National Spatial Data Infrastructure (NSDI)

Data Content standards - Soils
(Draft Version 2.0)

Department of Science & Technology
Ministry of Science & Technology

Government of India, New Delhi
December 2011

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NSDI Vision

National infrastructure for the availability and access to organised spatial data

Use of this infrastructure at Community, Local, Regional And National levels for sustained economic growth.

ACKNOWLEDGEMENTS

The Working Group (WG) on Data Content Standards is grateful to all the members for their support and cooperation in preparing the the Data Content Standards - Soils.

The WG would like to gratefully acknowledge all the nodal agencies for necessary inputs, encouragement and guidance in finalizing the NSDI Data Content Standards-Soils (Draft) document. The inputs and suggestions by the Scientists of NBSS&LUP are duly acknowledged.

The WG would like to place on record its deep sense of appreciation and gratitude to NSDI, NBSS&LUP and all Nodal Officers of NSDI for their active participation in the discussions and deliberations for shaping the NSDI Data Content Standards - Soils (Draft) document to maintain international standards in organization of soil resource databases under NSDI frame work.

In preparation of Data Content Standards on soils (Draft), the WG referred to a wide variety of spatial data infrastructures especially on data contents standards for soils adopted by various national and international organizations. The WG also referred to articles by renowned National and International experts in preparation of this document. The inputs and suggestions given by the reviewers on the document are duly acknowledged.

G. Obi Reddy

Dr. G. P. Obi Reddy
Sr. Scientist & In Charge, GIS
NBSS&LUP, Nagpur and
Chairman, NSDI Working Group
on "Data Content Standards"

Preface

In India, various agencies acquire and provide soil related data at different levels. Agencies at the National, State and Project levels generate soil data for different purposes. With rapidly changing landscape in both urban and rural areas and increasing emphasis on the conservation of the soil resources for Sustainable Agriculture, acquisition and sharing of soil data assumes a lot of importance. A greater degree of coordination is therefore essential for avoiding duplication in data acquisition, making the available data accessible to the end users, and sharing the data sets in a standard form for easy integration to support decisions. The National Spatial Data Infrastructure (NSDI), since its inception in June 2006, has been working towards devising new standards and adapting available standards to facilitate better coordination and sharing of digital geo-spatial data. The NSDI Working Group on 'Data Content Standard' has been working on various themes like Topography, Geology, Soil, Land Use, Groundwater, Meteorology to bring out the Content Standards. The Content Standards are expected to ensure setting up of interoperable organizational data nodes for automatic sharing and integration of digital geo-spatial data by end users.

I am happy that the Working Group on 'Data Content Standard' has brought out and released its Draft Version 2.0 primarily aimed at standardizing the tabular data associated with the soil maps, map units and map unit components of institutions/organizations associated with compilation of soil data. Several national level agencies participating in the NSDI initiative have contributed to the preparation of this Draft Version of the document under the overall guidance of the National Soil Survey & Land Use Planning (NBSSLUP) of the Indian Council of Agricultural Research (ICAR) of the Ministry of Agriculture, Government of India.

I hope that release of this Draft Version 2.0 of the Data Content Standard on Soil will open up a discussion amongst various stakeholders at different levels soil survey so as to publish the final version of the Content Standard document on Soils.

New Delhi (**Maj Gen Dr R Siva Kumar**)

12 Decemeber 2011 **CEO, NSDI**

FOREWORD

The National Spatial Data Infrastructure (NSDI) is a nodal agency to assemble geographic data nationwide on various themes to meet the requirement of various user community. GIS applications of many different disciplines have a recurring need for a few themes of data. The framework is a collaborative based effort in which these commonly needed data themes are developed, maintained, and integrated by public and private organizations within a geographic area. The document on Data Content Standard on soils is one of the key building blocks and forms the data backbone of the NSDI.

The purpose of this Data Content Standard on soils is to standardize the names, definitions, ranges of values, and other characteristics of soil survey map attribute data developed by the National Bureau of Soil Survey and Land Use Planning (NBSS&LUP), Nagpur. The soil attribute data associated with soil maps include the soil-site, physical and chemical properties of the various soils being described, interpretative information, the arrangement of these soils into the soil map units identified on the soil maps, and information about the soil map units themselves. The attribute data have no spatial relationship until they are linked to the maps *via* the map unit symbol and other unique identifiers. However, there is information included linking the soil data to geographical areas such as states, districts and major physiographic regions.

I am sure this document on data Content Standard on soils will be very useful to design and development of soils database to interpret the datasets of this vital resource for future use. I appreciate the efforts made by Dr. G.P. Obi Reddy, Sr. Scientist & Nodal Officer of NDSI and Chairmen, Working Group on Data Content Standards-Soils, Experts from NSDI and other contributors, who immensely contributed to organize the material for this publication**.** I am sure that this publication will be helpful for all those concerned in use soil resource databases and application in various developmental processes.

