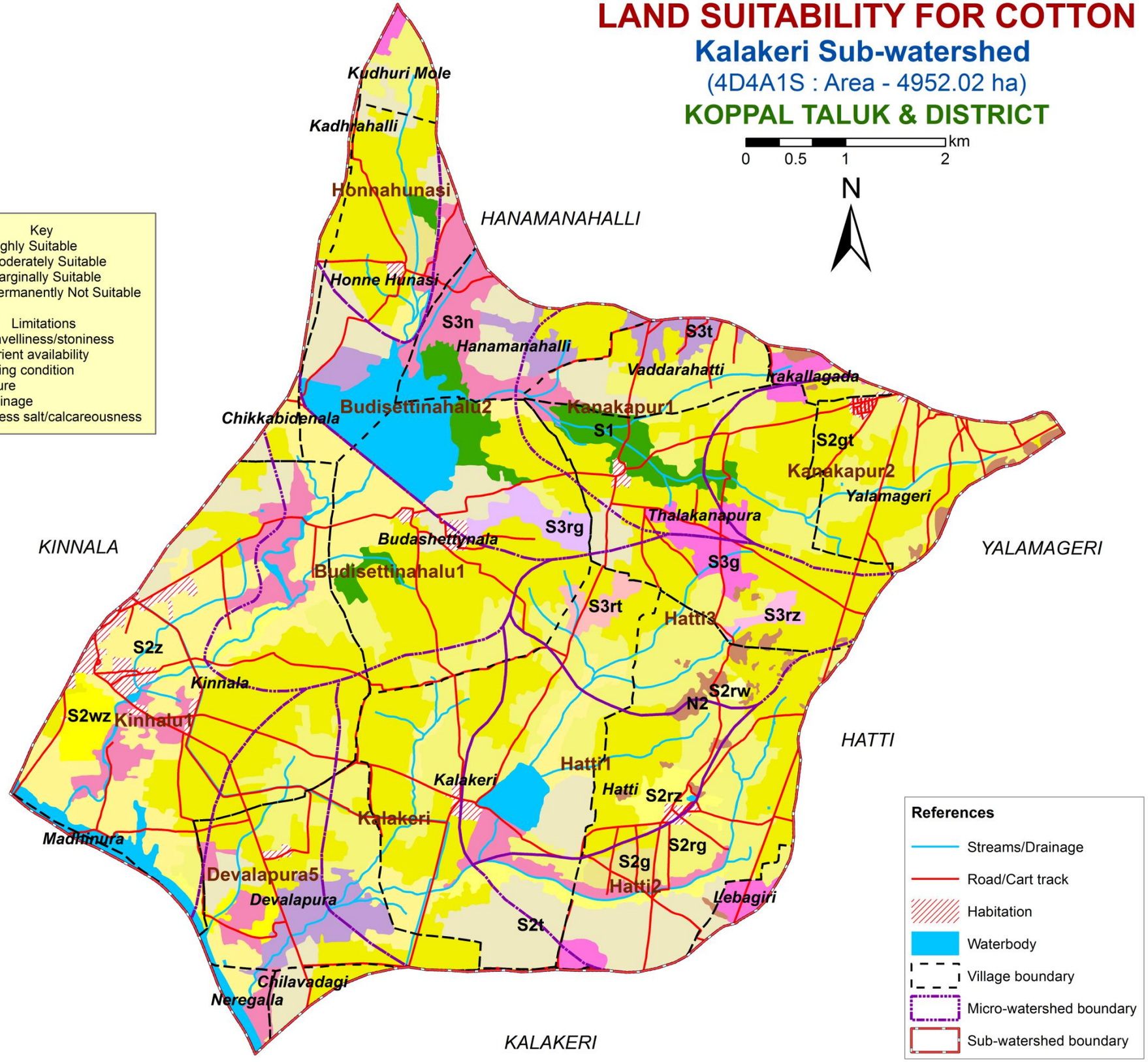



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

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

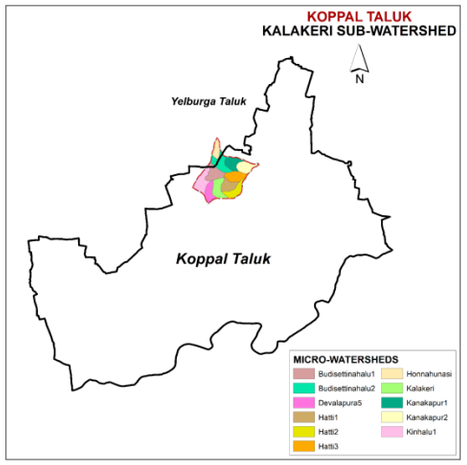
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 123 (2.48) |
| S2g | 40 (0.81) |
| S2t | 521 (10.52) |
| S2z | 503 (10.17) |
| S2gt | 1703 (34.38) |
| S2rg | 933 (18.84) |
| S2rw | 5 (0.1) |
| S2rz | 90 (1.81) |
| S2wz | 49 (0.99) |
| S3g | 108 (2.18) |
| S3n | 284 (5.73) |
| S3t | 143 (2.89) |
| S3rg | 36 (0.72) |
| S3rt | 24 (0.48) |
| S3rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



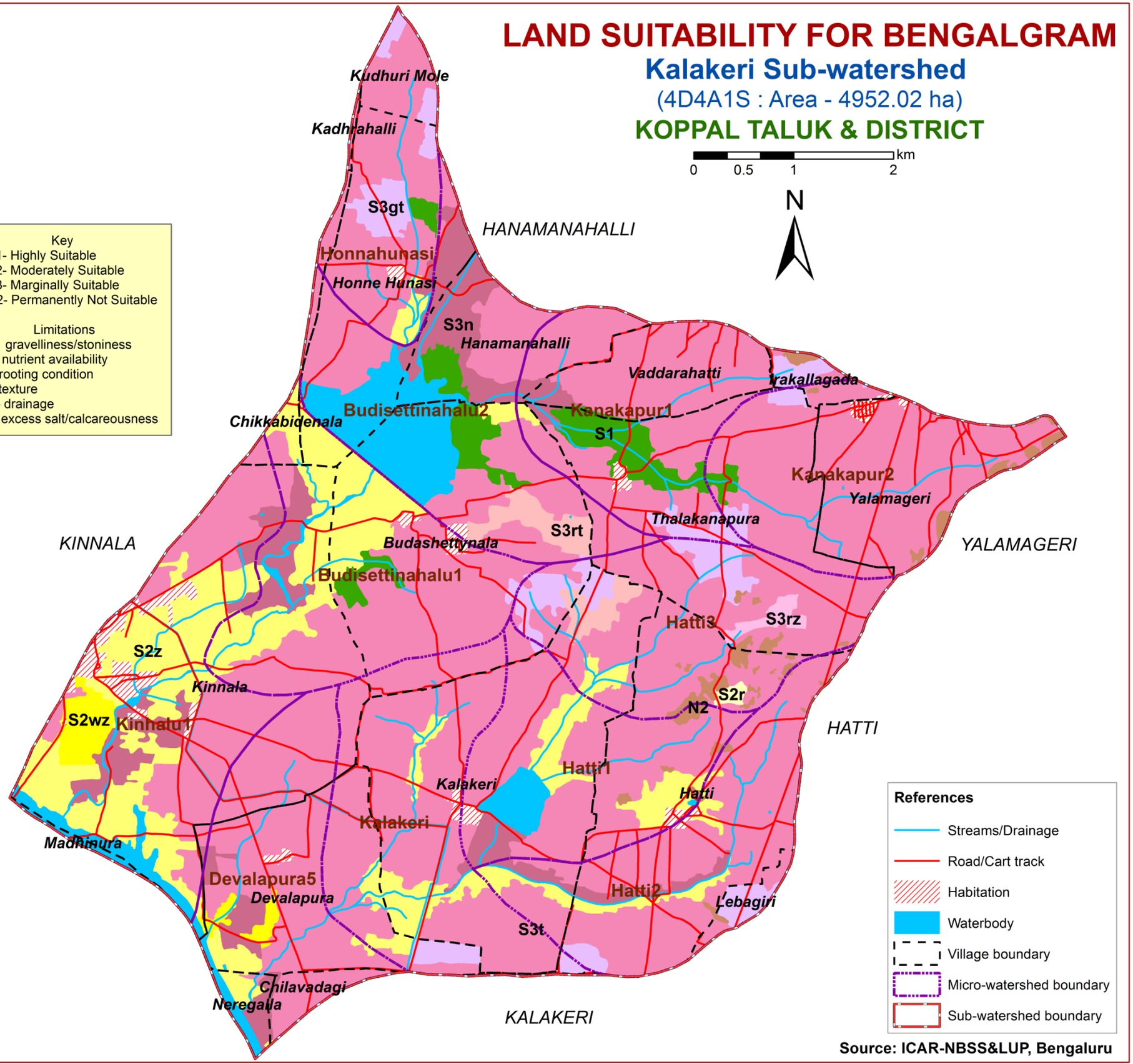

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.8. Land Suitability for Bengalgram




Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

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



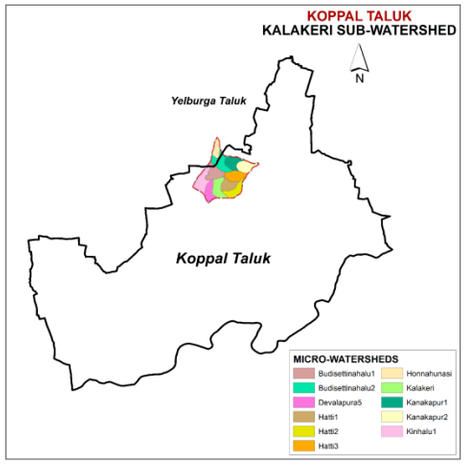

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 123 (2.48) |
| S2r | 5 (0.1) |
| S2z | 593 (11.98) |
| S2wz | 49 (0.99) |
| S3n | 284 (5.73) |
| S3t | 3250 (65.64) |
| S3gt | 197 (3.97) |
| S3rt | 59 (1.2) |
| S3rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody

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

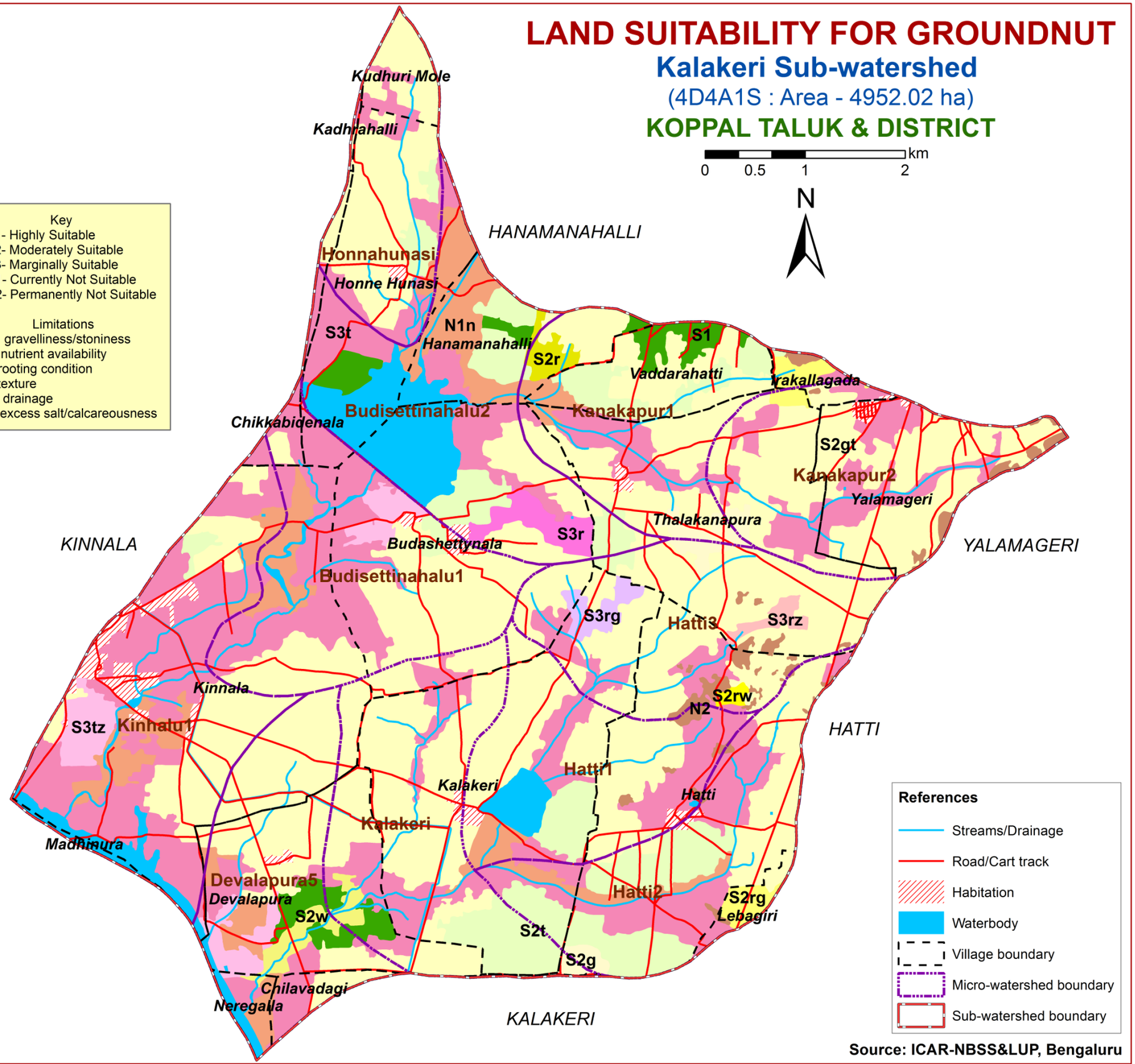



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

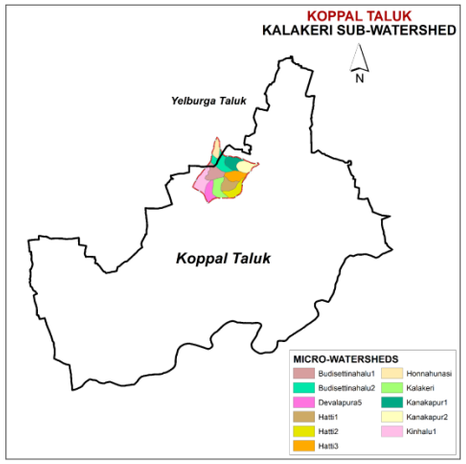
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 94 (1.9) |
| S2g | 48 (0.96) |
| S2r | 18 (0.37) |
| S2t | 405 (8.19) |
| S2w | 30 (0.61) |
| S2gt | 2271 (45.86) |
| S2rg | 37 (0.74) |
| S2rw | 5 (0.1) |
| S3r | 36 (0.72) |
| S3t | 1221 (24.67) |
| S3rg | 24 (0.48) |
| S3rz | 14 (0.28) |
| S3tz | 87 (1.75) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.10. Land Suitability for Chilli

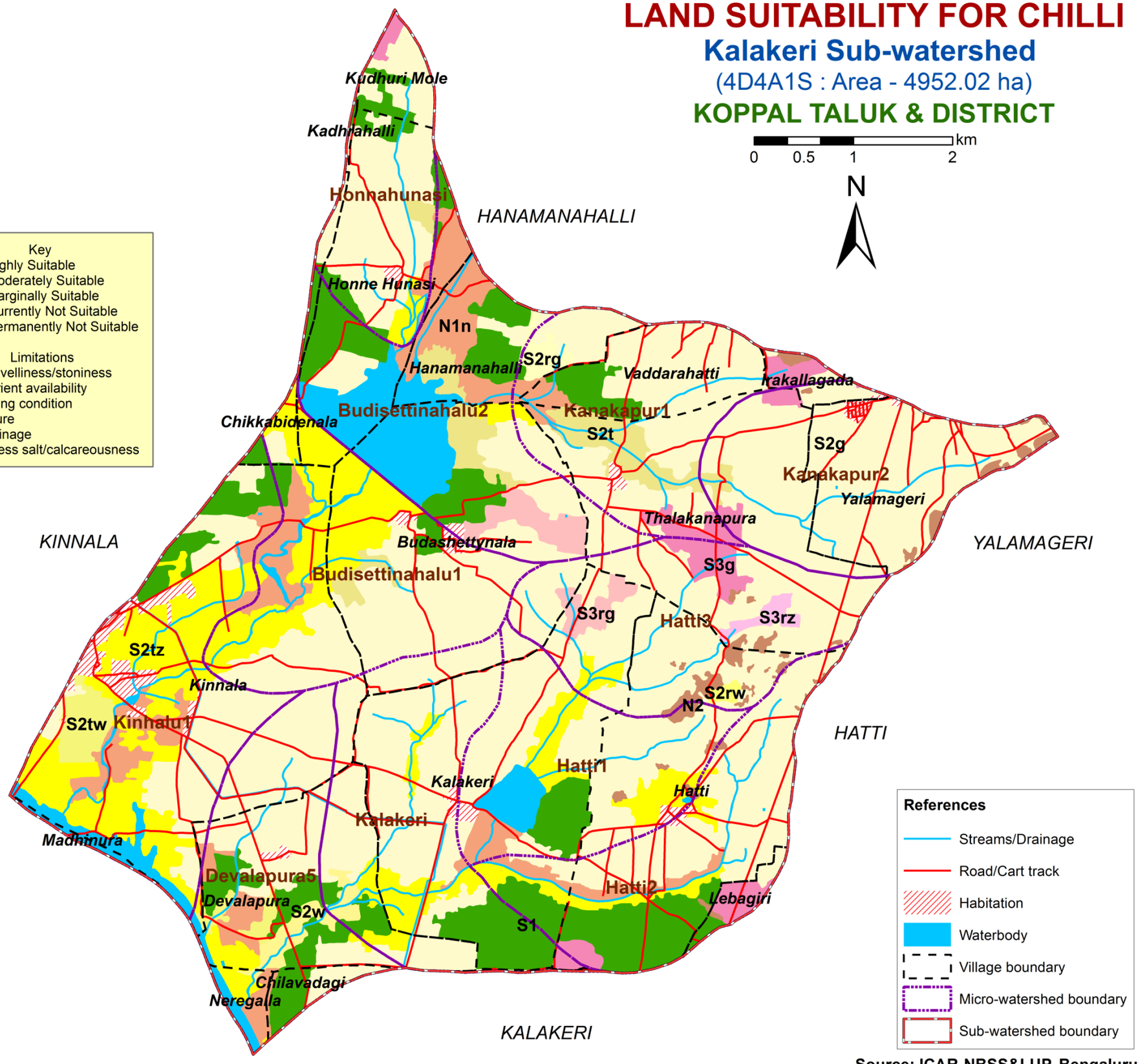



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

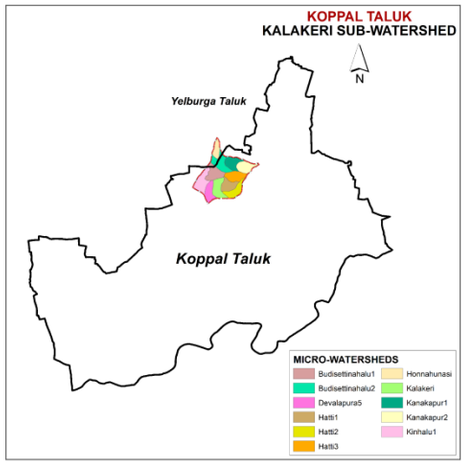
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2t | 123 (2.48) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S2tz | 593 (11.98) |
| S3g | 108 (2.18) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.11. Land Suitability for Pomegranate

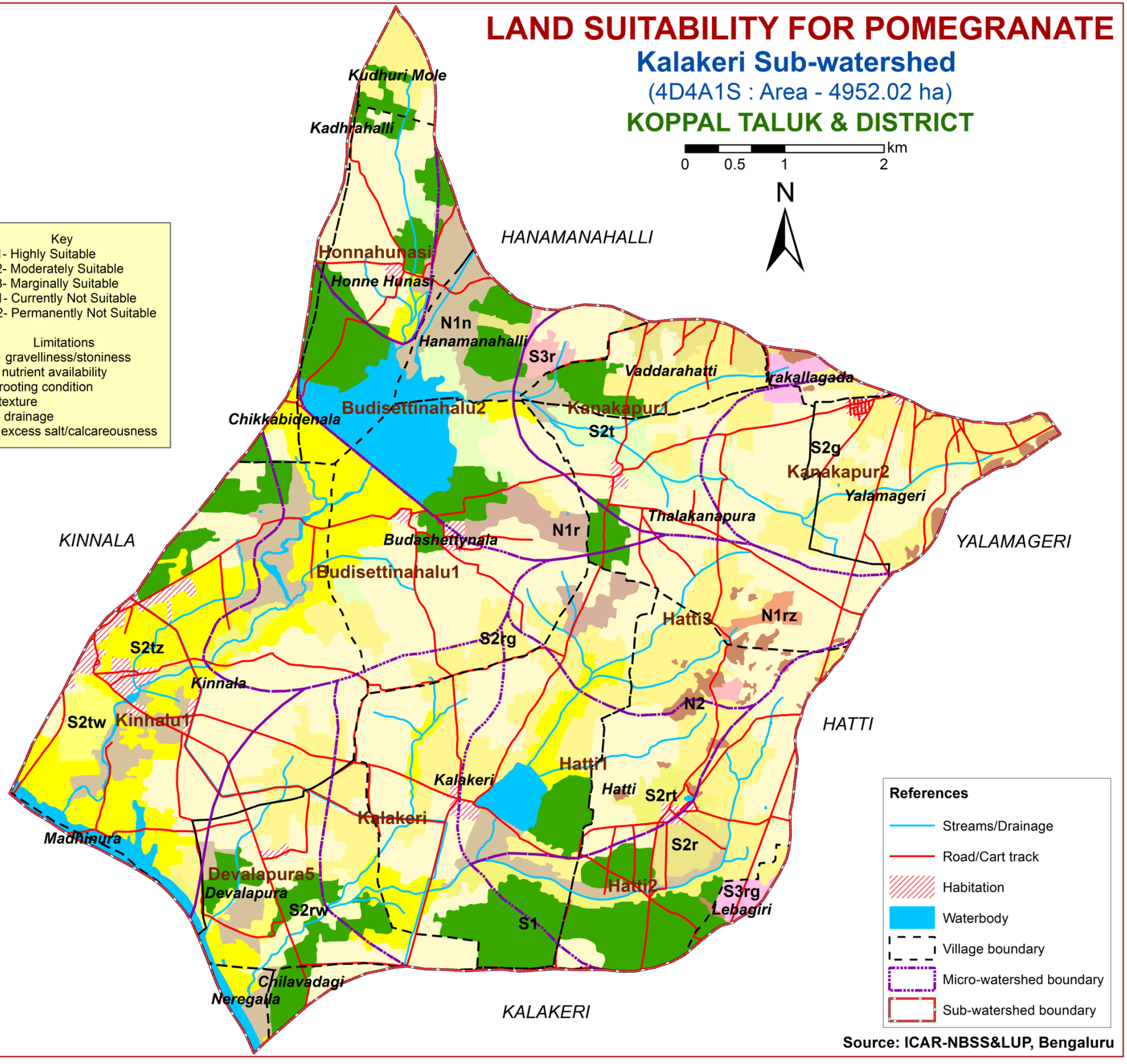



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

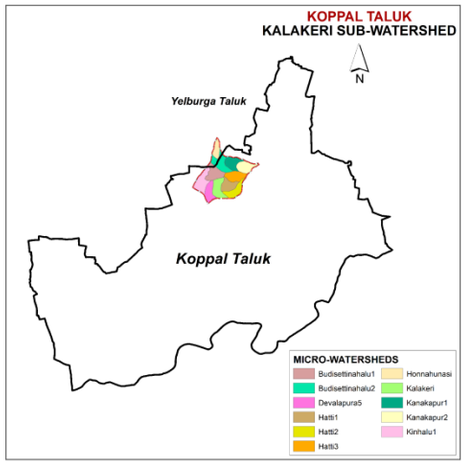
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 618 (12.47) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2t | 123 (2.48) |
| S2rg | 907 (18.31) |
| S2rt | 90 (1.81) |
| S2rw | 30 (0.61) |
| S2tw | 49 (0.99) |
| S2tz | 503 (10.17) |
| S3r | 23 (0.47) |
| S3rg | 37 (0.74) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.12. Land Suitability for Tomato

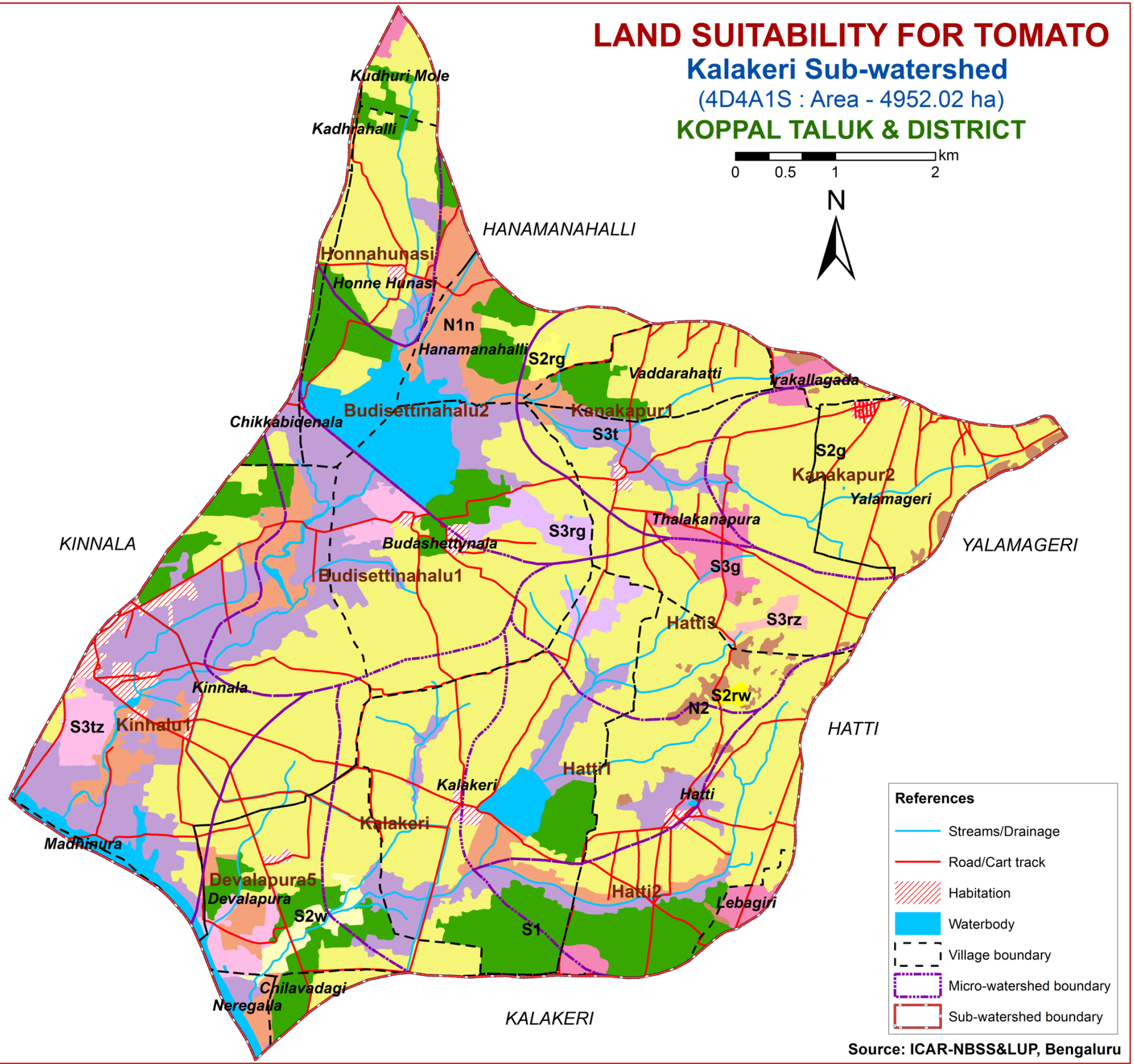



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

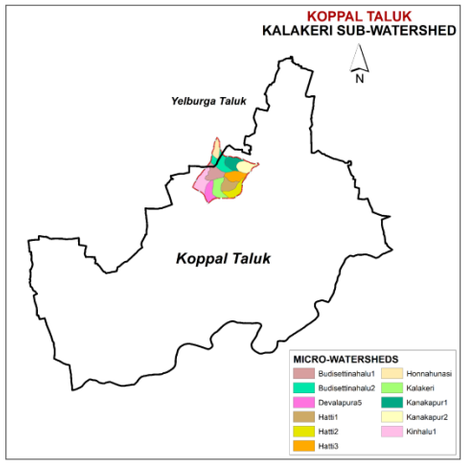
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S3g | 108 (2.18) |
| S3t | 678 (13.7) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| S3tz | 87 (1.75) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.13. Land Suitability for Mulberry

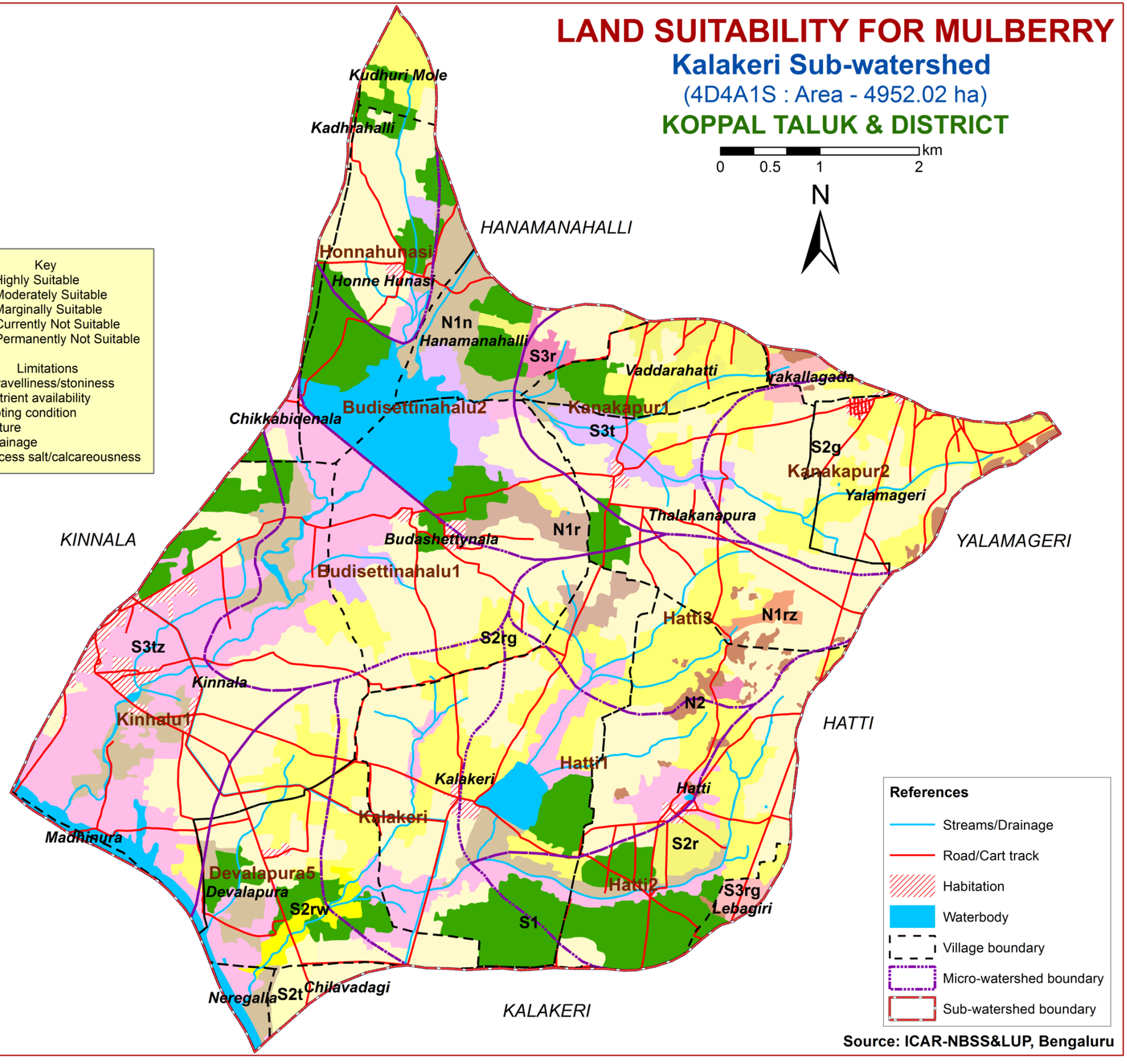



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

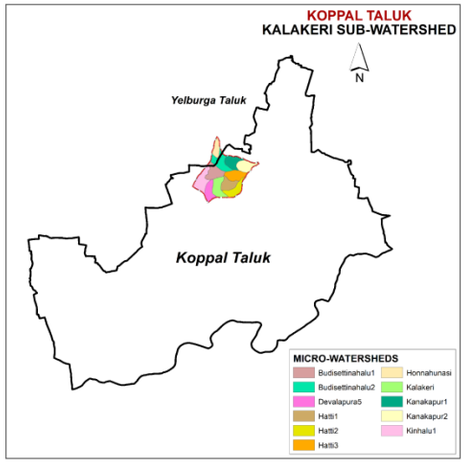
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 590 (11.92) |
| S2g | 1750 (35.35) |
| S2r | 100 (2.02) |
| S2t | 27 (0.55) |
| S2rg | 893 (18.04) |
| S2rw | 30 (0.61) |
| S3r | 23 (0.47) |
| S3t | 123 (2.48) |
| S3rg | 37 (0.74) |
| S3tz | 642 (12.96) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




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

# 7.14. Land Suitability for Bhendi

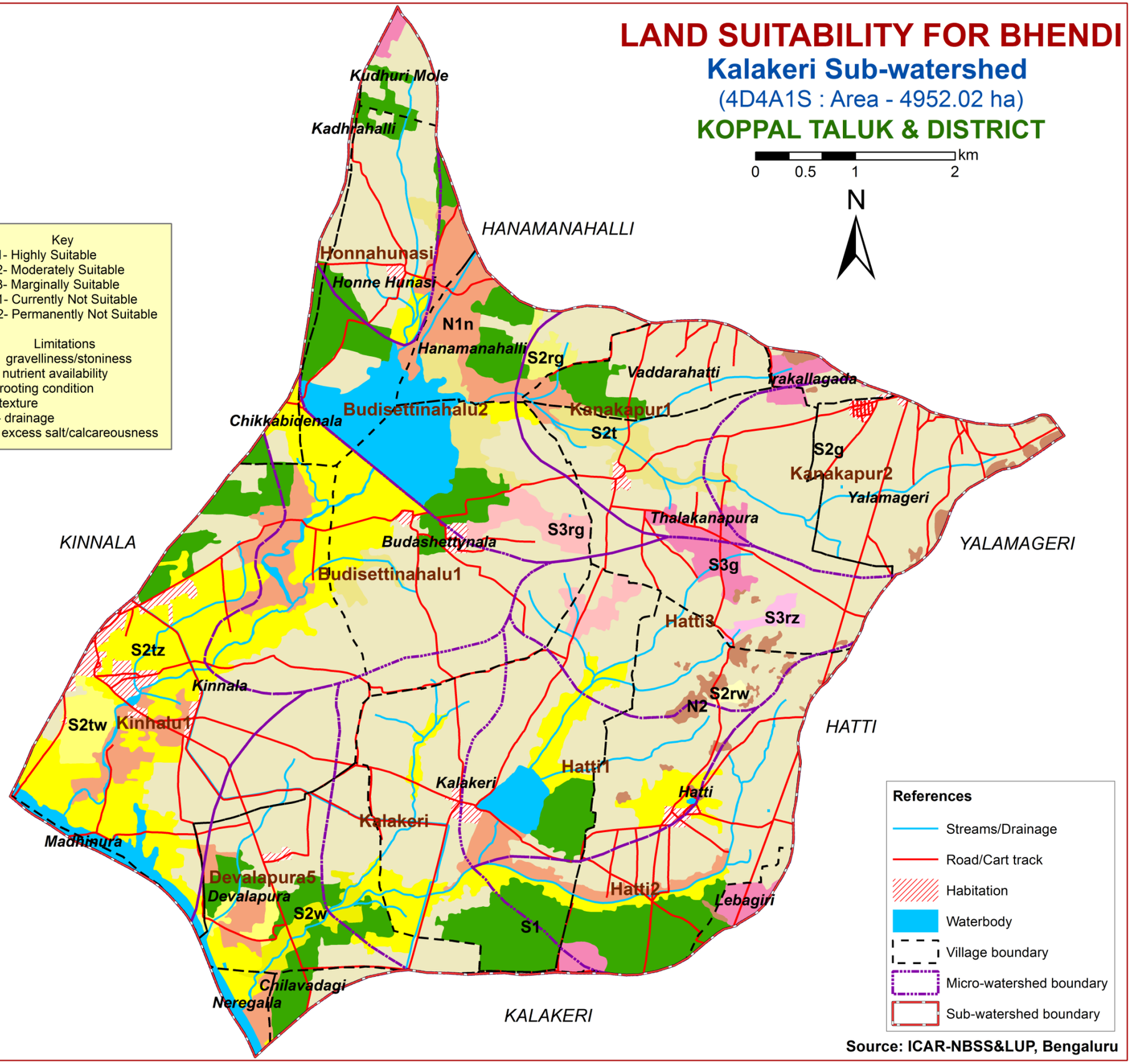



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

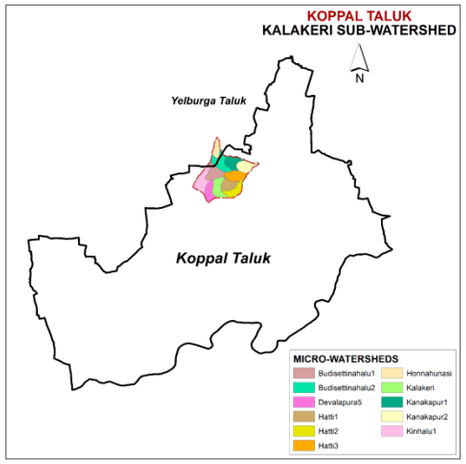
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2t | 123 (2.48) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S2tz | 593 (11.98) |
| S3g | 108 (2.18) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.15. Land Suitability for Guava

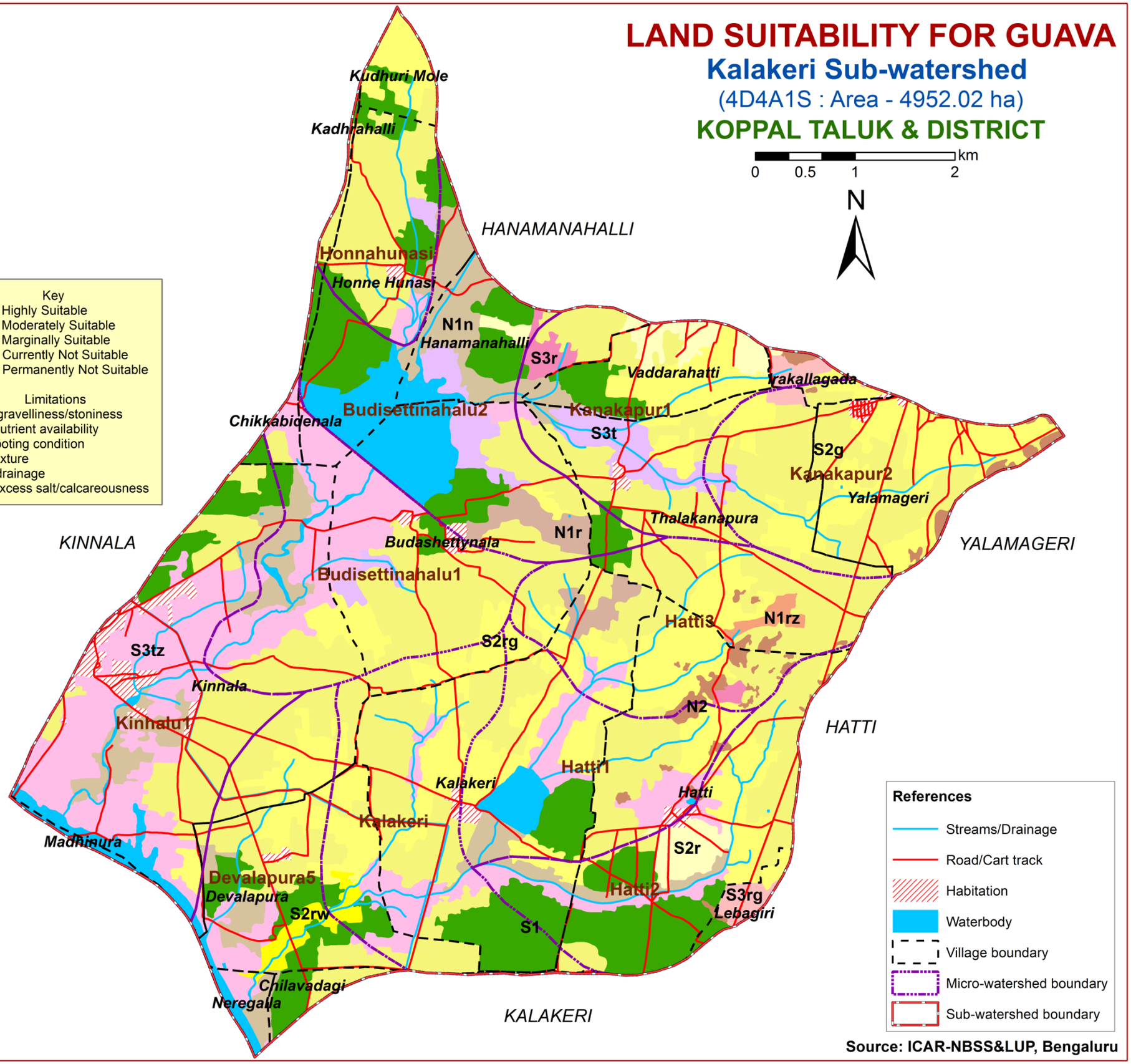



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

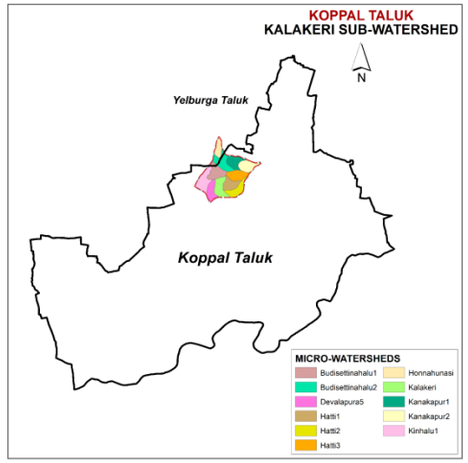
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 618 (12.47) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2rg | 907 (18.31) |
| S2rw | 30 (0.61) |
| S3r | 23 (0.47) |
| S3t | 123 (2.48) |
| S3rg | 37 (0.74) |
| S3tz | 642 (12.96) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.16. Land Suitability for Mango

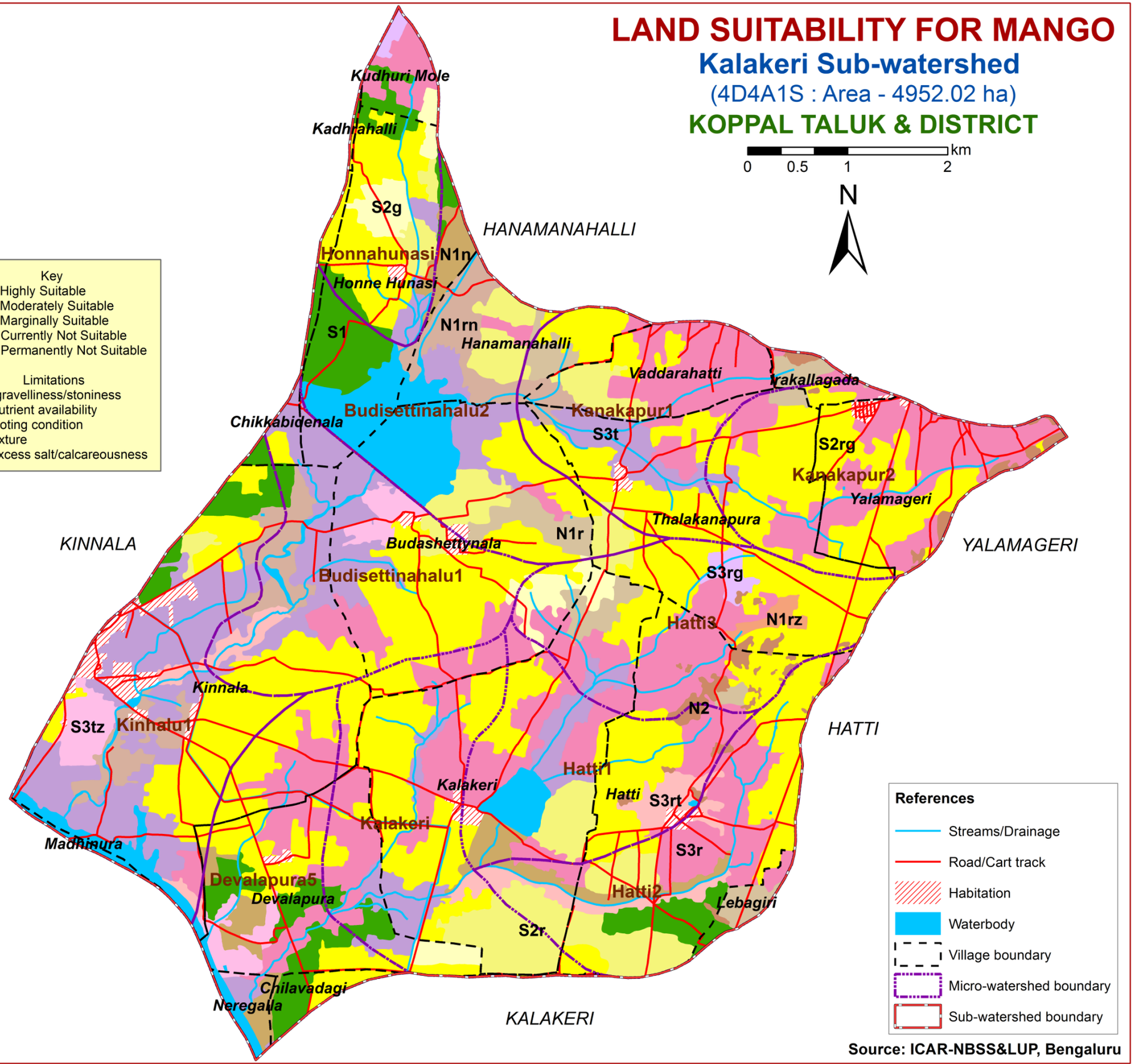



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

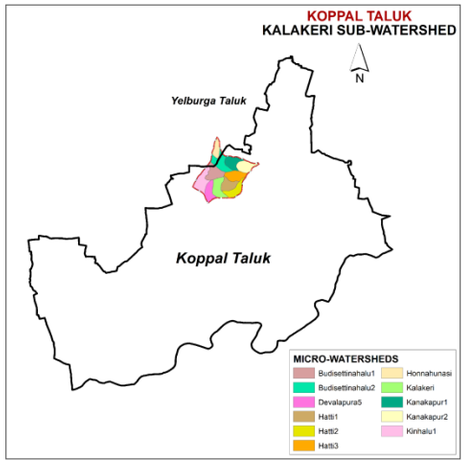
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 275 (5.55) |
| S2g | 89 (1.79) |
| S2r | 343 (6.92) |
| S2rg | 1662 (33.55) |
| S3r | 1001 (20.2) |
| S3t | 589 (11.89) |
| S3rg | 23 (0.47) |
| S3rt | 90 (1.81) |
| S3tz | 87 (1.75) |
| N1n | 112 (2.26) |
| N1r | 120 (2.41) |
| N1rn | 172 (3.47) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.17. Land Suitability for Sapota