Dipak Sarkar

Director, NBSS&LUP&

Member, EC, NSDI

WORKING GROUP ON NSDI DATA CONTENT STANDARDS

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1.	Dr. G.P. Obi Reddy	Chairman	National Bureau of soil survey & Land Use Planning (NBSS&LUP), Nagpur
2.	Shri P C Mohanan	Member	Central Statistical Organization, New Delhi
3.	Shri J M Chawla	Member	NCAER, Delhi
4.	Ms Smriti K Upadhyay	Member	Central Pollution Control Board, New Delhi
5.	Dr A K Singh	Member	Ministry of Rural Development, Delhi
6.	Shri R K Singh	Member	National Disaster Management Authority, New Delhi
7.	Shri M L Srivastava	Member	Forest Survey of India (FSI), Dehradun
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10.	Dr Y V S Murthy	Member	National Remote Sensing Centre (NRSC), Hyderabad
11.	Shri S K Sinha	Member	Central Ground Water Board (CGWB), Faridabad
12.	Shri E Haque	Member	Ministry of Earth Sciences (MoES), New Delhi
13.	Dr S K Pathan	Member	Space Application Centre (SAC), Ahemadabad
14.	Shri Prashant Kumar Gupta	Member	Central Water Commission (CWC), New Delhi
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16.	Shri R N Nanda	Member	Survey of India (SOI), Hyderabad
17.	Shri S K Bohra	Member	Geological Survey of India (GSI), New Delhi
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20.	Maj Gen R C Padhi	Member	Ministry of Defence (MoD), New Delhi
21.	Shri Kirtimoy Mukhopadhyay	Member	NATMO, Kolkata

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1. Background

Under the initiatives of Working Group on Data Content Standards of NSDI, the content standard for soils was developed from the perspective of defining the information required by a prospective user to determine the availability of a set of soil geospatial data; to determine the fitness and the set of soil geospatial data for an intended use and to determine the means of accessing the set of soil geospatial data. This standard is for the documentation of soil geospatial data. The challenges associated with maintaining high quality soil data in electronic environments require a clear understanding of data content standards and effective coordination and management of the organization's data requirements. The Content Standard for Soils uses to the maximum extent possible, existing International or National Standards in defining the data elements, sub elements, short names, data type, unit of measure, maximum, minimum value of each parameter and brief description.

NSDI Working Groups

S.No.	Name of the Working Group	Chairman
1	Metadata Standards	Dr. S.K. Pathan, SAC, Ahemadabad
2	Interoperability and data Exchange	Shri Subash Ashutosh, FSI Dehradun
3	Data Content Standards	Dr. G.P. Obi Reddy, NBSS&LUP, Nagpur
4	Node architecture & Guidelines	Shri S.K. Sinha, CGWB, Faridabad
5	Network and Access Control	Dr. Vandana Sharma, NIC, New Delhi
6	Cost Recovery/ Payment Gateways	Dr. Y.V.S. Murthy, NRSC, Hyderabad
7	Outreach &Communication	Dr. Yogesh Paithankar, CWC, New Delhi
8	Policy, Legal, Security and Projections/Transformations	Brig Girish Kumar, SOI, New Delhi
9	Data Delivery and Capacity building	Shri S K Bohra. GSI

2. Introduction

The main aim of Data Content Standard on soils is to understand and support the exchange of metadata on soils under umbrella of National Spatial Data Infrastructure (NSDI). The Data Content Standard on soils explain about the various soil parameters and their semantic content of geodetic control databases to develop standards for their use across the other spatial databases and to provide the metadata for the user community. It, in turn, helps to reduce the redundancy in data storage and development. Adoption of the Data Content Standard further enhances the database design, organization and development of the geospatial soil resource data.

The development framework for Data Content Standard on soils explain the various soil parameters, data specifications and provides a coherent set of requirements: Data Content Standard on soils describes in greater detail the spatial data themes defined in the database, and thus provides a sound starting point for the thematic aspects of the data specification development. It defines the elements necessary for inter-operability and data harmonization including cross-theme issues. It specifies requirements and recommendations with regard to data specification elements of common use, like the spatial and temporal schema, unique identifier management, object referencing, a generic network model, some common code lists, etc. The methodology for the development of data specifications defines a repeatable methodology enabling to arrive from user requirements to a data specification through a number of steps including use-case development, initial specification development and analysis of analogies and gaps for further specification refinement. It also defines how geographic information can be encoded to enable transfer processes between the systems of the data providers.

The standard was developed for soils from the perspective of defining the soil information required by a prospective user to determine the availability of a set of geo-spatial data; to determine the fitness and the set of geo-spatial data for an intended use; to determine the means of accessing the set of geo-spatial data; and to successfully transfer the set of geospatial data. As such, the standard establishes the names of data elements and compound elements to be used for these purposes, definitions of these data elements and compound elements, and information about the values that are to be provided for the data elements.

2.1 Purpose

This document contains the proposal of "Data Specifications" for description and scope of spatial data themes of soils. This deliverable of the “Data Specifications” is considered as a starting point for the development of Data Specifications. The descriptions of individual spatial data themes of soils have been established at different levels of detail. The purposes of the data Content Standard are:

- To provide common definitions for geo-spatial information on soils to facilitate the effective use and understanding the information availability.
- To standardize attributes to enhance the data sharing.
- To resolve discrepancies related to the use of homonyms and synonyms in the datasets of various organizations/agencies, which will minimize duplication within and among them.
- To provide guidance and direction for geo-spatial professionals on standardized attributes and definitions to improve the standards in data creation and management.
- To use participatory involvement in the standard development to reach out to various organizations, to encourage application of the standards.

2.2 Principles

This standard is intended to support the collection and processing of geospatial metadata on soils. Geo-spatial soil database has been logical grouped into soil- site, morphological, physical and chemical parameters.

2.3 Scope

Data Content Standard (Draft Version 2.0) on soils explains the content standards applicable to soil related parameters of any resolution except that associated taxonomies aare relevant up to a resolution of soil maps of 1:250,000 scale.

2.4 Limits

Data Content Standard on soils is limited to data associated with the maps, associated attribute/tabular data reference to NSDI. The data elements, which are overlapping with any other participating institute/organization of NSDI need to be specified.

3. Content of the standard for NSDI

Data Content Standard on soils contains a listing of data elements used to store the various broad groups and interpretive data associated with the soils. The relationships within the data were explained through entity relationship model in order to properly utilize the data as it is intended.

3.1 Geographic data standard – Data elements

In the 'Data Content Standard' we considered each data element as a table. Various data elements have been specified under soil site, morphological, physical and chemical properties pertaining to the NSDI database.

For example, we have two data elements for parameter 'slope'

slope_aspect

slope_gradient

3.2 Data dictionary

In this section, various data elements have been specified under soil site, morphological, physical and chemical properties pertaining to the NSDI database which explains the data element-wise, its short name, data type, unit of measure, minimum value, maximum value and brief description on data elements and its sub-classes need to be given. Data dictionary has four sections namely soil site parameters, soil morphological parameters, soil physical parameters and soil chemical parameters.

3.2.1 Soil-site parameters

Soil-site parameters refer to the various aspects of identification details, the prevailing geological, climatic, topographic details of the soils. The soil-site parameters and their detailed description are shown in table 1.

Table: 1 Soil-site parameters and their description

S. No	Data Element Name	Short Name	Data Type	Unit Of Measure	Minimum value	Maximum Value	Description
1	Observation No		Character				Follow codification as indicated below (district symbol followed by block, village and profile number).
2	Toposheet No		Character				A toposheet is a shortened name for topographic sheet. They are essentially contain information about an area like roads, railways, settlements, canals, rivers, electric poles, post offices etc.
3	Photograph No		Character				The number assigned to the photograph, where the photograph was captured at the profile site.
4	Author and Date of examination		Character				Give the name of the Officer in-charge of the field party and date of observation.
5	Location details		Character				Indicate the exact location of the profile on the cadastral map within the survey number and describe the location of the profile with reference to some nearby fixed features(identification marks).

	Latitude		Character				It is defined with respect to an equatorial reference plane
	Longitude		Character				It is defined in terms of meridians which are half circles running from pole to pole
	Village		Character				A group of houses and associated buildings larger than a hamlet and smaller than a town situated in a rural area
	Tehsil		Character				It consists of towns and villages around the towns
	District		Character				A division of territory as a country or state marked off for administrative, electoral or other purposes
	State		Character				A division of territory as a country marked off for administrative, electoral or other purposes
6	**Series and/or Local Name**		**Character**				It is the lowest category in the system. The series is a collection of soil individuals, essentially uniform in differentiating characteristics (like color, texture, structure, consistence) and in arrangement of horizons. It is the series which is most useful for making land use plans of a small area or agro technology transfer. The

							series are named after the geographic name of the place where it was first recognized or where they have wide extent of distribution.
7	**Soil Mapping Legend**		**Character**				Soil mapping legend are those activities conducted in the field to organize, gather, describe and delineate data needed to provide current and accurate soil maps and interpretations(in a coded manner)
8	**Aerial Photo Interpre-tation**	**API Unit**	**Character**				A method of studying terrain by examining aerial photographs of it, involving detection and identification of the objects photographed, determination of their qualitative and quantitative characteristics and recording the results graphically, numerically and texturally.
9	**Physiographic Unit**		**Character**				At the state level, based on geology, relief and land use, the physiographic sub-divisions can be further sub-divided into physiographic regions and landforms.
10	**Geology**		**Character**				The geology map of respective states, districts can be used to identify the major rock types of the survey area.

11	**Parent Material**	**PM**	**Character**				The loose unconsolidated mineral material formed by the weathering of rocks, from which the soils form, is known as the parent material of the soil. It may be alluvium, colluviums, lacustrine, moraine, Aeolian, etc.
	Alluvium	A	Character				Transported material by water
	Colluvium	C	Character				Transported material by mass movement or gravity and local wash
	Aeolian	E	Character				Transported material by wind
	Granite	G	Character				Residual or in place or in-situ deposits.
	Gneiss	N	Character				Metamorphic rocks resulted from profound alteration of igneous and sedimentary rocks by heat and pressure
	Schist	S	Character				Metamorphic rocks resulted from profound alteration of igneous and sedimentary rocks by heat and pressure
	Sandstone	D	Character				Sedimentary rock formed by the consolidation and compaction of sand and held together by natural cement such as silica
	Basalt	B	Character				Residual or in place or *in-situ* deposits.
	Limestone	L	Character				A common sedimentary rock consisting mostly of calcium carbonate used as