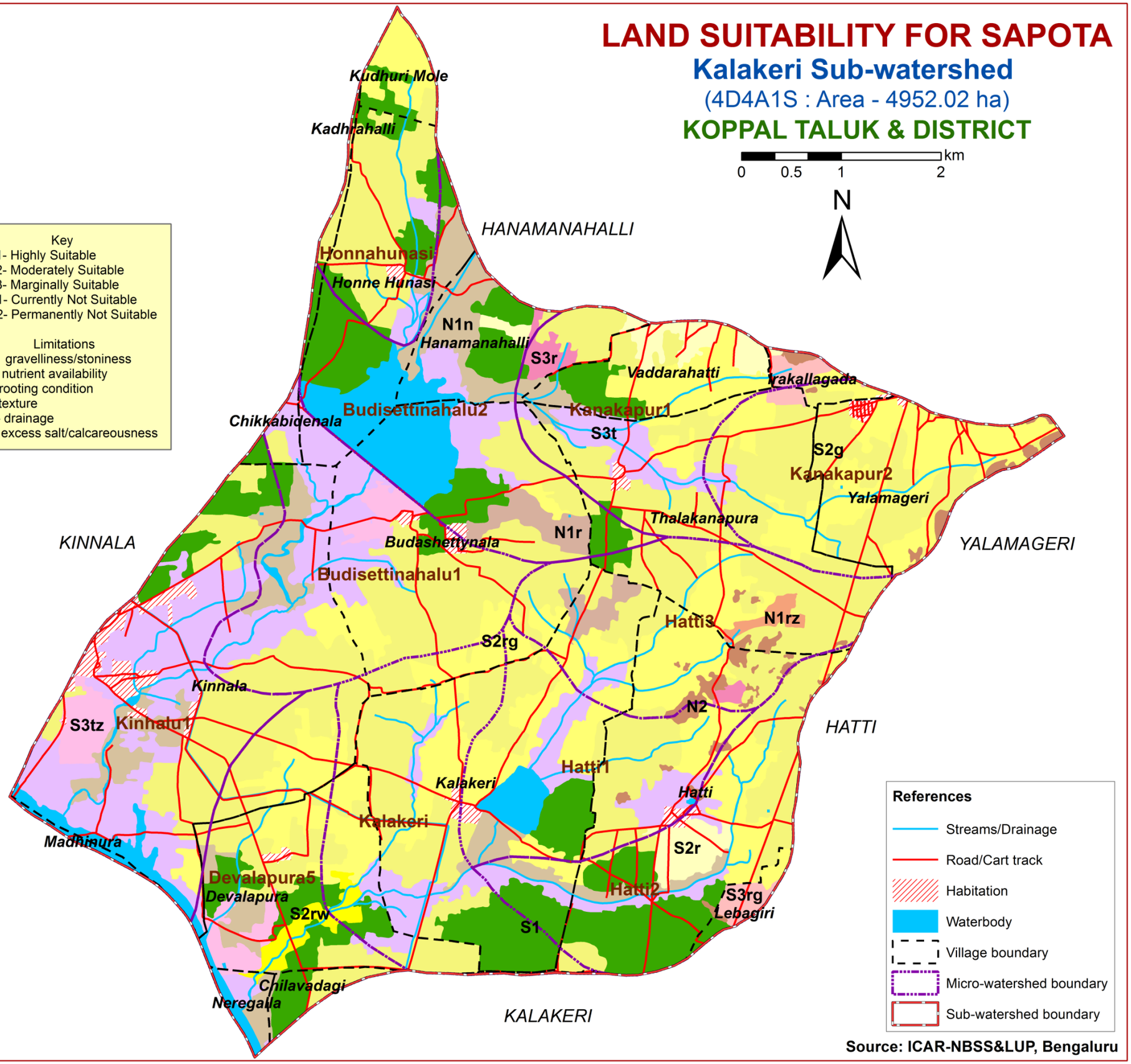



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

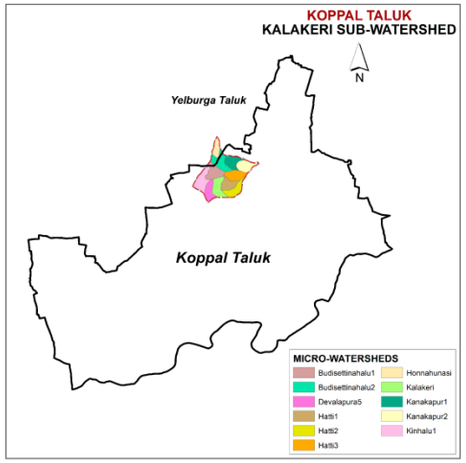
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 618 (12.47) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2rg | 907 (18.31) |
| S2rw | 30 (0.61) |
| S3r | 23 (0.47) |
| S3t | 678 (13.7) |
| S3rg | 37 (0.74) |
| S3tz | 87 (1.75) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.18. Land Suitability for Jackfruit

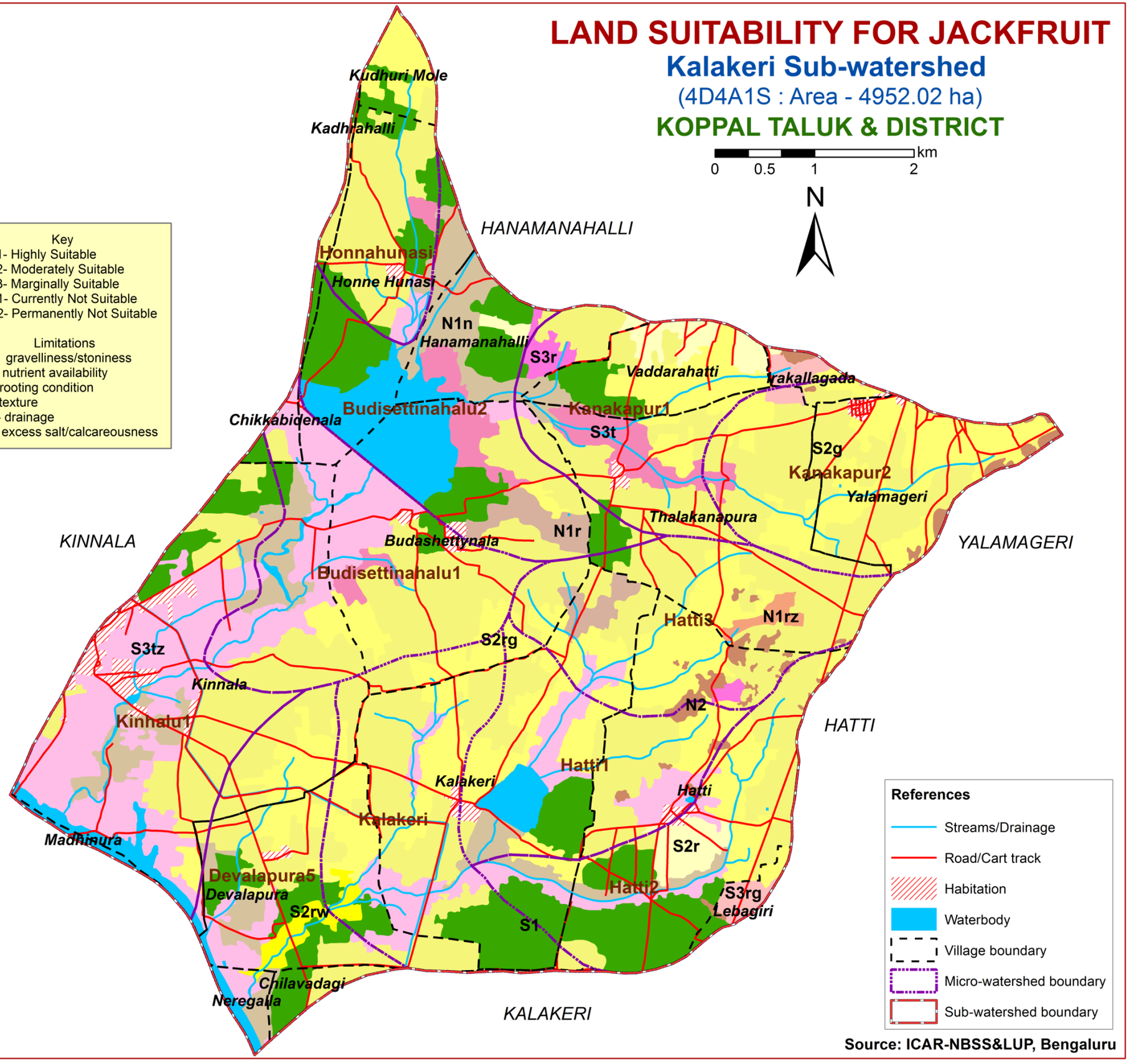



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

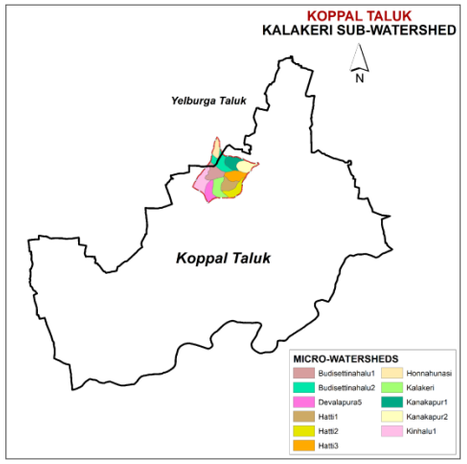
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 618 (12.47) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2rg | 907 (18.31) |
| S2rw | 30 (0.61) |
| S3r | 23 (0.47) |
| S3t | 123 (2.48) |
| S3rg | 37 (0.74) |
| S3tz | 642 (12.96) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.19. Land Suitability for Jamun

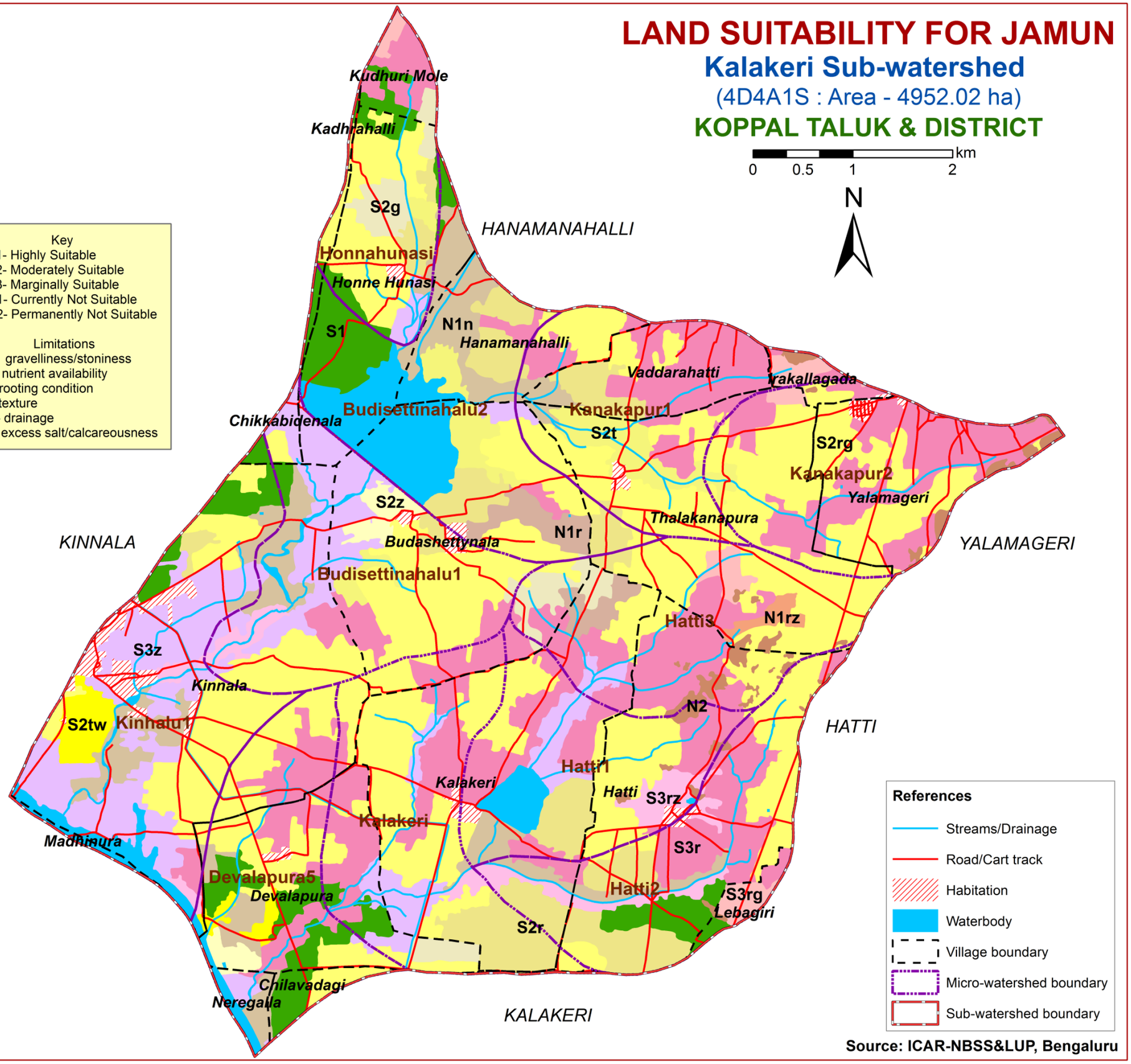



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

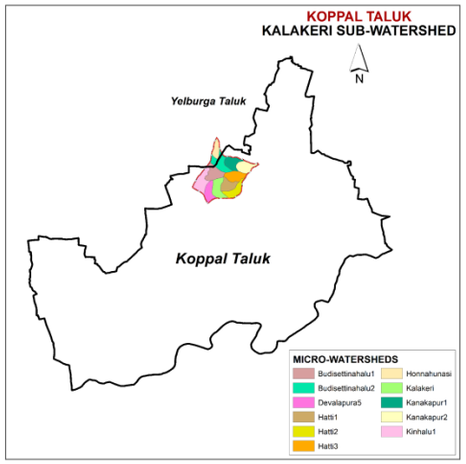
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 275 (5.55) |
| S2g | 89 (1.79) |
| S2r | 343 (6.92) |
| S2t | 123 (2.48) |
| S2z | 38 (0.76) |
| S2rg | 1662 (33.55) |
| S2tw | 49 (0.99) |
| S3r | 1024 (20.68) |
| S3z | 466 (9.41) |
| S3rg | 60 (1.21) |
| S3rz | 90 (1.81) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.20. Land Suitability for Musambi

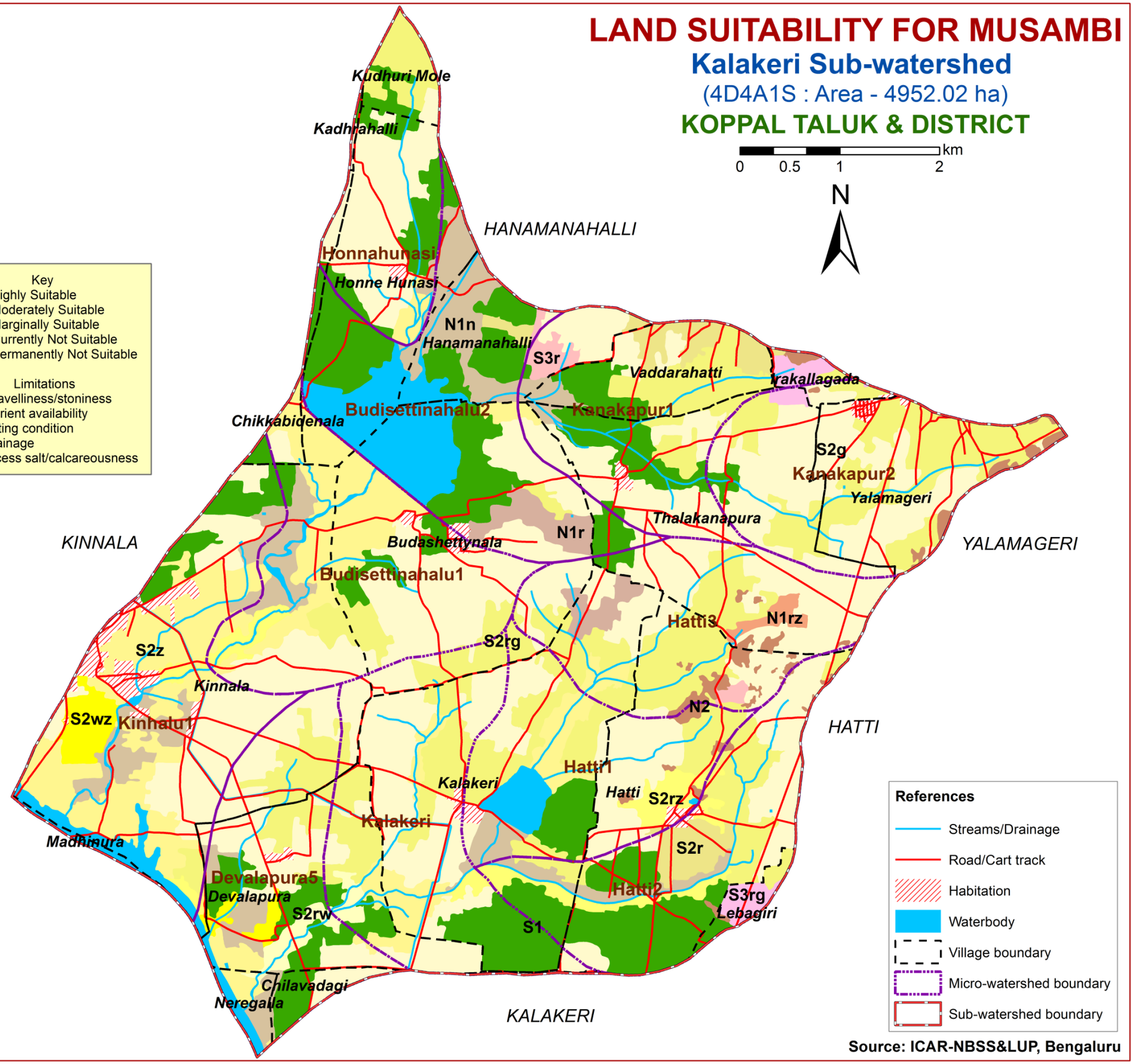



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

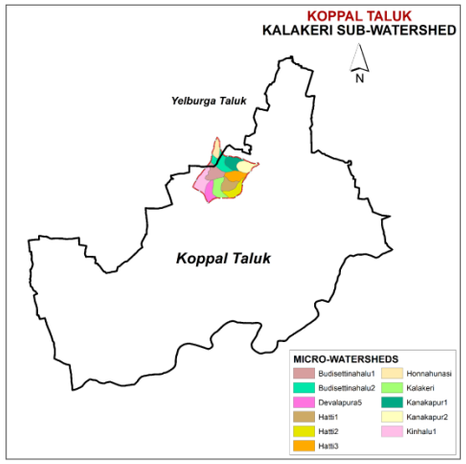
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 741 (14.95) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2z | 503 (10.17) |
| S2rg | 907 (18.31) |
| S2rw | 30 (0.61) |
| S2rz | 90 (1.81) |
| S2wz | 49 (0.99) |
| S3r | 23 (0.47) |
| S3rg | 37 (0.74) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.21. Land Suitability for Lime