							a building stone and in the manufacture of lime, carbon dioxide and cement
	Glacial	T	Character				Material that has been moved and deposited by glacial processes. Glacial drifts consists of all of the material picked up, mixed, disintegrated, transported and deposited by glacial ice or by water from melting glaciers.
	Marine Sediments	M	Character				Transported Material by water
	Undifferen-tiated	U	Character				
	Weathered basalt	WB					Weathered basalt due to physical/ chemical processes or both
	Granite/ Gneiss	GN					A rock consist of an orthogenesis or paragneiss having the composition of granite
	Quartzite	Q					
12	**Climate**	**C**	**Character**				Climate encompasses the statistics of temperature, humidity, atmospheric pressure, wind, rainfall, atmospheric particulates and other meteorological elemental measurement in a given regions over long periods.
	Humid	B	Character				Climate characterized by high rainfall and low evaporation potential.
	Sub-humid (Moist)	Cm	Character				Regions where moisture is normally less

							than under humid conditions but still sufficient for the production of many agricultural crops without irrigation or dry- land farming.
	Sub-humid(Dry)	Cd	Character				Regions where climates are characterized by little rain and huge daily temperature range but still sufficient for the production of many agricultural crops
	Per-humid	A	Character				A type of climate which has humidity index values of + 100 and above
	Semi-arid(Moist)	Dm	Character				In this ecosystem, the LGP ranges between 120 and 150 days. The rainfall varies from 750 to 1000 mm, a situation conductive to raise a single crop of short or medium duration.
	Semi-arid(dry)	Dd	Character				In this ecosystem, the LGP varies from 90 to 120 days and the rainfall ranges from 500 to 700 mm, a situation conductive to raise a single crop or short duration.
	Typic-Arid	Et	Character				The typic arid ecosystem represents conditions where rainfall exceeds 0.5 PET for a limited period but does not exceed the PET. The LGP in such conditions ranges between 60 and 90 days.

	Hyper-Arid	Eh	Character				The hyper arid ecosystem is the one where rainfall is very scanty(less than 150mm) moisture index is less than -83.2 and LGP<60+ days.
13	**Rainfall**	**R**	**Integer**	**mm**	**0**	**>3000**	Indicate the average annual rainfall of the area in mm
	Very low		Integer	mm	0	300	Average annual rainfall ranging from 0 to 300 mm
	Low		Integer	mm	300	500	Average annual rainfall ranging from 300 to 500 mm
	Moderately low		Integer	mm	500	800	Average annual rainfall ranging from 500 to 800 mm
	Moderate		Integer	mm	800	1000	Average annual rainfall ranging from 800 to 1000 mm
	Moderately High		Integer	mm	1000	1500	Average annual rainfall ranging from 1000 to 1500 mm
	High		Integer	mm	1500	2000	Average annual rainfall ranging from 1500 to 2000 mm
	Very high		Integer	mm	2000	3000	Average annual rainfall ranging from 2000 to 3000 mm
	Excessive		Integer	mm	>3000		Average annual rainfall more than 3000 mm
14	**Topography**		**Character**	**Per cent**			The surrounding land of the profile will normally have complex slopes and the terms used to describe the topography of the surrounding country are indicated below. In contrast to this only simple slopes are used to describe the location of the profile in the

							pedon description form.
	Level		Character	Per cent	0	1	Slope of the topography ranges from 0 to 1%
	Nearly Level		Character	Per cent	1	3	Slope of the topography ranges from 1 to 3%
	Undulating		Character	Per cent	3	8	Slope of the topography ranges from 3 to 8%
	Rolling		Character	Per cent	8	16	Slope of the topography ranges from 8 to 16%
	Hilly		Character	Per cent	16	30	Slope of the topography ranges from 16 to 30%
	Steep		Character	Per cent	30	60	Slope of the topography ranges from 30 to 60%
	Very Steep		Character	Per cent	>60		Slope of the topography is greater than 60%%
15	**Landform type**		**Character**				Any physical, recognizable feature on the Earth's surface, having a characteristic shape that is produced by natural processes and mappable at common survey scales.
	Marine landforms		Character				Beach, beach ridge, dunes, salt pans, swamp, coastal plain, island, gulf, marsh, etc
	Alluvial landforms		Character				Delta, alluvial fan, delta plain, flood plain, plain, etc.
	Inland and hilly landforms		Character				Mountains, mountain slope, mountain valley, hills, high hills, low hills, hill slope, peak, ridge, dyke, tors,

							inselberg, escarpment, gorge, ravine, valley, etc.
16	**Elevation above MSL**	**Eleva-tion**	**Integer**	**m**	**0**	**1000**	Elevation refers to the height of a point on the earth's surface, relative to mean sea level. It can be determined from the topographic maps or by using a calibrated altimeter or by Global Positioning System (GPS).
17	**Slope gradient (%)**	**SL**	**Character**	**Per cent**	**0**	**100**	Slope gradient is the inclination of the surface of the soil from the horizontal. It indicates the direction of the surface water flow at the site. The difference in elevation between two points is expressed as a percentage of the distance between those points. The slope gradient is measured at the profile site by using Abney level and ranging rods.
	Level to nearly level	a	Character	Per cent	0	1	0 to 35 mins abney level reading
	Very gently sloping	b	Character	Per cent	1	3	35 min to 1 degree 44 mins abney level reading
	Gently sloping	c	Character	Per cent	3	8	1 degree 44 mins to 2 degrees 52 mins abney level reading
	Moderately sloping	d	Character	Per cent	8	15	2 degrees 52 mins to 5 degrees 43 mins abney level reading
	Moderately steep	e	Character	Per cent	15	30	5 degrees 43 mins to 8 degrees 32 mins abney level reading
	Steeply sloping	f	Character	Per cent	30	50	8 degrees 32 mins

							to 14 degrees 3 mins abney level reading
	Very steeply sloping	g	Character	Percent	>50		14 degrees 3 mins to 18 degrees 16 mins abney level reading
18	**Slope gradient**	**SL**	**Integer**	**Length (m)**	**0**	**>600**	Slope length indicates the distance up to which there is no break in the slope.
			Integer	m	0	50	Slope gradient ranges from 0 to 50 m
			Integer	m	50	150	Slope gradient ranges from 50 to 150 m
			Integer	m	150	300	Slope gradient ranges from 150 to 300 m
			Integer	m	300	600	Slope gradient ranges from 300 to 600 m
			Integer	m	>600		Slope gradient is greater than 600 m
19	**Erosion**	**e**	**Integer**		**0**	**100**	The detachment and movement of soil materials from one place to another is known as soil erosion. Depending on the landscape position, vegetation and rainfall, soil erosion may be very slow or very rapid.
	None to very slight	e1	Integer				
	Slight	e2	Integer				This class consists of soils that have lost some, but on the average less than 25 per cent, of the original A and /or E horizons or of the uppermost 20 cm of the original A and/or E horizons if they were less than 20 cm thick.
	Moderate	e3	Integer				This class

							consists of soils that have lost, on the average, 25 to 75 per cent of the original A and/or E horizons or of the upper most 20 cm if the original A and/or E horizons were less than 20 cm thick.
	Severe	e4	Integer				This class consists of soils that have lost, on the average, 75 per cent or more of the original A and/or E horizons or of the uppermost 20 cm if the original A and/or E horizons were less than 20 cm thick. In most areas of class 3 erosion, material below the original A and/or E horizons is exposed at the surface in cultivated areas; the plough layer consists entirely of this material.
	Very Severe		Integer				This class consists of soils that have lost all of the original A and/or E horizons or the uppermost 20 cm if the original A and/or E horizons were less than 20 cm thick. In addition, class 4 includes loss of some or all of the deeper horizons throughout most of the area.
20	**Run-off**		**Character**				Surface run-off or external soil drainage refers to the loss of water (includes both

							rainfall and water flowing from other or nearby soils) from an area by flow over the land surface.
	Ponded		Character				None of the water added to the soil as precipitation or by flow from surrounding areas escapes as run-off. This condition occurs normally in depressions.
	Very slow		Character				Surface water flows away very slowly that free water lies on the surface for long periods or enters immediately into the soil. In very slow condition, most of the water either passes through the soil or evaporates into the air. This condition is observed normally in level to nearly level areas or in very porous sandy soils
	Slow		Character				Surface water flows away slowly that free water lies on the surface for significant periods or enters rapidly into the soil. In very slow condition, large part of the water either passes through the soil or evaporates into the air. This condition is observed normally in nearly level or very gently sloping areas or in sandy soils. Normally there is little or no erosion hazard.

	Medium		Character				Surface water flows away at such a rate that a moderate proportion of the water enters the soil and free water lies on the surface for only short periods. In this condition, large part of the rainfall is absorbed by the soil and used for plant growth. The erosion hazard may be slight to moderate when these soils are brought under cultivation.
	Rapid		Character				A large part of the rainfall moves rapidly over the surface of the soil and a small part moves through the soil profile. In this condition, water runs off nearly as fast as it is added on the surface. Rapid runoff areas are observed normally in 19 moderately steep to steep areas and in soils with low infiltration capacity. The erosion hazard is normally moderate to high.
	Very Rapid		Character				A very large part of the rainfall moves rapidly over the surface of the soil and a very small part moves through the soil profile. In this condition, water runs off as fast as it is added on the surface. Rapid runoff areas are

							observed normally in steep to very steep areas and in soils with low infiltration capacity. The erosion hazard is normally high or very high
21	**Drainage**	**d**	**Character**				Natural drainage class refers to the frequency and duration of wet periods under conditions similar to those under which the soil developed. Alteration of the water regime, either through drainage or irrigation, is not a consideration unless the alterations have significantly changed the morphology of the soil.
	Very poorly drained		Character				Similar to poorly drained soils except that the soils occur on level or depressed areas and are frequently ponded. The occurrence of internal free water is very shallow and persistent or permanent.
	poorly drained		Character				Water is removed so slowly that the soil is wet at shallow depths, sometimes for long periods. Water table is persistently shallow, such that most crops cannot be grown unless the soil is artificially drained.
	Somewhat		Character				The soil is wet at