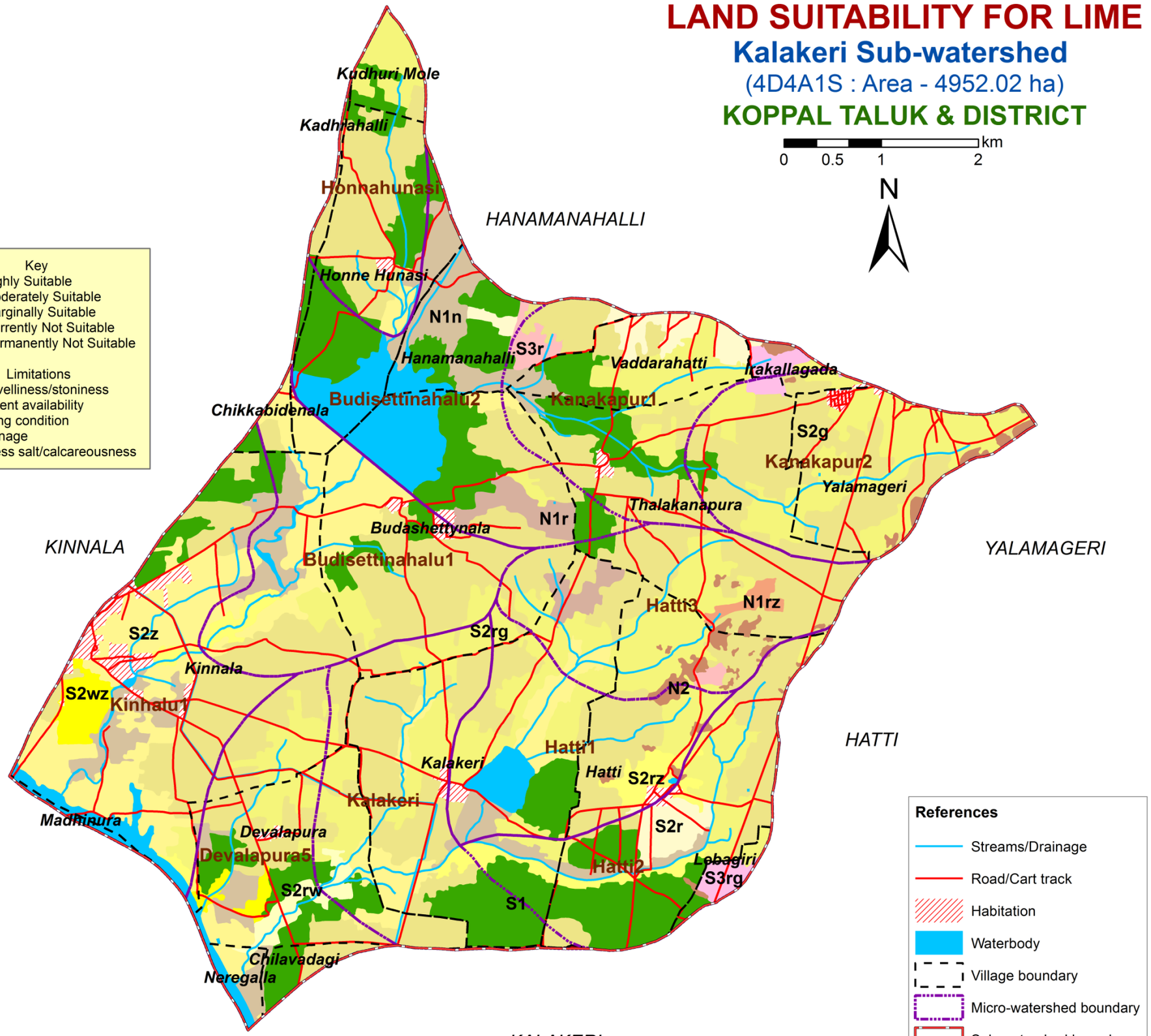



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

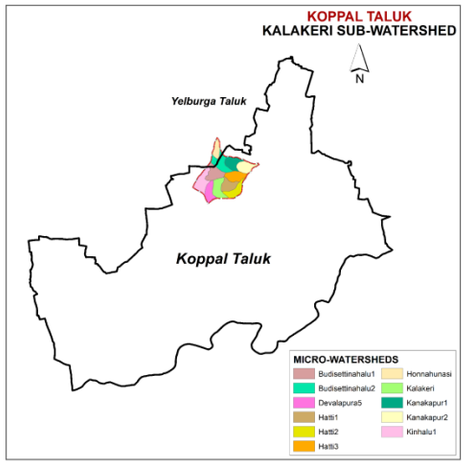
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 741 (14.95) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2z | 503 (10.17) |
| S2rg | 907 (18.31) |
| S2rw | 30 (0.61) |
| S2rz | 90 (1.81) |
| S2wz | 49 (0.99) |
| S3r | 23 (0.47) |
| S3rg | 37 (0.74) |
| N1n | 284 (5.73) |
| N1r | 59 (1.2) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.22. Land Suitability for Cashew

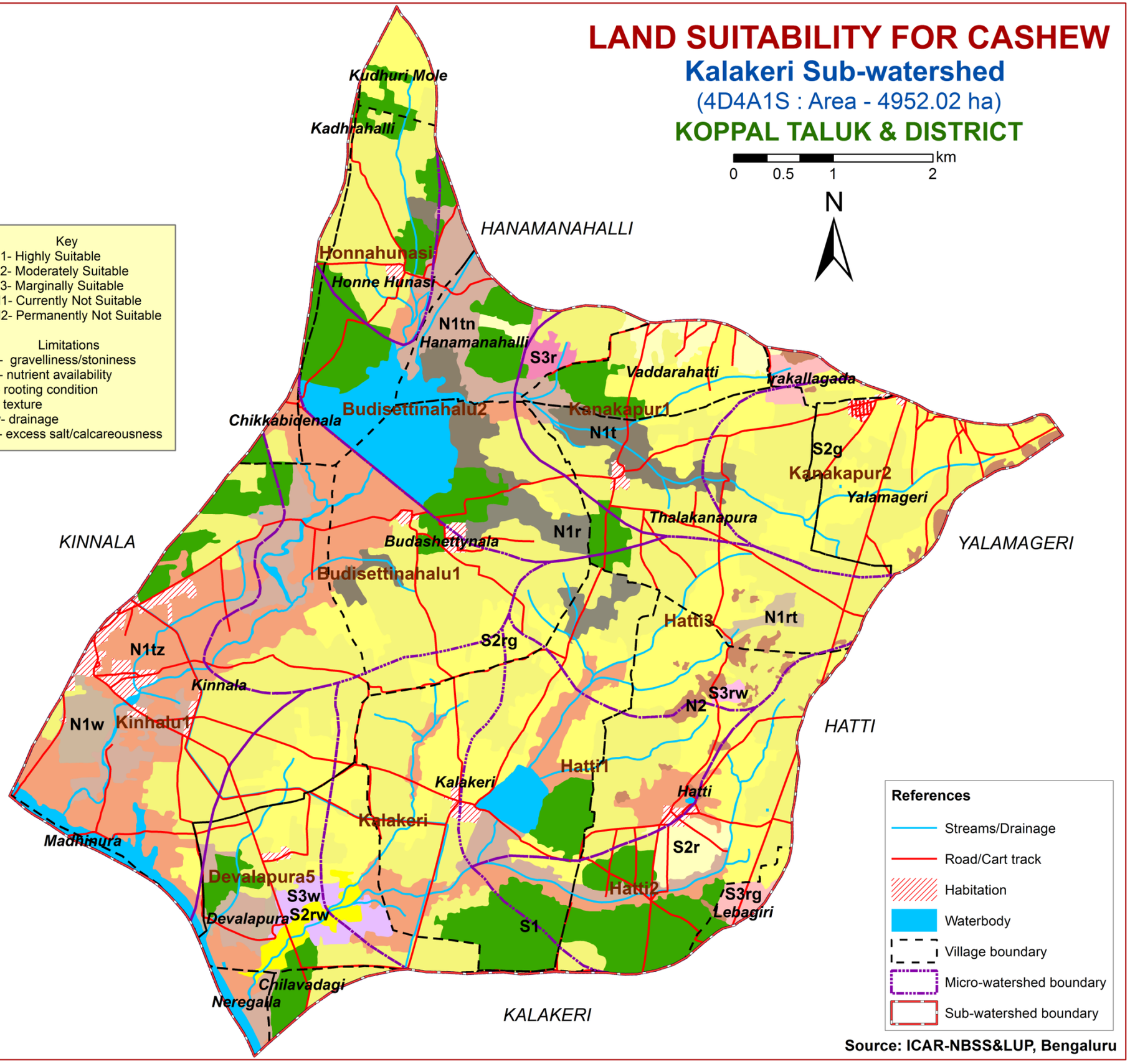



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

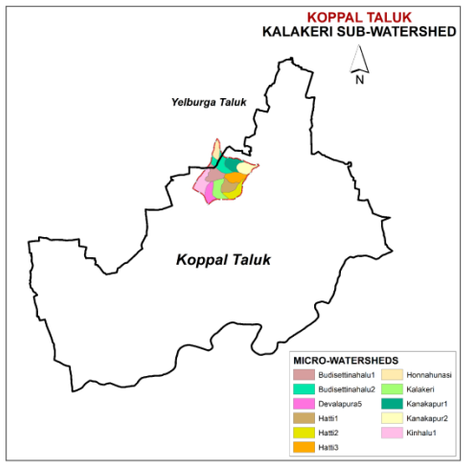
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 579 (11.68) |
| S2g | 1750 (35.35) |
| S2r | 86 (1.75) |
| S2rg | 907 (18.31) |
| S2rw | 30 (0.61) |
| S3r | 18 (0.37) |
| S3w | 39 (0.79) |
| S3rg | 37 (0.74) |
| S3rw | 5 (0.1) |
| N1r | 59 (1.2) |
| N1t | 123 (2.48) |
| N1w | 49 (0.99) |
| N1rt | 14 (0.28) |
| N1tn | 284 (5.73) |
| N1tz | 593 (11.98) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.23. Land Suitability for Custard Apple

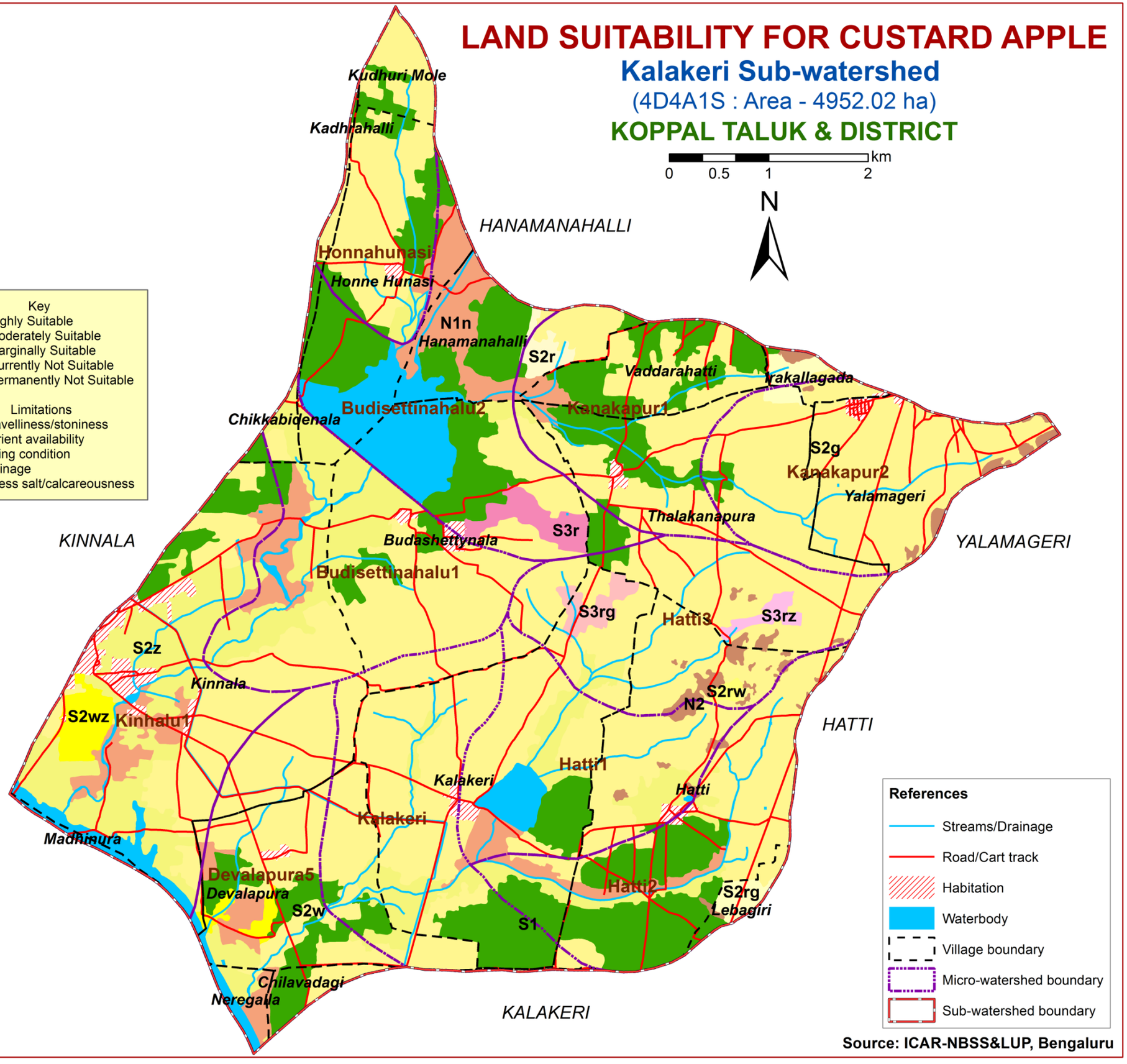



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

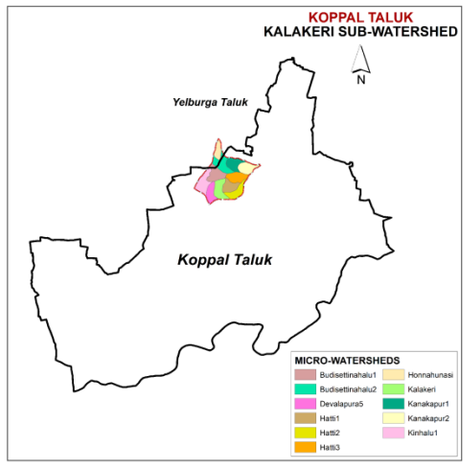
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 841 (16.98) |
| S2g | 2644 (53.38) |
| S2r | 18 (0.37) |
| S2w | 30 (0.61) |
| S2z | 593 (11.98) |
| S2rg | 37 (0.74) |
| S2rw | 5 (0.1) |
| S2wz | 49 (0.99) |
| S3r | 36 (0.72) |
| S3rg | 24 (0.48) |
| S3rz | 14 (0.28) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.24. Land Suitability for Amla

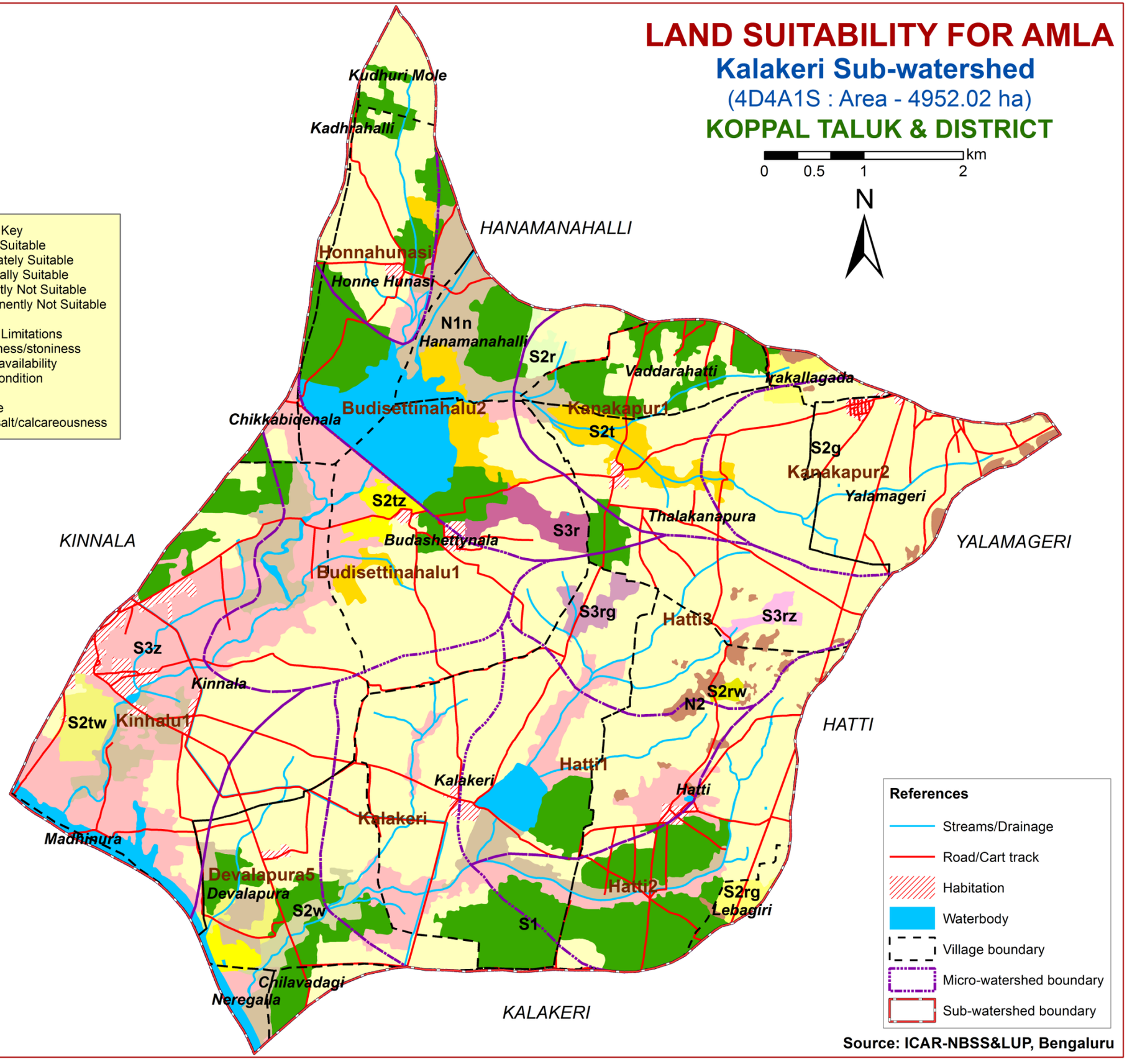



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

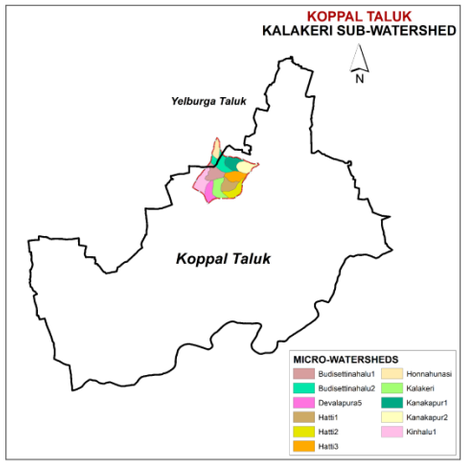
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 718 (14.49) |
| S2g | 2644 (53.38) |
| S2r | 18 (0.37) |
| S2t | 123 (2.48) |
| S2w | 30 (0.61) |
| S2rg | 37 (0.74) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S2tz | 38 (0.76) |
| S3r | 36 (0.72) |
| S3z | 555 (11.22) |
| S3rg | 24 (0.48) |
| S3rz | 14 (0.28) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.25. Land Suitability for Tamarind

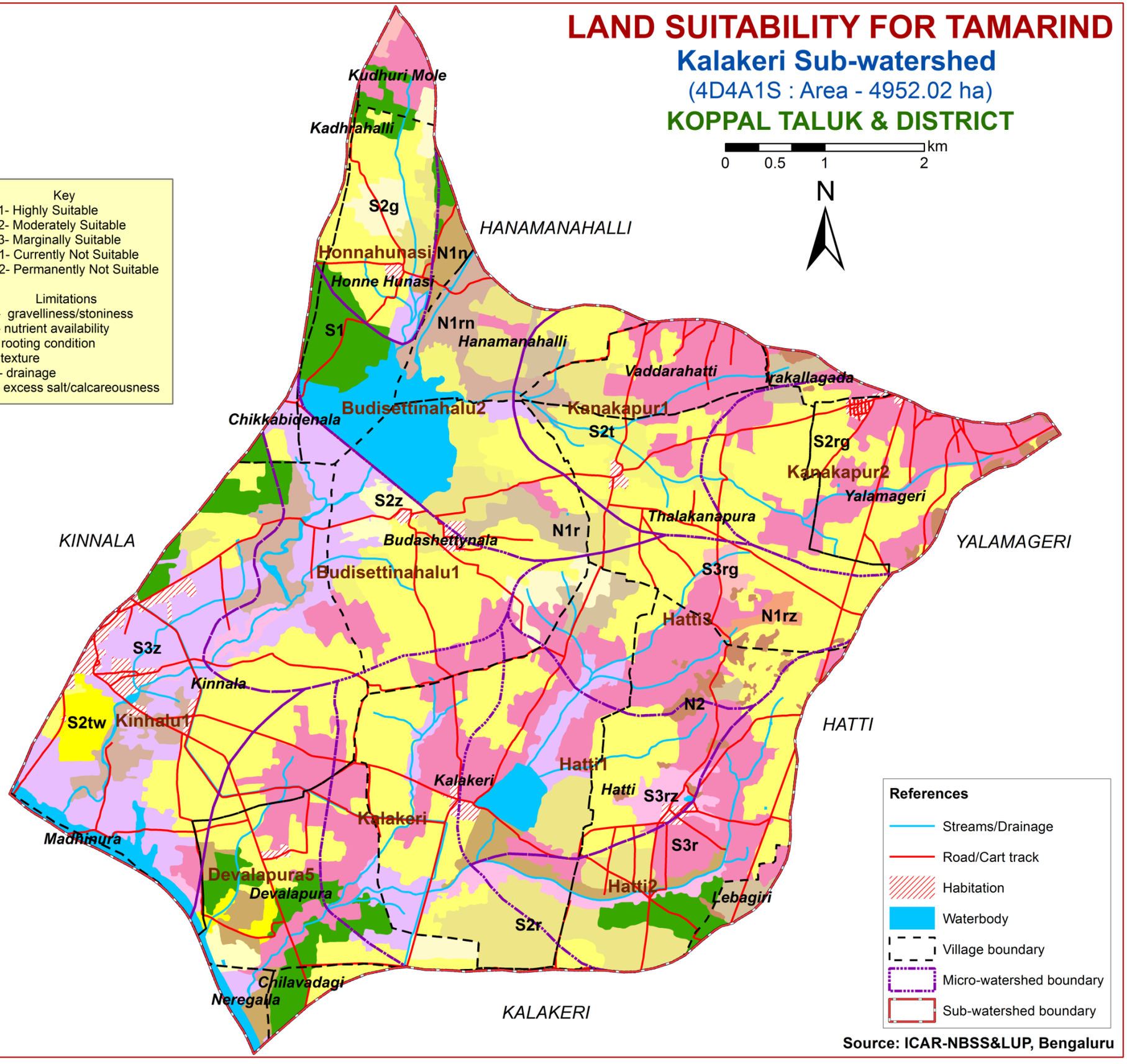



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

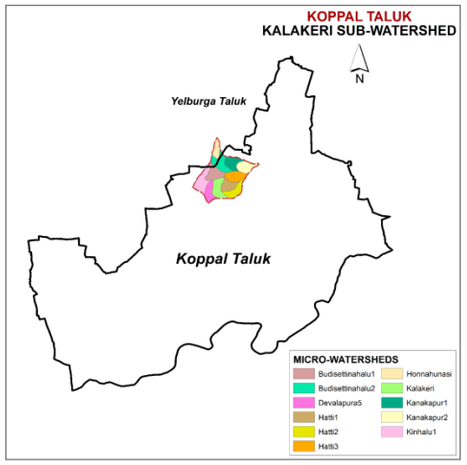
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 275 (5.55) |
| S2g | 89 (1.79) |
| S2r | 343 (6.92) |
| S2t | 123 (2.48) |
| S2z | 38 (0.76) |
| S2rg | 1662 (33.55) |
| S2tw | 49 (0.99) |
| S3r | 1001 (20.2) |
| S3z | 466 (9.41) |
| S3rg | 23 (0.47) |
| S3rz | 90 (1.81) |
| N1n | 112 (2.26) |
| N1r | 120 (2.41) |
| N1rn | 172 (3.47) |
| N1rz | 14 (0.28) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.26. Land Suitability for Brinjal