	poorly drained						a shallow depth for significant periods during the growing season. Wetness restricts the growth of crops unless artificial drainage is provided. The soils commonly have a impervious layer, a high water table, additional water from seepage and/or nearly continuous rainfall.
	Moderately well drained		Character				Water is removed from the soil somewhat slowly. Soil is wet for only a short time within the rooting zone during the growing season, but long enough that most mesophytic crops are affected. These soils commonly have a slowly pervious layer within the upper one meter, periodically receive high rainfall, or both
	Well drained		Character				Water is removed from the soil readily but not rapidly. Water is available to plants throughout most of the growing season. Wetness does not inhibit growth of roots for most or all of the growing season.
	Somewhat Excessively drained		Character				Similar to excessively drained soils, but the water table may not be as deep and the soil may be slightly

							fine textured
	Excessively drained		Character				Water is removed from the soil very rapidly. Soil is commonly very coarse textured or rocky
22	**Ground Water Depth**	**GWD**	**Character**	**m**	**0**	**>10**	Indicate the depth of water table and seasonal fluctuations of the profile site area. The water table measurement can be taken from the nearest open or borewells or by enquiring with farmers of the area
	Shallow		Character	m		<1	Ground water depth is less than 1 m
	Moderately Shallow		Character	m	1	2	Ground water depth ranges from 1 to 2 m
	Moderately Deep		Character	m	2	5	Ground water depth ranges from 2 to 5 m
	Deep		Character	m	5	10	Ground water depth ranges from 5 to 10 m
	Very Deep		Character	m	>10		Ground water depth is greater than 10 m
23	**Flooding**		**Character**				Where ever records are available they can be collected and the frequency can be indicated and in other areas, it can be estimated based on the site characteristics and other converging evidences
	Nil	0	Character				
	Slight	1	Character				
	Moderate	2	Character				
	Severe	3	Character				
	Very Severe	4	Character				
24	**Salinity**	**Sal**	**Integer**	**ECe (dSm^{-1})**	**0**	**>50**	A non sodic soil containing an excess of soluble salt (EC >4 dSm^{-1}) that adversely

							affect plant growth and impair its productivity.
	Negligible	S0	Integer		1	2	Salinity ranges from 1 to 2 ECe(dSm^{-1})
	Slight	S1	Integer		2	4	Salinity ranges from 2 to 4 ECe(dSm^{-1})
	Moderate	S2	Integer		4	8	Salinity ranges from 4 to 8 ECe(dSm^{-1})
	Moderately Strong	S3	Integer		8	15	Salinity ranges from 8 to 15 ECe(dSm^{-1})
	Strong	S4	Integer		15	25	Salinity ranges from 15 to 25 ECe(dSm^{-1})
	Severe	S5	Integer		25	50	Salinity ranges from 25 to 50 ECe(dSm^{-1})
	Very Severe	S6	Integer		>50		Salinity is greater than 50 ECe(dSm^{-1})
25	**Sodicity**	**Sod**	**Float**	**Per cent**	**0**	**40**	A soil containing sufficient amount of exchangeable sodium that adversely affects crop production and soil structure under most conditions of soil and plant type.
	Negligible	N0	Float	Per cent	0	5	Sodicity ranges from 0 to 5%
	Slight	N1	Float	Per cent	5	15	Sodicity ranges from 5 to 15%
	Moderate	N2	Float	Per cent	15	25	Sodicity ranges from 15 to 25%
	Strong	N3	Float	Per cent	25	40	Sodicity ranges from 25 to 40%
	Severe	N4	Float	Per cent	>40		Sodicity is greater than 40%
26	**Surface Stoniness**		**Float**	**Per cent**	**0**	**>40**	The approximate amount of stones and boulders present at the surface has to be assessed separately and reported
	Slight		Float	Per cent	0	15	Stoniness ranges from 0 to 15 %
	Moderate		Float	Per cent	15	40	Stoniness ranges from 15 to 40 %
	Strong		Float	Per cent	>40		Stoniness is

							greater than 40%
	Stoniness		**Float**	**% Surf. cover**	**0**	**>75**	The approximate amount of stones and boulders present at the surface has to be assessed separately and reported
						<3	Stoniness is less than 3% surface cover
					3	15	Stoniness ranges from 3 to 15% surface cover
					15	40	Stoniness ranges from 15 to 40% surface cover
					40	75	Stoniness ranges from 40 to 75% surface cover
					>75		Stoniness is greater than 75% surface cover
27	**Rock Outcrops**			**M**	**<2**	**>90**	The distance (m) between the rock outcrops and their percentage coverage in the field is to be recorded.
					<2		No rocks or very few rocks to interfere with tillage
					2	10	Fairly rocky, sufficient to interfere with tillage but not to make inter-tilled crops impracticable. Exposures are roughly 35 to 100 m apart.
					10	25	Rocky, sufficient to interfere with tillage of inter-tilled crops impracticable. Exposures are roughly 10 to 35 m apart
					25	50	Very rocky, sufficient to make all use of machinery impracticable, except for light machinery. Exposures are roughly 3.5 to 10 m apart.
					50	90	Extremely rocky, sufficient rock outcrops to make

							all use of machinery impracticable. Exposures are about 3.5 m apart or less.
					>90		Rock outcrops
28	**Natural Vegetation**						The type of vegetation observed should be described first in simple terms, like evergreen, deciduous or shrub forests, grasslands, etc., and then their common names and their species names wherever possible. Generally, a close relationship exists between native vegetation and kinds of soil. The growth and stand (canopy) of native vegetation and cultivated crops will be of great help in recognizing soil boundaries. Even within a field, differences of vigour, stand, or colour of the crop or of weeds commonly mark soil differences and as such are valuable clues to the location of soil boundaries in the field to the surveyor.
29	**Crop Yield**		**Float**	**Kg\hect -are**			Crop yield is not only a measure of the yield of per unit area of land under cultivation, yield is also the seed generation of the plant itself
30	**Present Land Use**		**Character**				Indicate the name of the crop/crops (common names like bajra, ragi etc. are preferred)

							cultivated in the current season and wherever possible the crops cultivated in the previous season, if they are different from the present one. Also provide the approximate yield\ha and management level (low, medium or high) followed by the farmer for the major crops cultivated. If the crop is irrigated, indicate the method of irrigation and indicate the major and minor crops if it is a mixed one.
a)	Forest		Character				Forest is defined as an ecosystem or assemblage of ecosystems dominated by trees and other woody vegetation
	Forest with no canopy	F0	Character				
	Thin Forest sparse vegetation	F1	Character				
	Moderately densed forest and fully stocked	F2	Character				
	Densed forest fully stocked with top canopy	F3	Character				
b)	Cultivated		Character				Prepare and use land for crops or gardening
	Cultivated single crop	C1	Character				Prepare and use land for single crop
	Cultivated double crop	C2	Character				A form of multiple cropping in which two crops are grown on a field at different times of the year
	Cultivated	C3	Character				Growing 3 crops a

	triple crop						year in sequence
c)	Terraces		Character				A porch or walkway bordered by colonnades
	Poorly bunded	T1	Character				An outer wall or tank not well designed to retain the contents of an inner tank in the event of leakage or spillage
	Poorly terraced	T2	Character				A porch or walkway that is not well bordered by colonnades
	Benched terraced	T3	Character				Benched terraced are a series of level or virtually level strips running across the slope at vertical intervals supported by steep bank or risers
d)	Pasture land		Character				Land suitable for grazing
	Pasture and grazing land	P	Character				A field covered with grasses or herbage and suitable for grazing by livestock
	Hay Land	H	Character				These lands are also used for grazing
e)	Degraded culturable		Character				It is concept in which the value of the biophysical environment is affected by one or more combination of human induced processes acting upon the land
	Gullied and /or ravenous land	1	Character				The gullies are formed as a result of localized surface run-off affecting the friable unconsolidated material in the formation of perceptible channels resulting in undulating terrain. The

							gullies are the first stage of excessive land dissection followed by their networking which leads to the development of ravenous land.
	Undulating upland with or without scrub	2	Character				
	Surface waterlogged and marsh	3	Character				
	Salt affected land	4	Character				
	Shifting cultivation area	5	Character				
	Degraded forest land	6	Character				
	Degraded pastures/graz-ing land	7	Character				
	Degraded non-forest plantation land	8	Character				
	Strip lands	9	Character				
	Sands	10	Character				
	Mining industrial waste lands	11	Character				
f)	Degraded unculturable land		Character				
	Barren and rocky or stony waste or sheet rock area	A	Character				
	Steep sloping area	B	Character				
	Snow covered and/or glacial area	C	Character				
31	**Classification**		**Character**				It deals with the systematic categorization of soils based on distinguishing characteristics as well as criteria that dictate choices in use
32	**Phase**		**Character**				A sub-division of a soil series based on features that

							affect its use and management.
	Surface		Character				The outer face, outside or exterior boundary of a thing.
	Sub -stratum		Character				Any underlying layer
33	**Land Capability Class**		**Character**				A system of classifying the land according to its capability for practical land use (Klingebiel and Montogomery 1961).
		Class-I	Character				Few limitations restrict their use
		Class-II	Character				Moderate limitations reduce choice of plants or require moderate conservation practices
		Class-III	Character				Severe limitations reduce choice of plants or special conservation practices are required
		Class-IV	Character				Very severe limitations restrict choice of plants; special conservation practices are required.
		Class-V	Character				Not suited to cultivation ,little to no erosion hazard, but limitations that limit their use to pasture
		Class-VI	Character				Severe limitations that make them generally unsuitable for agriculture and limit their use to pasture and range
		Class-VII	Character				Very severe limitations make them unsuitable for cultivation and restrict their use.