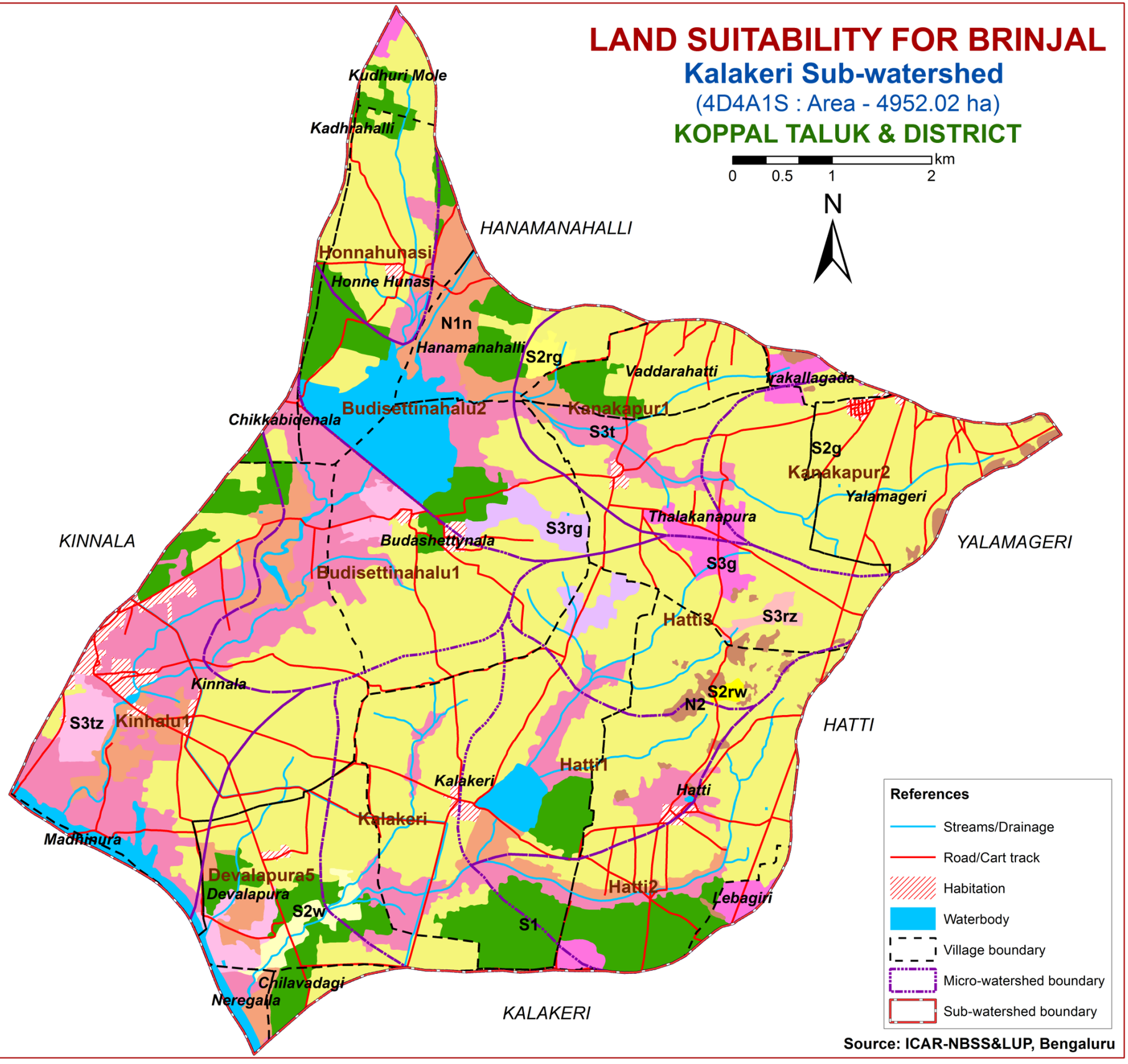



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

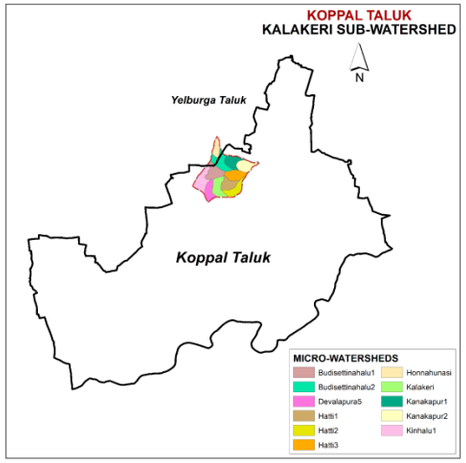
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S3g | 108 (2.18) |
| S3t | 678 (13.7) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| S3tz | 87 (1.75) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.27. Land Suitability for Onion

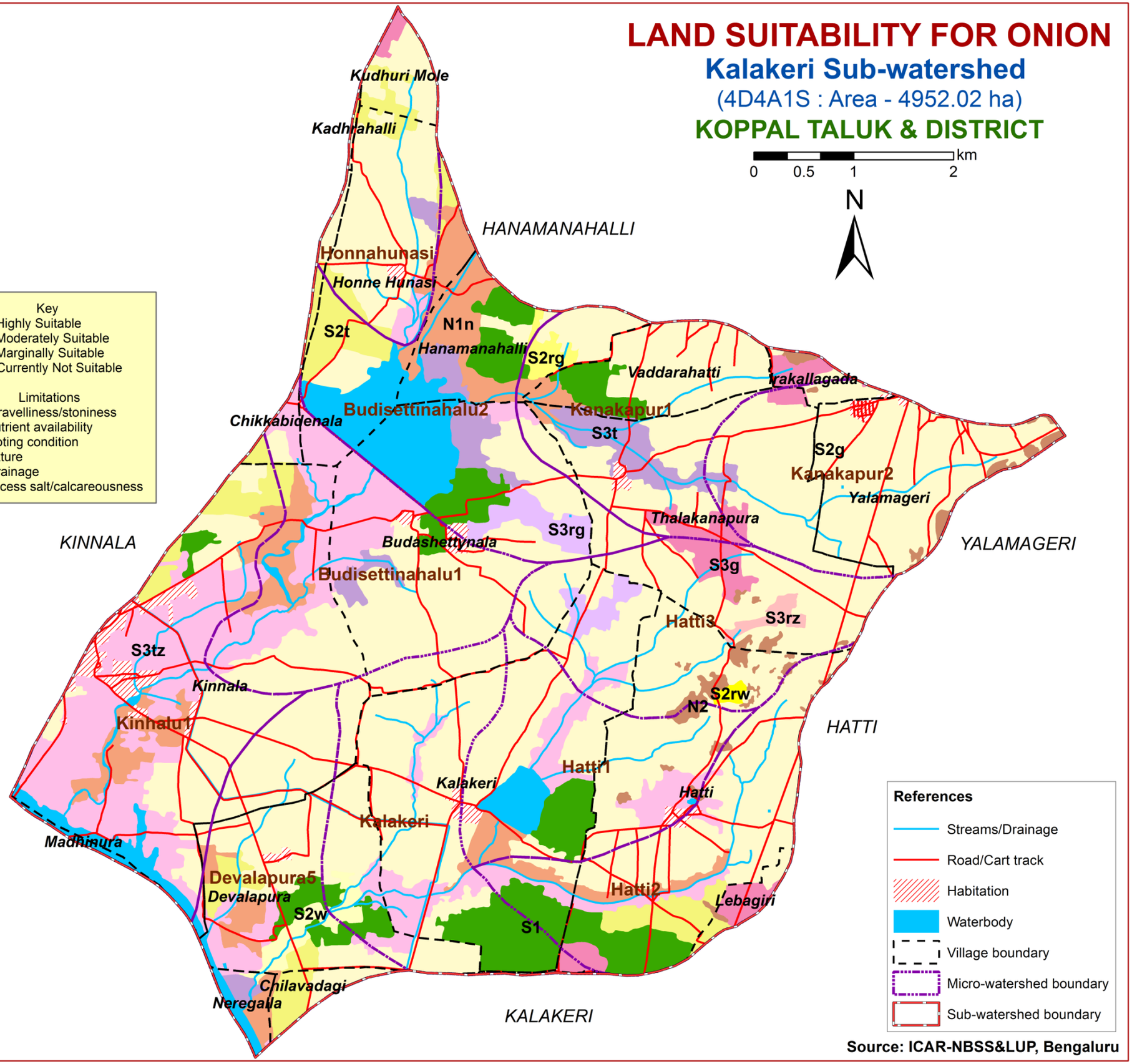



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

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

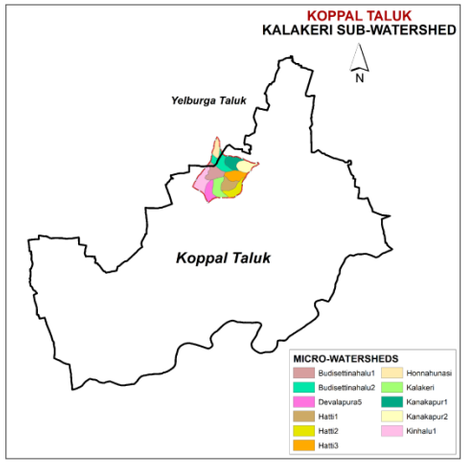
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 314 (6.34) |
| S2g | 2759 (55.71) |
| S2t | 218 (4.4) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S3g | 108 (2.18) |
| S3t | 130 (2.63) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| S3tz | 635 (12.82) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.28. Land Suitability for Jasmine

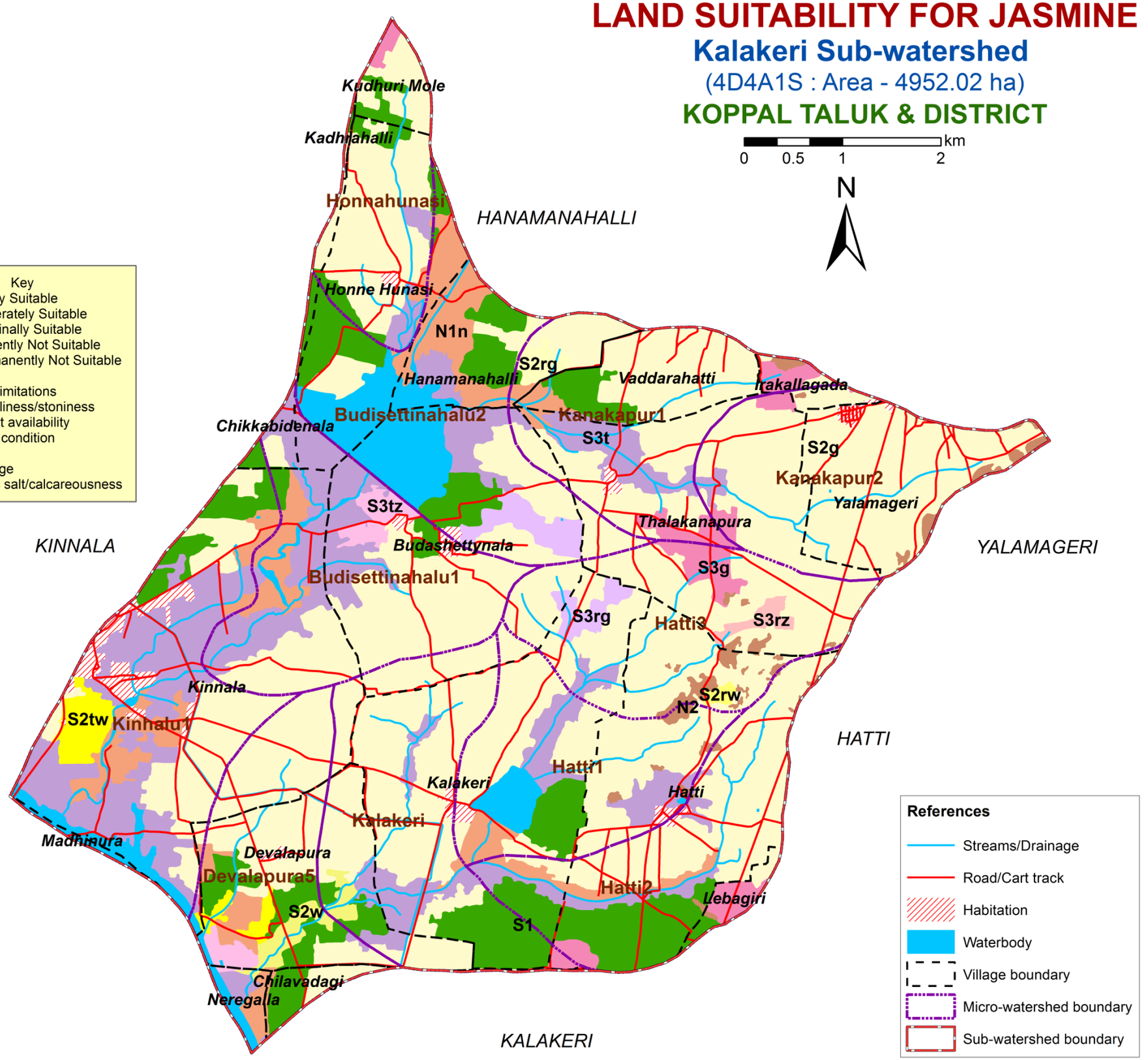



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

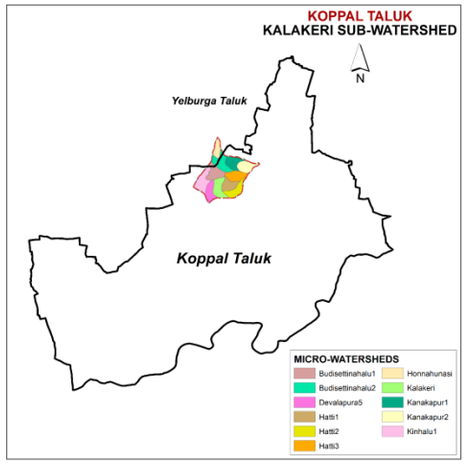
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S3g | 108 (2.18) |
| S3t | 678 (13.7) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| S3tz | 38 (0.76) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.29. Land Suitability for Crossandra

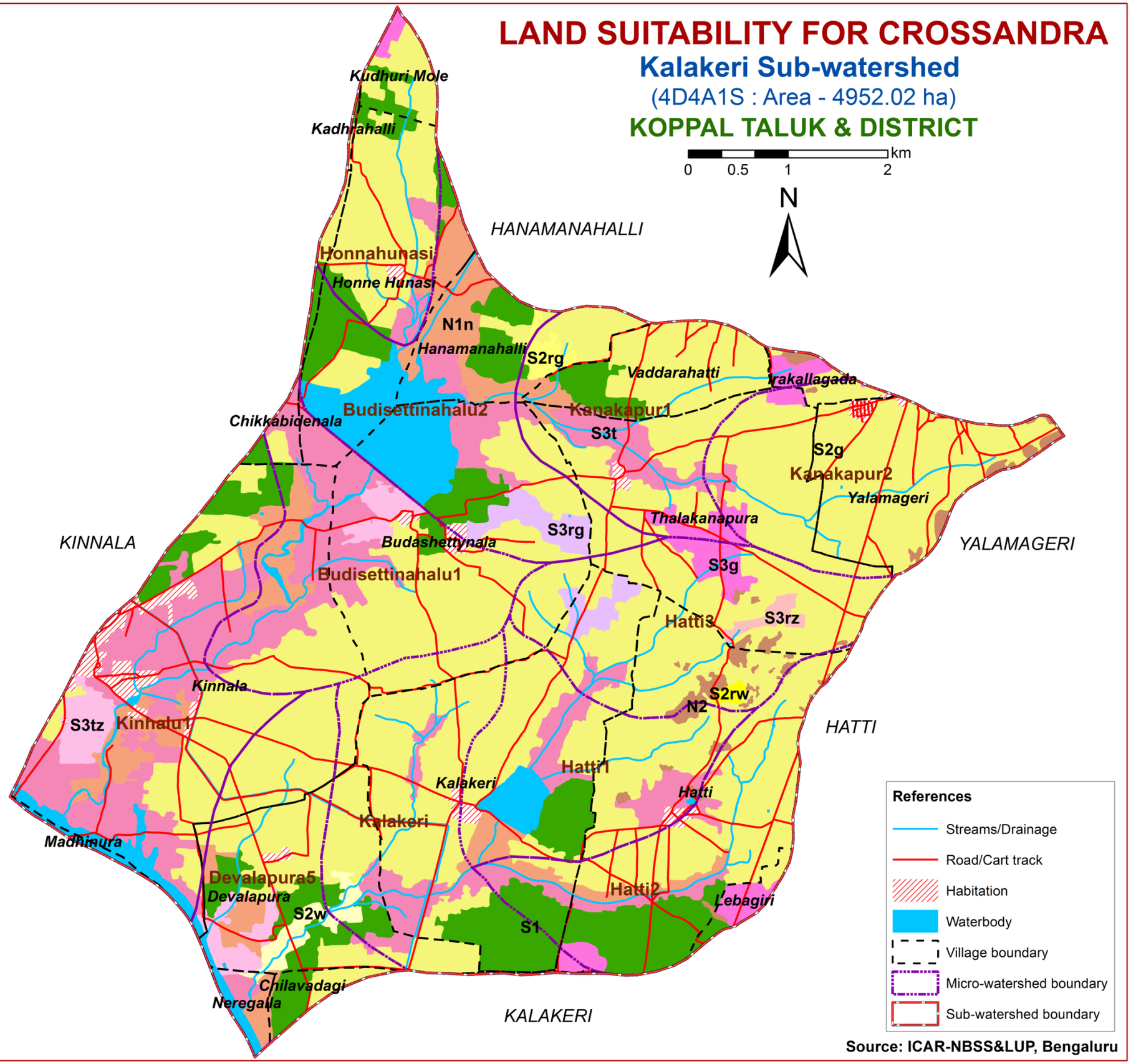



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

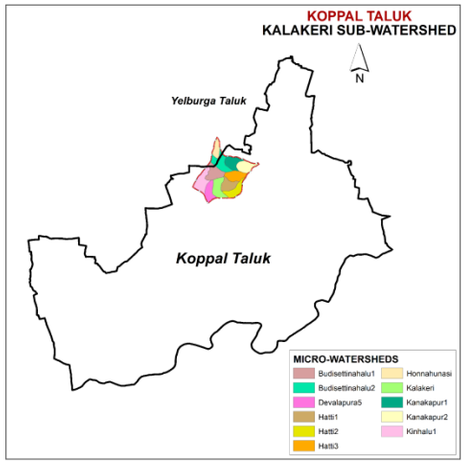
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S3g | 108 (2.18) |
| S3t | 678 (13.7) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| S3tz | 87 (1.75) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody



# 7.30. Land Suitability for Marigold

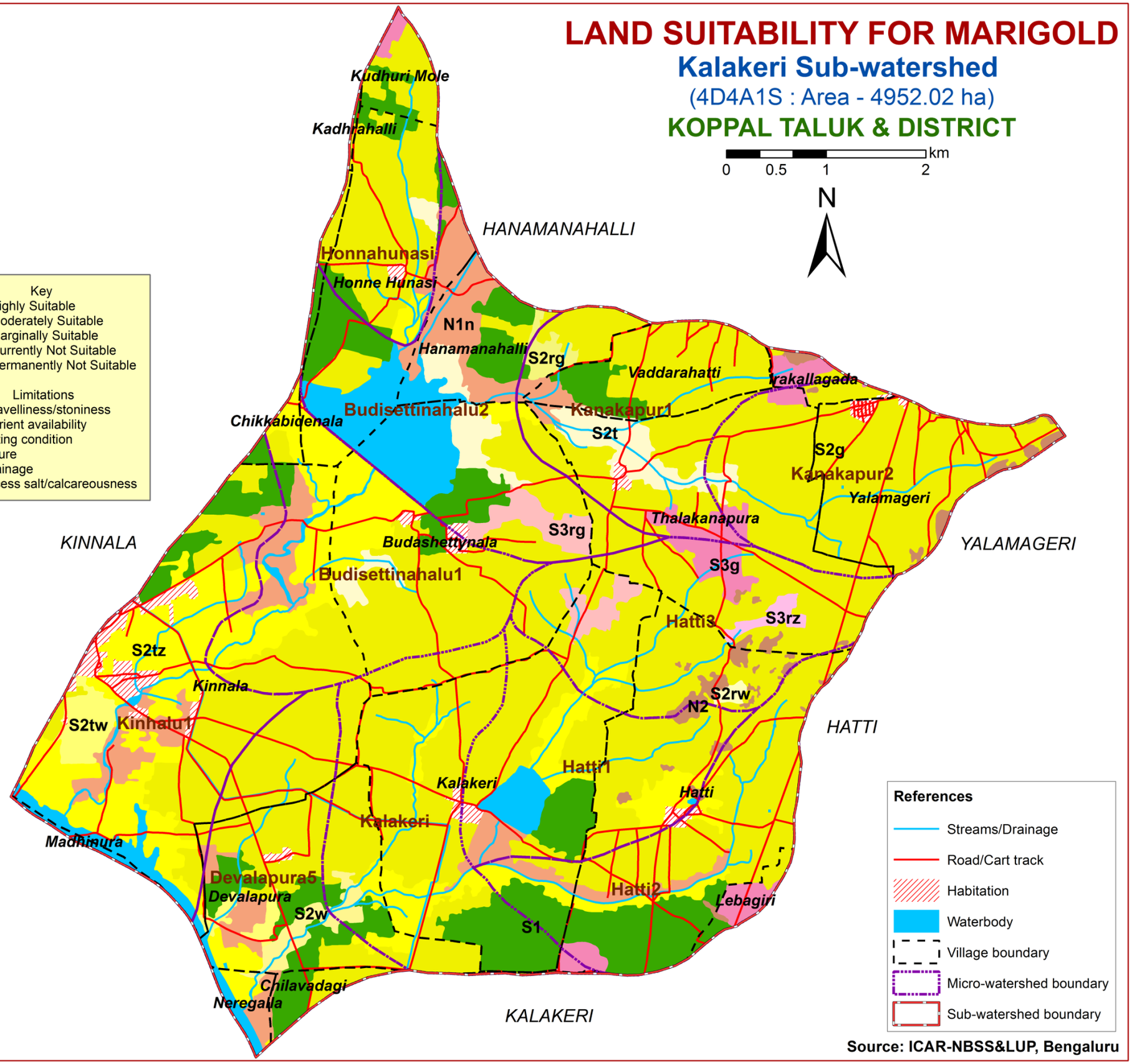



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

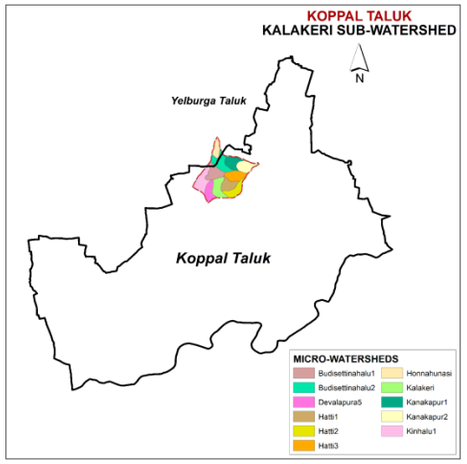
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2t | 123 (2.48) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S2tz | 593 (11.98) |
| S3g | 108 (2.18) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0.4 (0.01) |
| Others* | 327 (6.61) |

* - Habitation & Waterbody




Source: ICAR-NBSS&LUP, Bengaluru

# 7.31. Land Suitability for Chrysanthemum

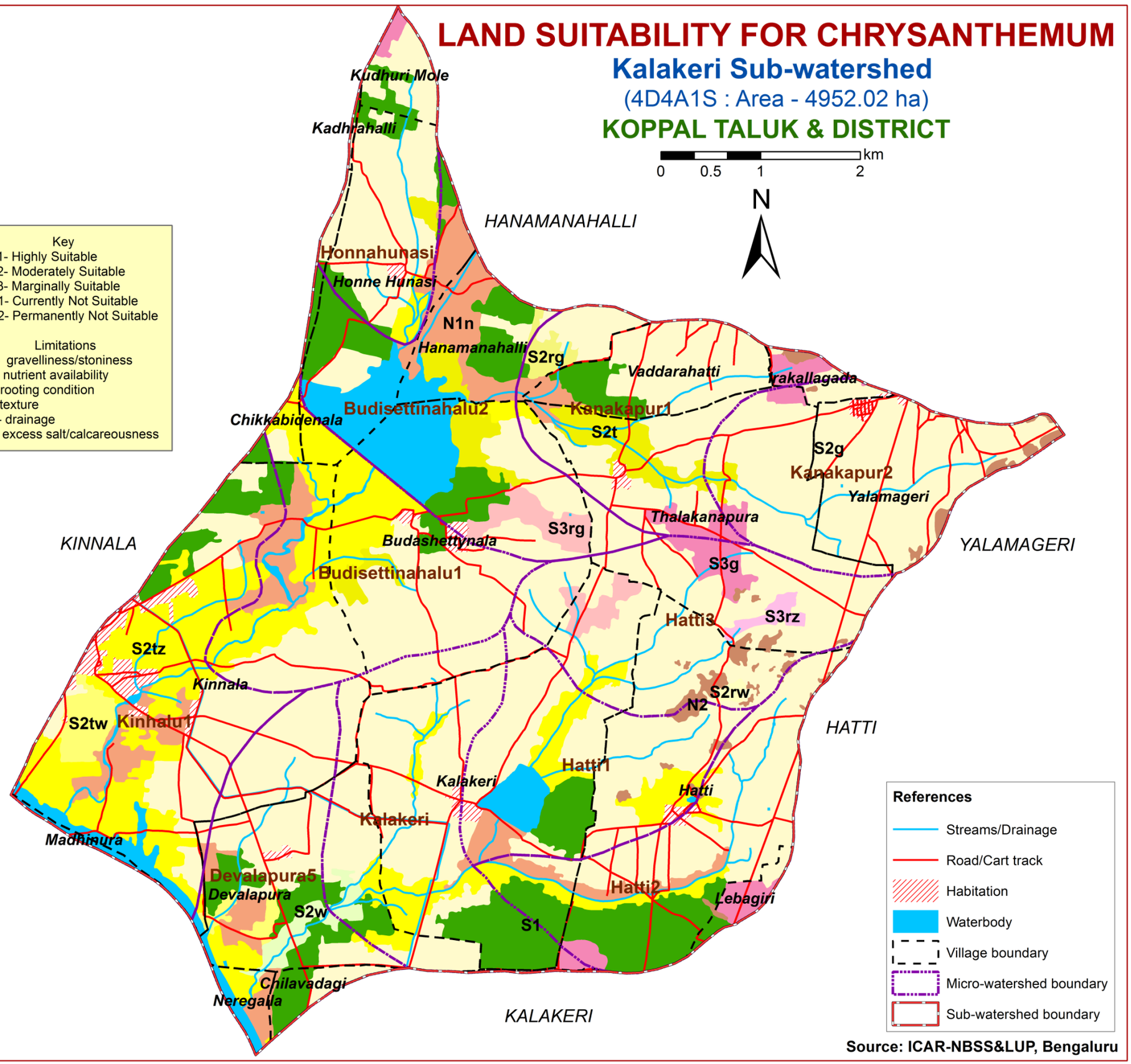



Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 532 (10.74) |
| S2g | 2759 (55.71) |
| S2t | 123 (2.48) |
| S2w | 30 (0.61) |
| S2rg | 18 (0.37) |
| S2rw | 5 (0.1) |
| S2tw | 49 (0.99) |
| S2tz | 593 (11.98) |
| S3g | 108 (2.18) |
| S3rg | 59 (1.2) |
| S3rz | 14 (0.28) |
| N1n | 284 (5.73) |
| N2 | 51 (1.02) |
| Mining/Industrial | 0 (0.01) |
| Others* | 327 (6.61) |

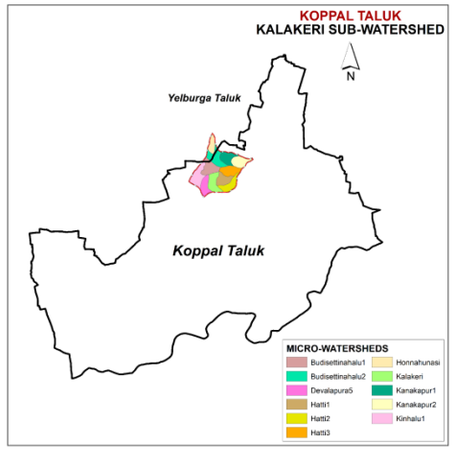
* - Habitation & Waterbody




**Source: ICAR-NBSS&LUP, Bengaluru**

# 8. Soil and Water Conservation Measures

## 8.1. Soil & Water Conservation Plan



## 9.Table. Proposed Crop Plan for Kalakeri 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 | 474.SRRmA1<br>436.HLPcB2g1<br>440.TDGcB2<br>(Moderately deep to very deep lowland soils) | Maize, Sorghum, Sunflower, Bajra, Red gram | **Fruit crops**: Amla, Tamarind<br>**Vegetables:** Chillies, Drumstick, Bhendi, Brinjal<br>**Flowers:** Marigold, Chrysanthemum, Crossandra | Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices |
| 2 | 461.GGRhB2<br>463.APRmA1<br>(Very deep, stratified clay soils) | Maize, Sorghum, Sunflower, Bajra, cotton, Red gram, Bengal gram | **Fruit crops**: Amla, Custard apple, Jamun, Lime, Musambi, Tamarind, Pomegranate<br>**Vegetables:** Chillies, Bhendi<br>**Flowers:** Marigold, Chrysanthemum | Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices |
| 3 | 464.HNHhB2g1<br>(Moderately shallow lowland sandy clay oils) | Maize, Sorghum, Groundnut, Sunflower, Bajra, Red gram, | **Fruit crops**: Amla,<br>**Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal<br>**Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra | Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices |
| 4 | 272HLKiA1<br>277MRDhB1g1<br>285RTRcB2<br>288 RTRiB2<br>(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<br>**Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal, Curry leaves<br>**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 | Field Crops/ Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 5 | 105.HDHbB2g1<br>106.HDHcA1g1<br>108 HDHcB1<br>110HDHcB2<br>111HDHcB2g1<br>114 HDHcC2g2<br>119 HDHhB1<br>122 HDHhB2<br>123 HDHhB2g1<br>125 HDHiB1<br>127 HDHiB2<br>180 BDGcB1g1<br>187 BDGhB2<br>188 BDGhB2g1<br>191BDGiB1<br>194BDGiB2g1<br>214BPRbA2<br>216BPRbB2<br>217BPRbB2g1<br>221BPRcA1g1<br>222BPRcB1<br>224BPRcB2<br>225BPRcB2g1<br>227BPRcC2g1<br>228BPRhB1<br>230BPRhB2<br>231BPRhB2g1<br>233BPRhC3g2<br>236BPRiA1g2<br>237BPRiB1<br>239BPRiB2<br>240BPRmB2<br>249NGPbB1<br>251NGPcB2g1<br>257NGPhB1, 260NGPhB2, 262NGPiB1, 267GDPcB2, 268GDPhB2,455BDGcB2<br>(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<br>**Vegetables:** Tomato, Chilli, Drumstick, Onion, Bhendi, Brinjal, Curry leaves<br>**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 | Field Crops/Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 6 | 289NDLbB2g1<br>291NDLcB2g1<br>300NDLiB2<br>(Very deep, red gravelly sandy clay soils) | Maize, Sorghum, Sunflower, Groundnut, Bajra, Cotton, Red gram | **Fruit crops** : Mango, Tamarind, Sapota, Pomegranate, Amla, Cashew, Guava, Custard apple, Jack fruit, Jamun, Lime, Musambi<br>**Vegetables:** Tomato, Chilli, Drumstick, Onion, Bhendi, Brinjal, Curry leaves<br>**Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |
| 7 | 342DRLiB2<br>384KVRiB2<br>386KVRmA1<br>388KVRmB1<br>401KDTiB1<br>410MLRiB2<br>418MLRmB2<br>366.BWThB1<br>(Moderately deep to deep, black calcareous clay soils) | Maize, Sorghum, Sunflower, Bajra, Cotton, Red gram, Bengal gram, Soybean, Safflower, Linseed | **Fruit crops**: Pomegranate, Lime, Musambi, Custard apple<br>**Vegetables:** Drumstick, Chillies, Bhendi, Coriander<br>**Flowers:**Marigold, Chrysanthemum, | Application of FYM, Bio-fertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices |
| 8 | 328RNKhB2<br>333RNKmB1<br>336RNKmB2<br>337RNKmB2g1<br>368GRHiB2<br>370GRHmA1<br>396BGPmB1<br>(Moderately shallow to deep, sodic clay 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 |

*To be continued…*

| LMU. No | Soil Map Units | Field Crops/Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 9 | 134.GHTbB2g1<br>160.BSRhB1g1<br>161.BSRhB2<br>195.KMHbB2<br>200KMHiB1<br>201.KMHiB2<br>204MNLcB2<br>211JDGhB1g1<br>(Moderately deep to deep, red sandy clay to clay soils) | Maize, Sorghum, Groundnut, Sunflower, Bajra, Mulberry, Cotton, Red gram | **Fruit crops**: Sapota, Pomegranate, Amla, Cashew, Custard apple, Guava, Jackfruit, Jamun, Lime, Musambi, Tamarind<br>**Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal, Curry leaves<br>**Flowers:** Marigold, Chrysanthemum**,** Jasmine, Crossandra | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |
| 10 | 54.LKRiB2g1<br>452.LKRhB2g1<br>(Moderately shallow, red gravelly sandy clay soils) | Bajra, Groundnut, Horse gram, Castor | **Fruit crops** : Amla, Custard apple<br>**Vegetables:** Curry leaves<br>**Flowers:** Marigold, Chrysanthemum | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |
| 11 | 72.KTPhB2g1<br>(Moderately shallow, red sandy clay soils) | Maize, Sorghum, Groundnut, Bajra, Cotton, Horse gram, Castor | **Fruit crops** : Amla, Custard apple<br>**Vegetables:** Tomato, Chilli, Onion, Bhendi, Brinjal ,Curry leaves<br>**Flowers:**Marigold, Chrysanthemum, Jasmine, Crossandra | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |
| 12 | 20.HRVbB2<br>468ABRhB2<br>469ABRmB2<br>(Shallow, red gravelly loamy 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 |
| 13 | 310.MTLmB2<br>(Shallow, calcareous clay soils) | - | Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra* | Use of short duration varieties, sowing across the slope |

# PART-B

# Hydrological Inventory of Kalakeri 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 Kalakeri 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**

**E-mail: hd_rcb.nbsslup@icar.gov.in**
**nbssrcb@gmail.com**

# Details of Hydrology Team of LRI Partner Responsible for Preparation of Atlas

| Name | Designation |
|---|---|
| Dr. Rajendra Hegde | Principal Scientist & Head Coordinator |
| 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<br>(Reviewed and approved) | Professor & Lead Scientist,<br>Dept. of Civil Engineering & ICWaR, IISc, Bangalore |
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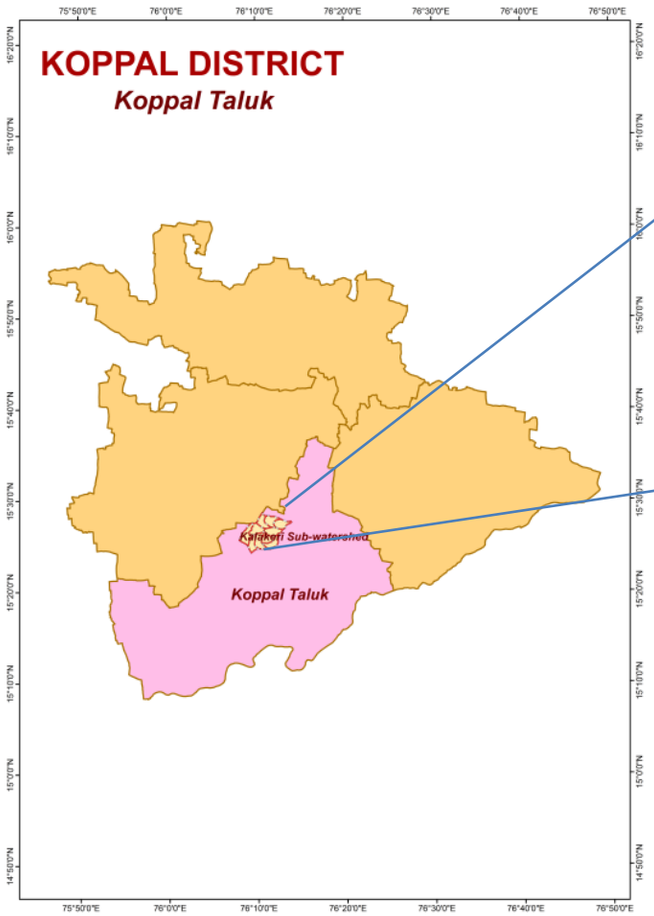
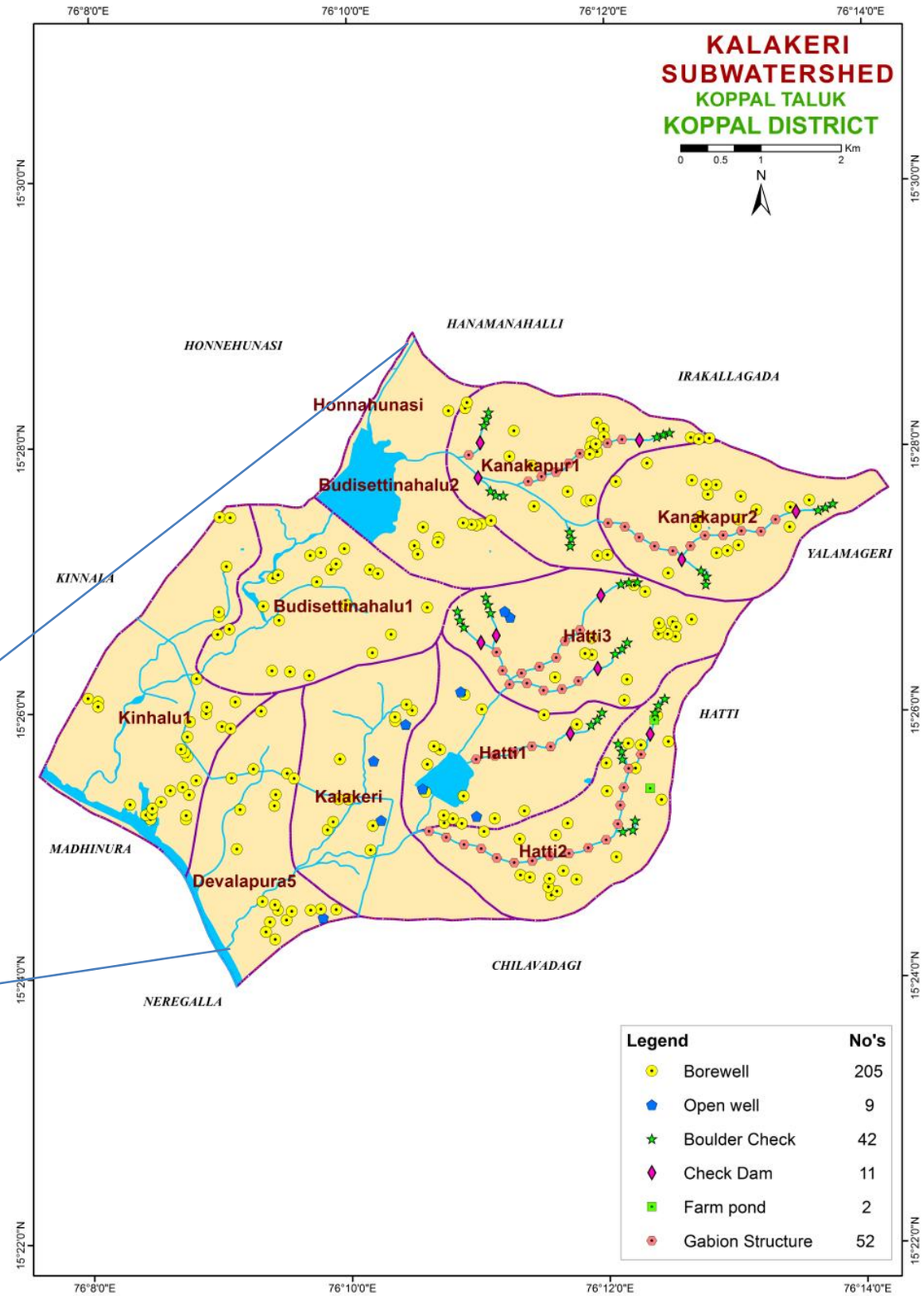
# INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Kalakeri sub-watershed (4D4A1S) in Koppal taluk, Koppal district, has been undertaken for integrated planning, development and management at the level of soil mapping units.
- Kalakeri sub-watershed (Koppal taluk, Koppal district) is located between $15^0$23'38''–$15^0$29'7'' North latitudes and $76^0$6'33''–$76^0$14'29'' East longitudes, covering an area of about 4680 ha.
- This sub-watershed encompasses of 11 MWs namely, Budisettinahalu-1 (4D4A1S1e), Budisettinahalu-2 (4D4A1S1d), Devalapura-5 (4D4A1S2e), Hatti-1(4D4A1S2c), Hatti-2 (4D4A1S2a), Hatti-3 (4D4A1S2b), Honnahunasi (4D4A1S1a), Kalakeri (4D4A1S2d), Kanakapur-1 (4D4A1S1c), Kanakapur-2 (4D4A1S1b) and Kinhalu-1 (4D4A1S1f) micro watersheds. Land Resource Inventory (LRI) was generated for ten among the eleven 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 grown are Maize, Cotton, Sunflower, Bajra, Groundnut, Redgram and major *rabi* crops are Sorghum, Bengal gram and Safflower.
- Hydrological components namely rainfall (annual, *kharif, rabi* and summer*)*, PET, AET, runoff, surface soil moisture, ground water status and water balance are presented.

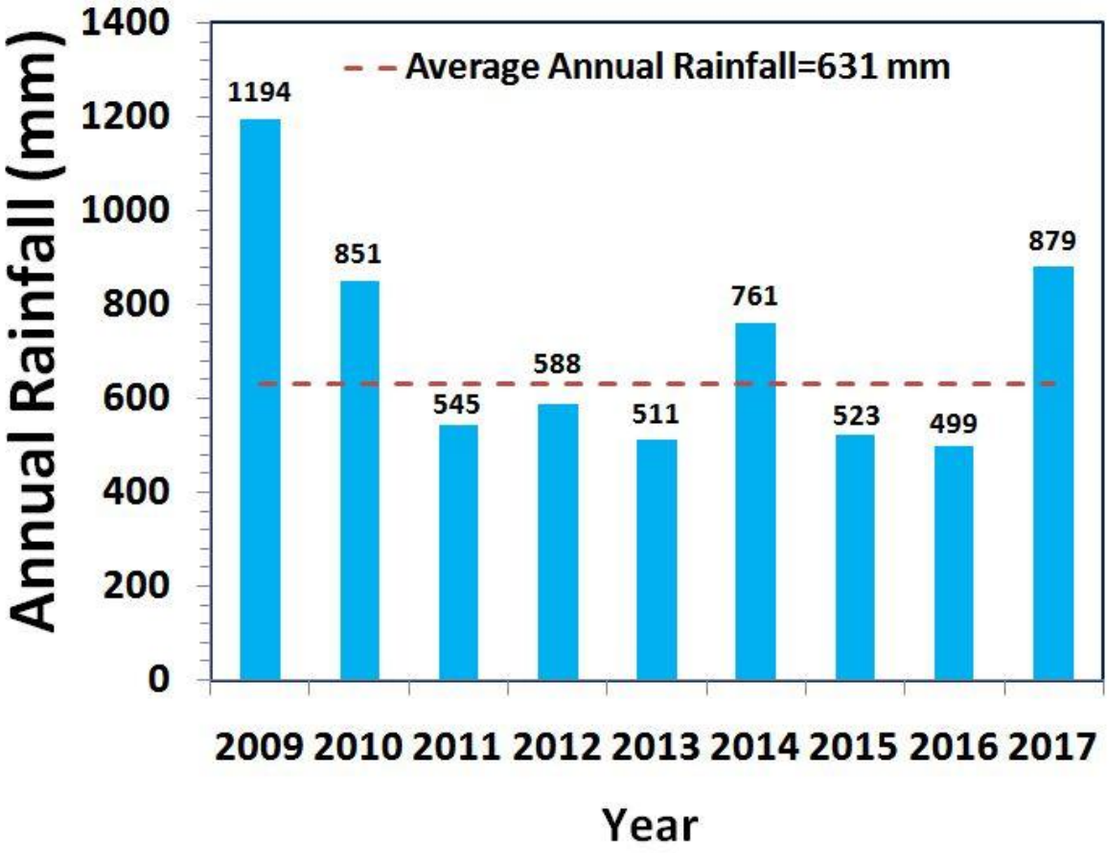
# LOCATION MAP OF KALAKERI SUB-WATERSHED

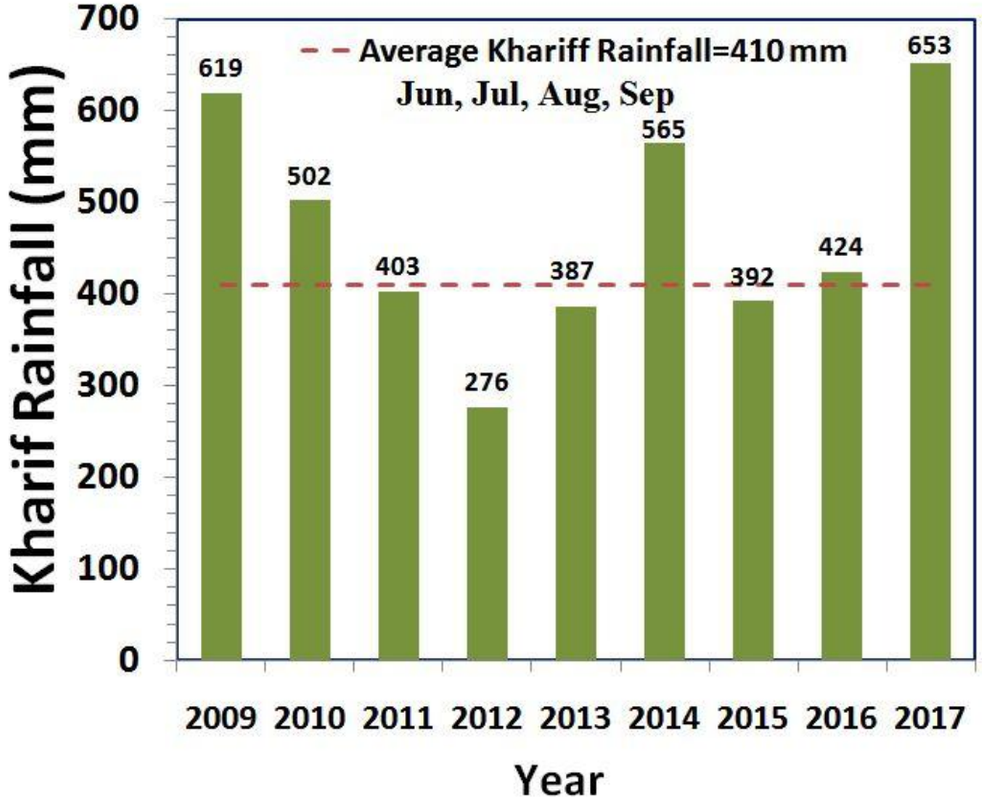

Soil & Water Conservation Structures in Kalakeri Sub-watershed, Koppal taluk, Koppal district

# RAINFALL INDEX

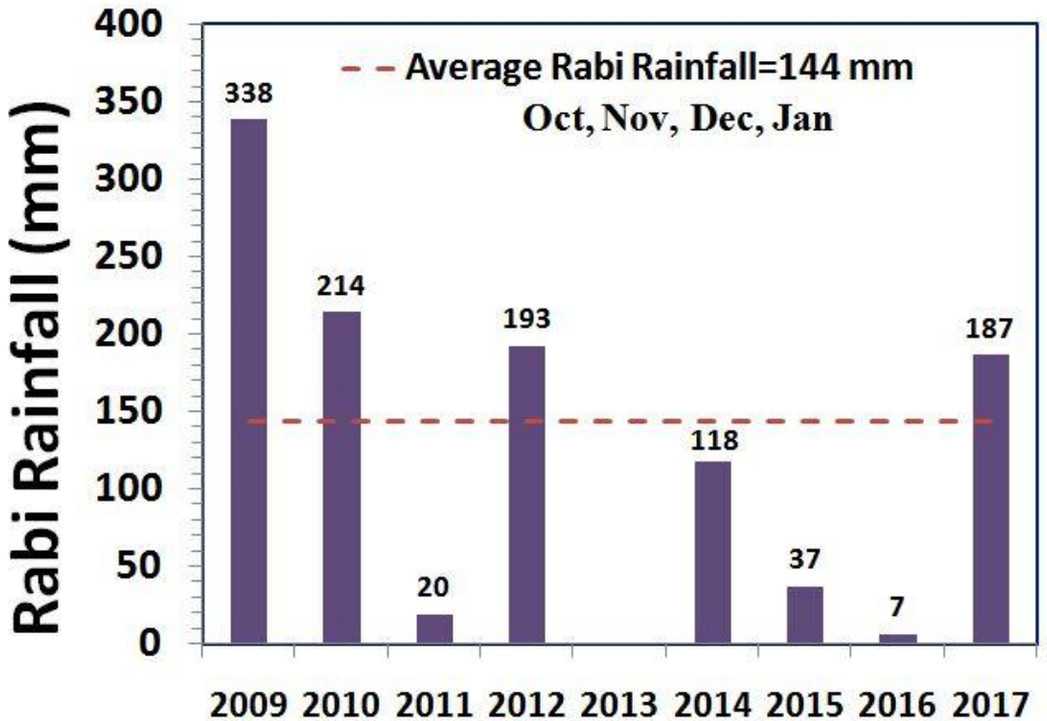



The average annual rainfall (1960-2014) recorded at the Koppal station in Koppal taluk of Koppal district is 631 mm. The annual rainfall at Irakallagada station (Hobli H.Q.) is presented. During the years 2011, 2012, 2013, 2015 and 2016 the annual rainfall was deficient by 14%, 7%, 19%, 17% and 21% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 68% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2011, 2012, 2013 and 2015 the *kharif* rainfall was deficient by 2%, 33%, 6% and 4 % respectively.

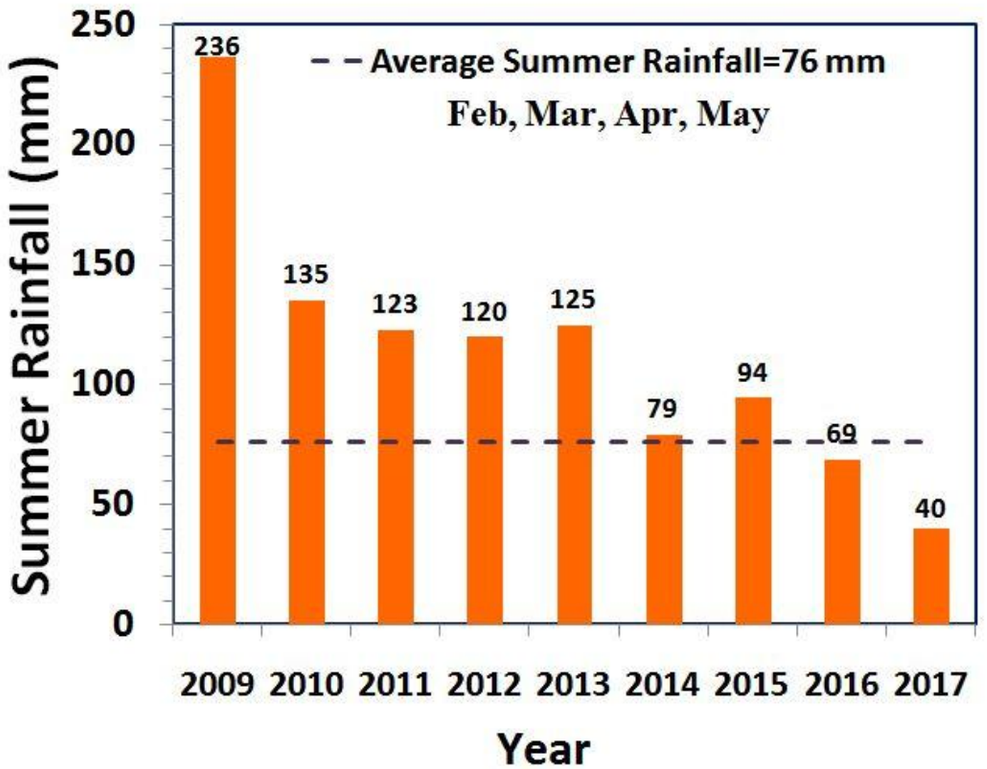


# RAINFALL INDEX

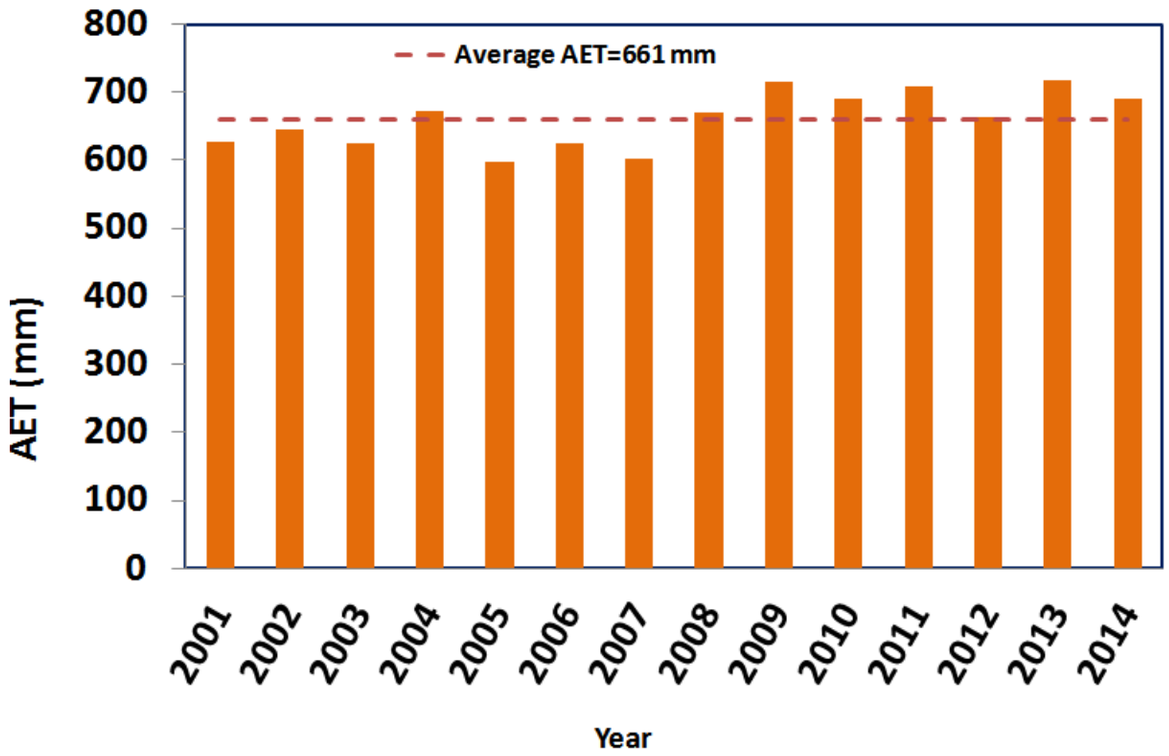


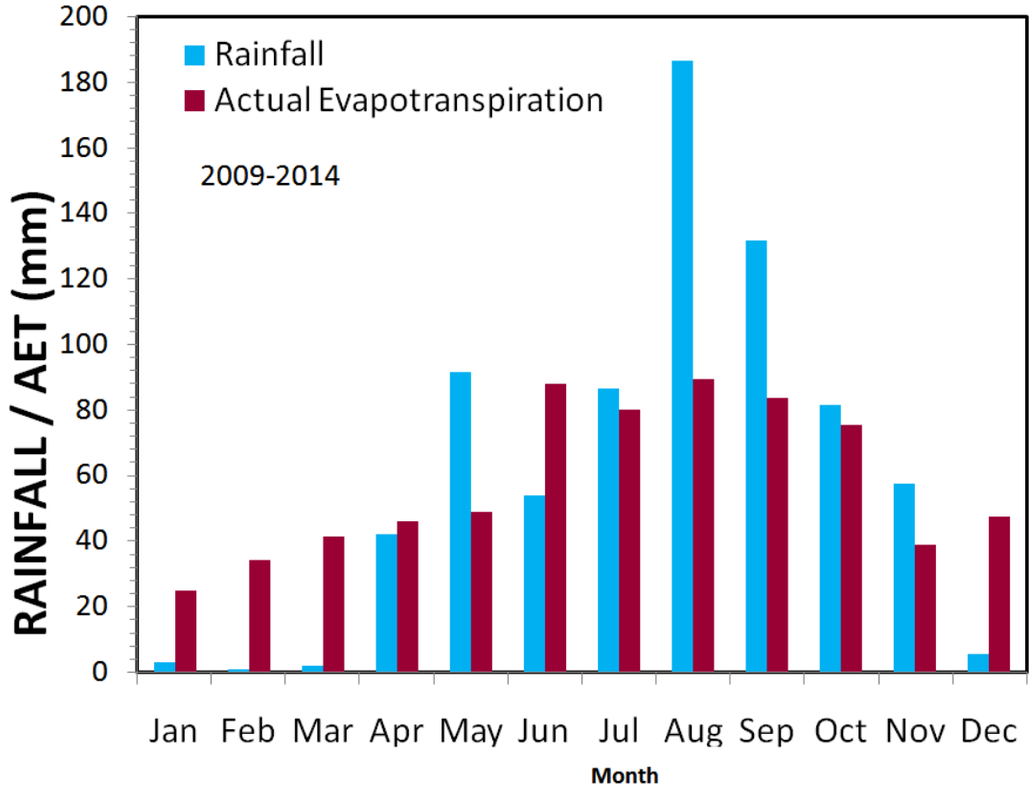

The average *rabi* rainfall (Oct-Jan) is about 15% of the average annual rainfall. During the years 2011, 2013, 2014, 2015 and 2016 the *kharif* rainfall was deficient by 86%, 100%, 18%, 74% and 95 % respectively.

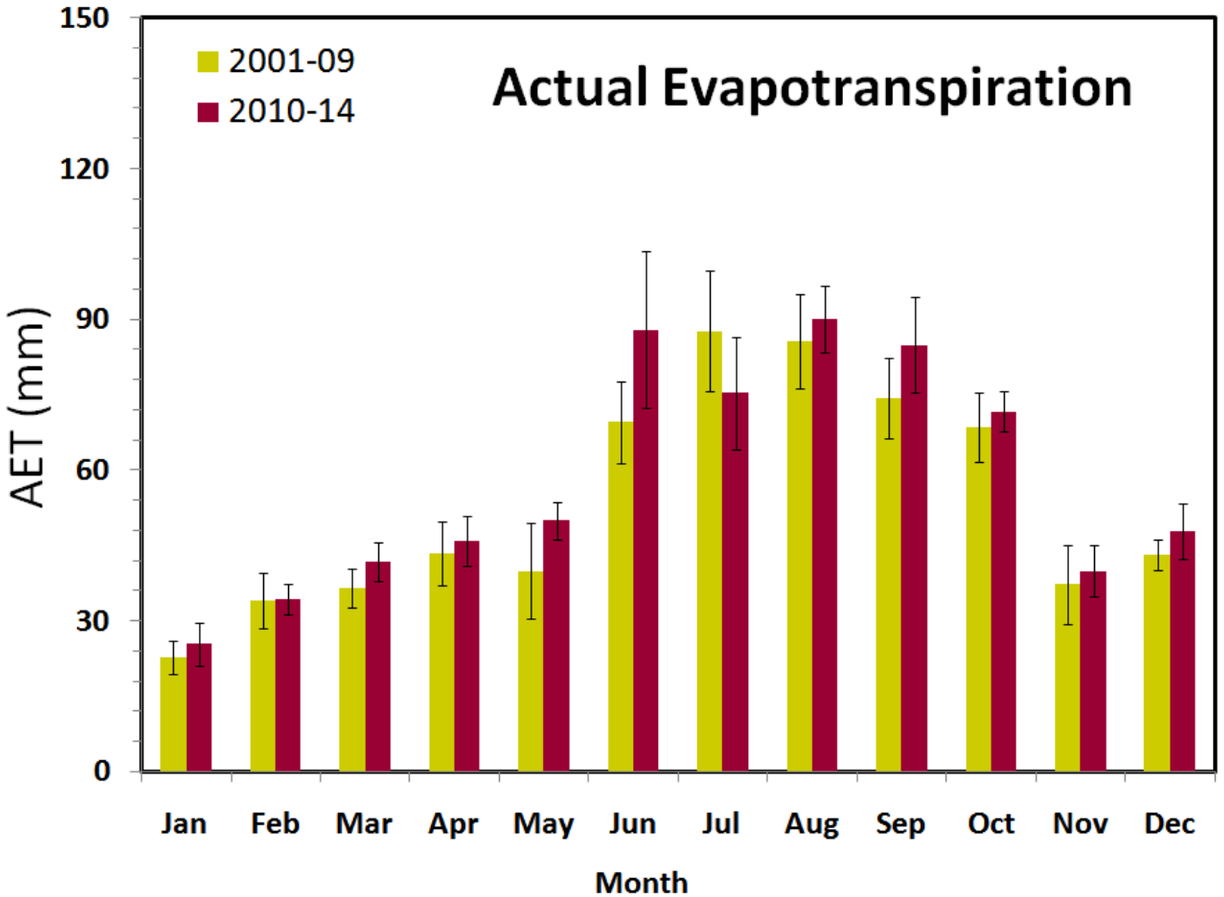
The average summer rainfall (Feb-May) is about 17 % of the average annual rainfall.



# EVAPOTRANSPIRATION

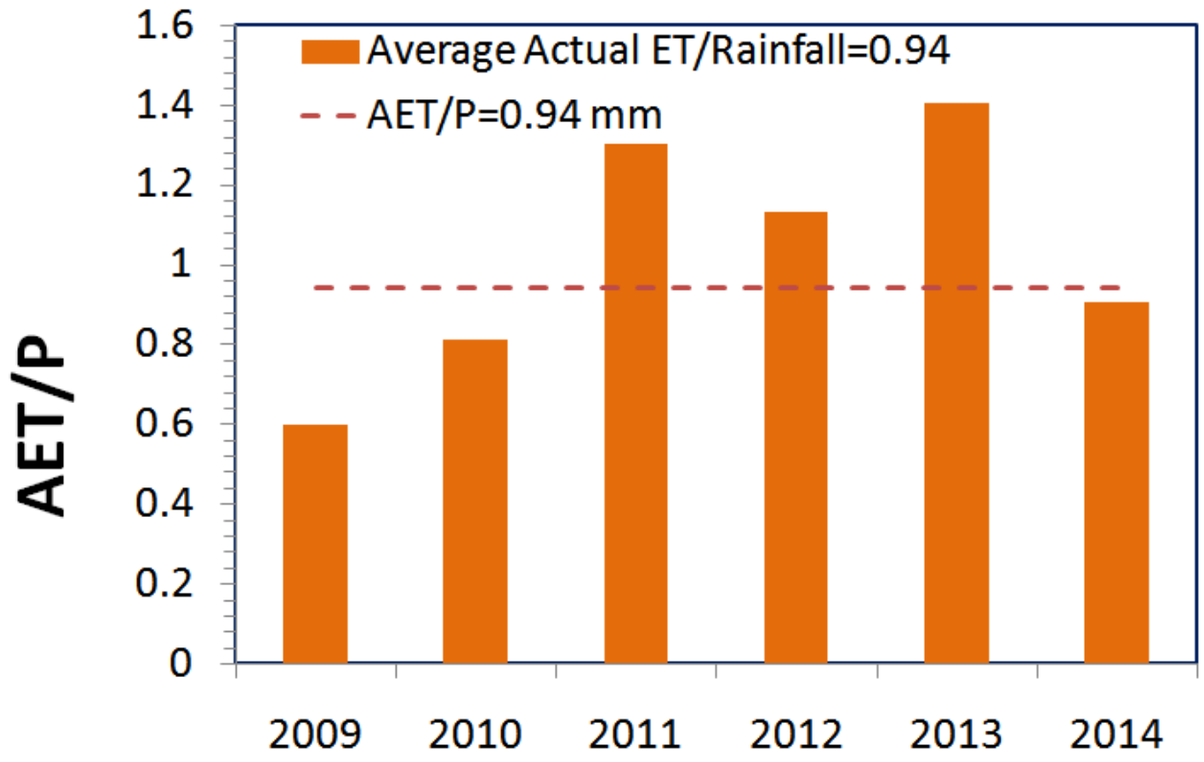


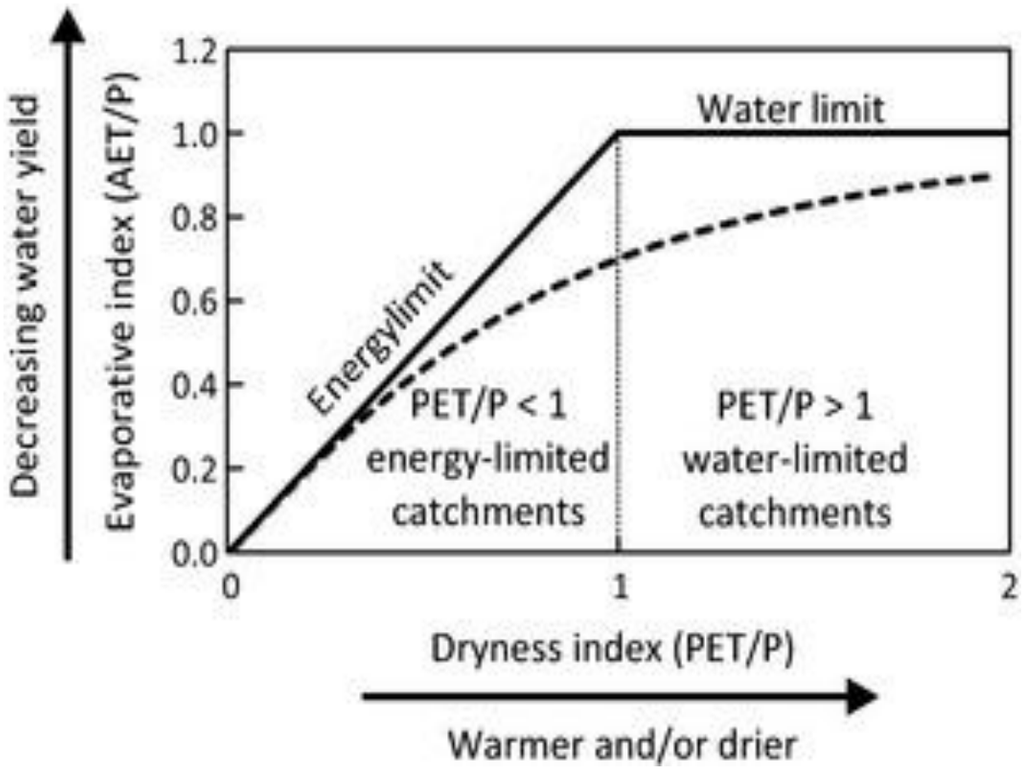



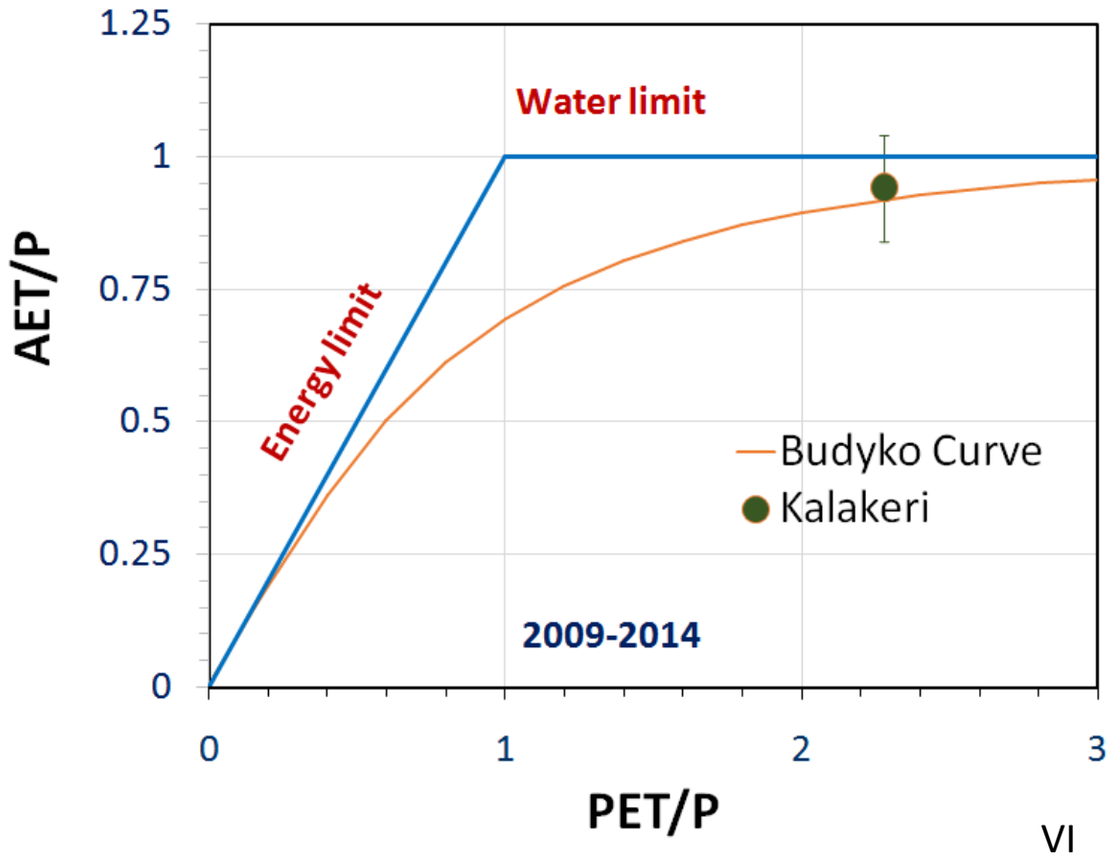

The average annual actual ET is slightly higher than the average rainfall. During *Kharif* average rainfall and ET was found to be 410 mm and 341 mm respectively, whereas in *rabi* it was about 144 mm and 186 mm. In comparison to the 2001-2009, the annual ET increased by 7% during 2010-2014.

# EVAPOTRANSPIRATION INDEX

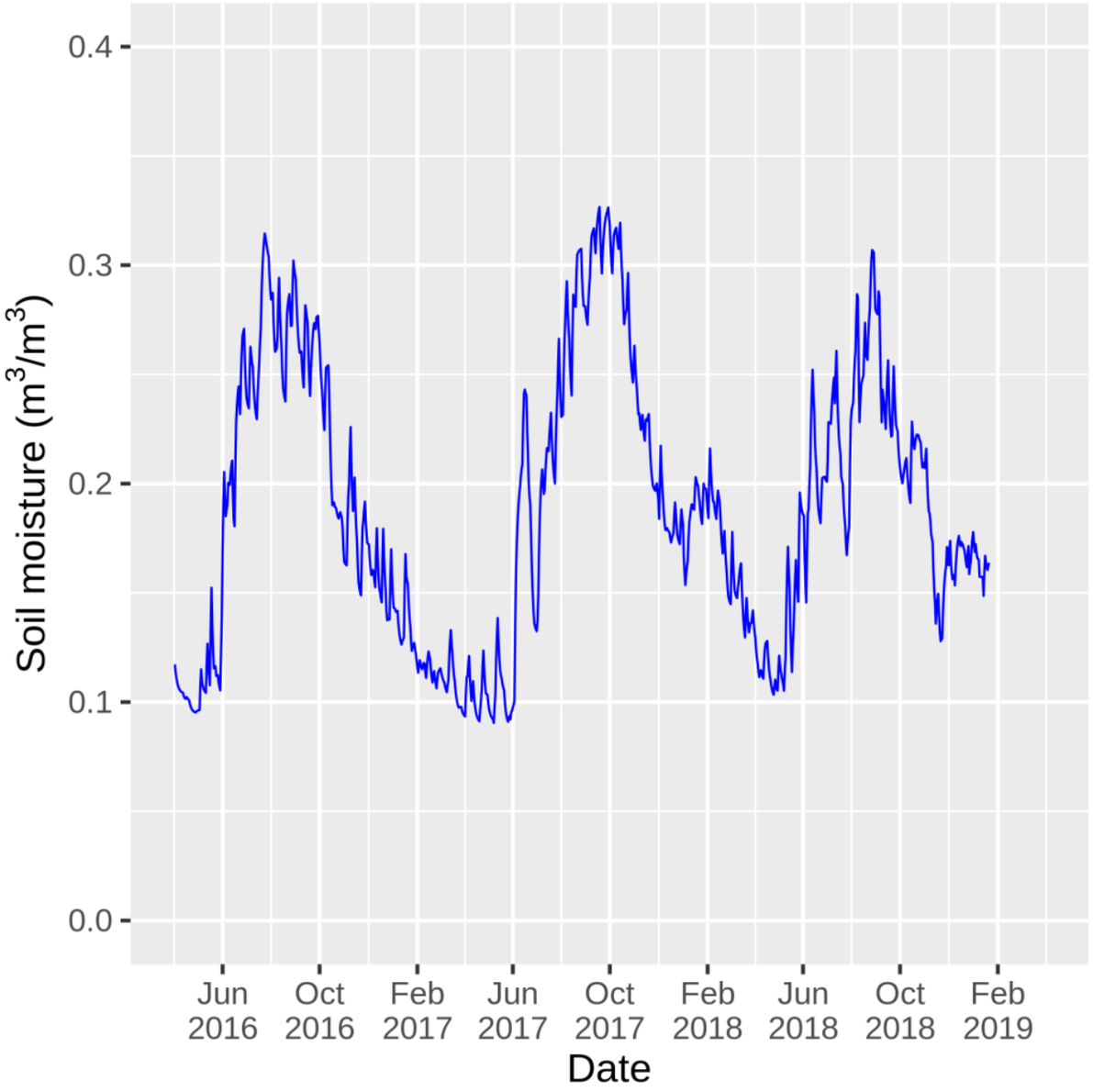


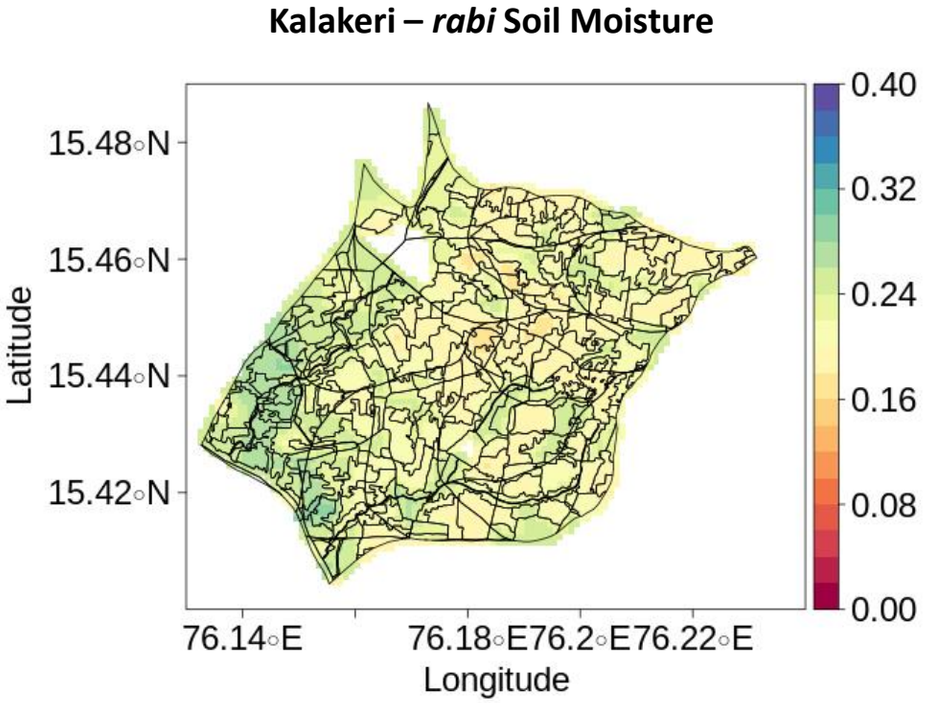

The average AET/P ratio was about 94%, which is higher than the sustainable limit of about 80%. Even during extremely lower rainfall year of 2011, AET was 660 mm. This suggests the presence of water storage and utilization from other sources such as groundwater, which buffered the lower rainfall.

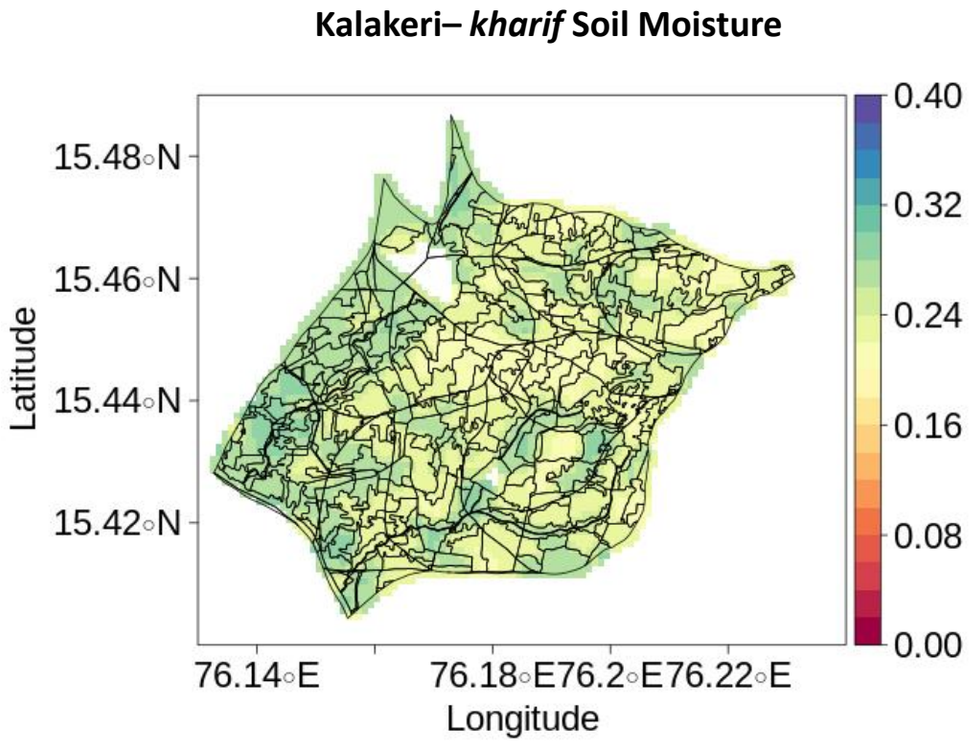


# SATELLITE RETRIEVED SOIL MOISTURE



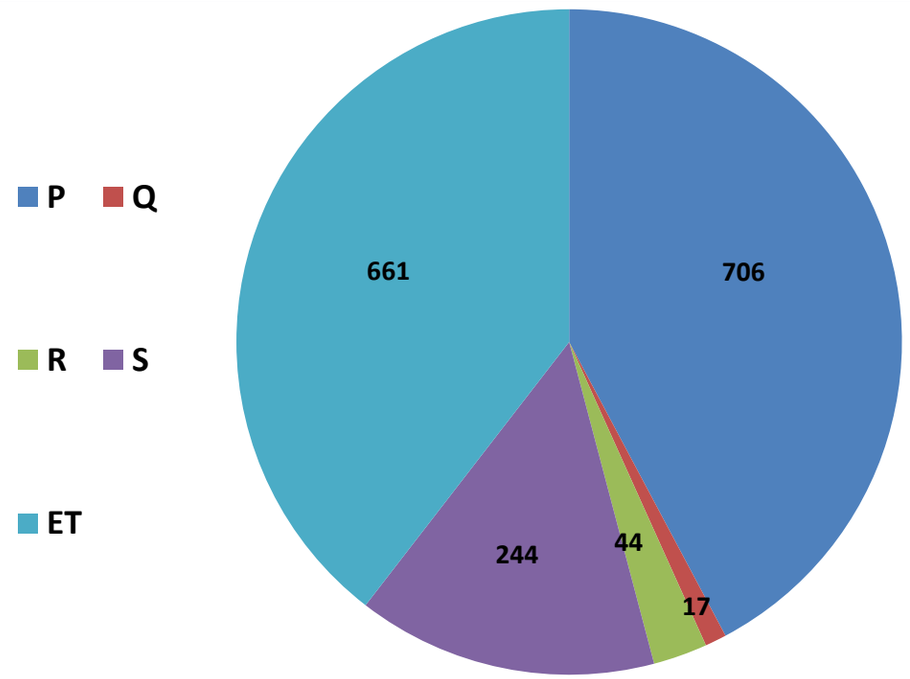




The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 12-31% in *kharif* and 17-25% in *rabi* seasons of 2016, 9-32% in *kharif* and 16-34% in *rabi* seasons of 2017 and 18-32% in *kharif* and 15-20% in *rabi* seasons of 2018.

# WATER BALANCE

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

- Q = Runoff
- P = Precipitation
- E = Evapotranspiration
- R = Groundwater recharge
- S = Storage change in the watershed

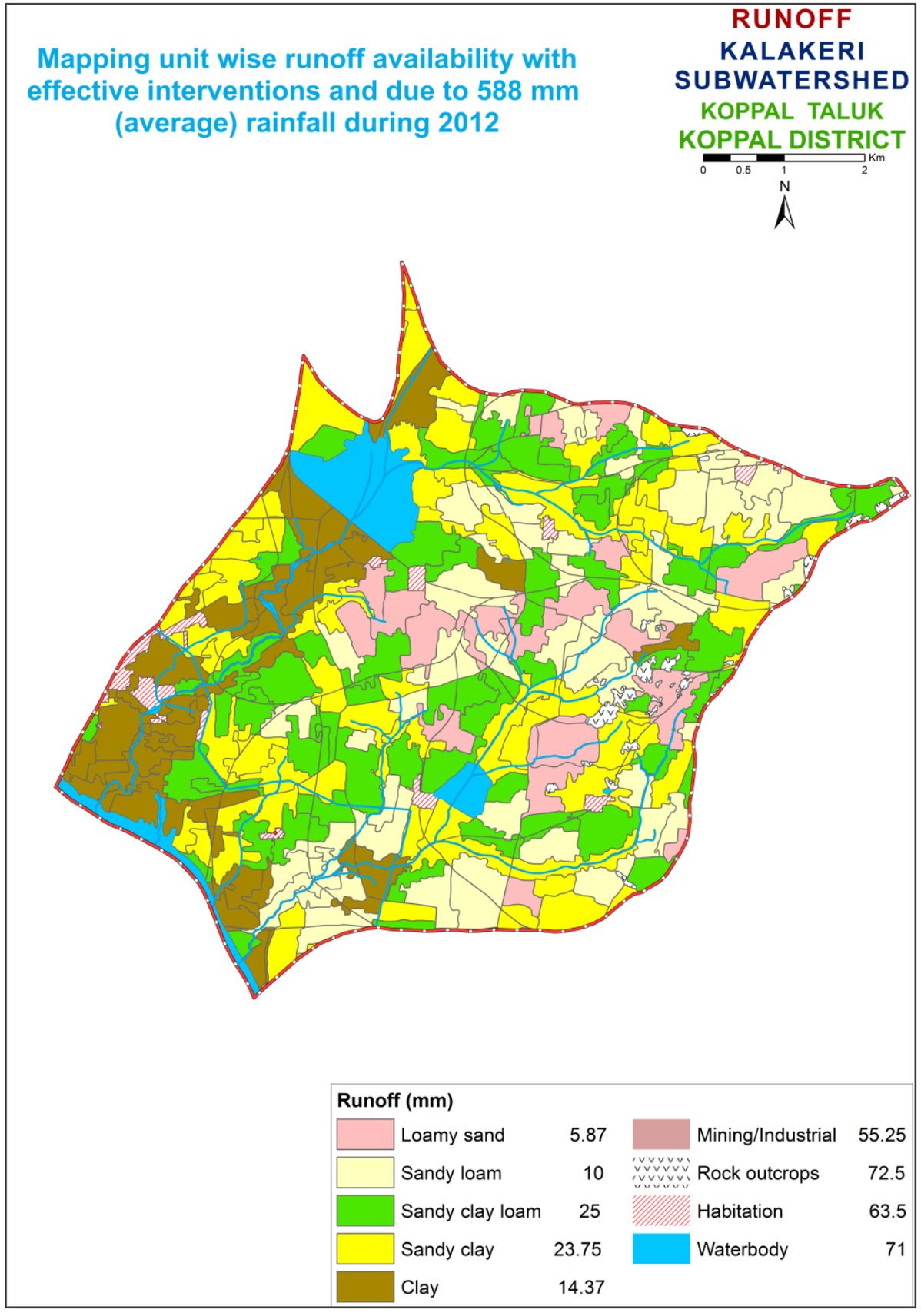



During August-November months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

**P = 706 mm (average of 2009-2017) ET = 661 mm R = 44 mm S =244 mm Q = 17.48 mm**

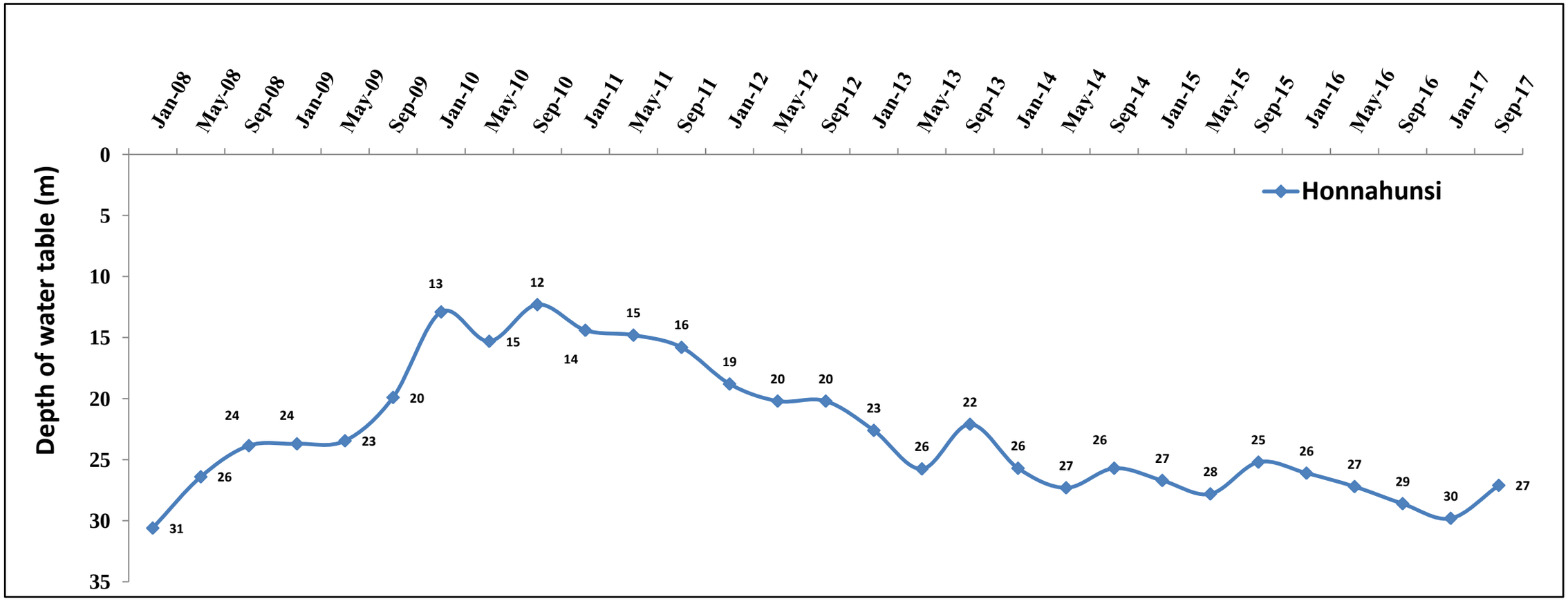
| Sl. No. | | Average_ 2012 (mm) |
|---|---|---|
| **1.** | Rainfall | 588 |
| **2.** | Runoff availability with existing conditions | 40.09 |
| **3.** | Runoff availability with effective interventions | 21.85 |
| **4.** | Runoff allowed as environmental flow at the outlet | 4.37 |
| **5.** | Runoff excess for harvesting by construction of structures | 17.48 |

# RUNOFF


RUNOFF
KALAKERI
SUBWATERSHED
KOPPAL TALUK
KOPPAL DISTRICT
Mapping unit wise runoff availability with effective interventions and due to 588 mm (average) rainfall during 2012
0 0.5 1 2 Km
N
Runoff (mm)
Loamy sand 5.87
Sandy loam 10
Sandy clay loam 25
Sandy clay 23.75
Clay 14.37
Mining/Industrial 55.25
Rock outcrops 72.5
Habitation 63.5
Waterbody 71

# GROUND WATER STATUS

## HONNAHUNSI STATION




The total number of wells present in Kalakeri Sub-watershed as per LRI data is 214 (205-Borewells & 9-Openwells). Groundwater levels was found from the data obtained from KSNDMC for the nearest station of Honnahunsi. The above graph depicts the groundwater levels during the years 2008-2012 was inclined whereas groundwater levels from 2013-2017 was almost constant, Deepest levels were found in 2008.

x

# SUMMARY


- The average annual rainfall of 631 mm in the Kalakeri sub-watershed as recorded from the Irakallagada station data by KSNDMC.

- 68 percent, 15 percent and 17 percent 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 not appropriate and need to be altered to shift the deficit water balance.

- The estimated runoff available to use is 17 mm for an annual rainfall of 706 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 (244 mm) and utilizable runoff plus recharge is 292 mm (=244+17+31)

- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the *kharif* and *rabi* seasons is 527 mm. Hence the amount of water use for *kharif* and *rabi* seasons may be estimated as 659 mm (*i.e* 125% of AET). This demand for the two seasons is marginally higher by 367 mm, i.e. (659-292). The AET in June-Sept months is 73% of rainfall. Hence, there is slightly less opportunity to harvest the excess water through watershed management practices for utilizing during rabi season.

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