		Class-VIII	Character				Unsuitable for any commercial plant production.
34	**Land Irrigability Class**		**Character**				To evaluate the suitability of the mapped soils for the sustained use under irrigation, for making such a kind of interpretation(of soil and land conditions) one is concerned with predicting the behavior of soils under greatly altered water regimes brought about by introducing irrigation (AISLUS, 1971)
		Class-I	Character				Suitable for irrigated agriculture
		Class-II	Character				Suitable for irrigated agriculture
		Class-III	Character				Suitable for irrigated agriculture
		Class-IV	Character				Not irrigable, except under special condition
		Class-V	Character				Undetermined Suitability for irrigation
		Class-VI	Character				Non irrigable
35	**Important Crops**		**Character**				
	Cereals		Character				A grain used for food such as wheat, oats or corn
	Oilseeds		Character				Any of several seeds that yield oil
	Cash Crops		Character				Cash crops consists of foods like tobacco, sugarcane
	Horticultural crops		Character				The crops mainly grown for their fruits
	Plantation crops		Character				Grown for their economic value

36	**Management Practices**		**Character**				
	Low		Character				Management practices by farmers/No inputs
	Medium		Character				
	High		Character				Optimum management /Recommended inputs
37	**Suitability Class**		**Character**				A set of classes for evaluating land suitability. The FAO system consist of three levels of classification suitable(S) or not suitable (N); degree of suitability.
	Suitable	S1	Character				Land having no significant limitations to sustained application of a given use or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level
	Moderately Suitable	S2	Character				Land having limitations which in aggregate are moderately severe for sustained application of a given use, the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on class

							S1 land
	Marginally Suitable	S3	Character				Land having limitations which in aggregate are severe for sustained application of a given use, will reduce productivity or benefits or increase required inputs, that this expenditure will be only marginally justified
	Actually unsuitable but potentially suitable	N1	Character				Land having limitations which may be surmountable in time but which cannot be corrected with existing knowledge at currently acceptable cost, the limitations are so severe as to preclude successful sustained use of the land in the given manner
	Actually and potentially unsuitable	N2	Character				Land having limitations which appear so severe as to preclude any possibilities of successful sustained use of the land in the given manner

3.2.2 Soil morphological parameters

Soil morphology refers to the inherent characteristics of the soils acquired during their evolution and retaining impress of one or several genetic factors. This comprises of the evaluation and description of the soil colour, texture, structure, consistence, presence or otherwise of pans, concretions and such other features of horizons of soil profiles as can be perceived in the field. Description of such and related characteristics necessitates standards terminology, notation and defined symbols to be followed by the field soil surveyors and recorded in the appropriate field sheets or field note books. The soil morphological parameters and their detailed description are shown in table 2.

Table 2: Soil morphological parameters and their description

S.No	Data Element Name	Short Name	Data Type	Unit Of Measure	Minimum value	Maximum Value	Description
1	**Horizon**	**H**	**Character**				Horizon development indicates the extent and degree of soil genesis. It varies widely from soil to soil. In the early stages of soil formation, horizon development may be weak.
	Organic Horizon	O	Character				This layer is dominated by organic material. They consist of undecomposed or partially decomposed litter, deposited on the surface of either mineral or organic soils. The O layer may be present on the surface of a mineral soil or at any depth beneath the surface, if it is buried. A horizon formed by illuviation of organic material into mineral subsoil is not considered as an O horizon.
	Mineral Horizon	A	Character				It is a mineral horizon formed at

							the surface or below O horizon. They exhibit obliteration of all or much of the original rock structure and show an accumulation of humified organic matter intimately mixed with the mineral fraction. This horizon is not dominated by properties of either E or B horizons or properties resulting from cultivation, pasturing, or similar kinds of disturbance.
	Mineral Horizon	E	Character				Mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these, leaving a concentration of sand and silt particles. These horizons exhibit obliteration of all or much of the original rock structure. This horizon is usually lighter in colour than B and A horizons. The organic matter is normally less than A horizon and occurs commonly near the surface (below O or A horizon and above B horizon).
	Mineral Horizon	B	Character				Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all or much of the original rock structure.
	Mineral Horizon	C	Character				Horizons or layers, excluding hard bedrock, that are little affected by pedogenic processes and lack properties of O, A, E, or B

							horizons. The material of C layers may be either like or unlike that from which the solum persumably formed. The C horizon may have been modified even if there is no evidence of pedogenesis.
	Bed Rock	R	Character				The R layer is sufficiently coherent when moist to make hand digging with a spade impractical, although it may be chipped or scrapped.
2	**Depth**	**D**	**Float**	**cm**	**0**	**>150**	Soil depth indicates the depth of the solum, which includes A and B horizons, occurring above the parent material or hard rock. Depth is measured from the soil surface.
	Extremely Shallow	D0	Float	cm	0	10	Soil depth ranging from 0 to 10 cm
	Very Shallow	D1	Float	cm	10	25	Soil depth ranging from 10 to 25 cm
	Shallow	D2	Float	cm	25	50	Soil depth ranging from 25 to 50 cm
	Slightly deep Shallow	D3	Float	cm	50	75	Soil depth ranging from 50 to 75 cm
	Moderately deep	D4	Float	cm	75	100	Soil depth ranging from 75to 100 cm
	Deep	D5	Float	cm	100	150	Soil depth ranging from 100 to 150 cm
	Very Deep	D6	Float	cm		>150	Soil depth > 150 cm
3	**Boundary**		**Character**				A transitional area or layer present between two adjoining horizons or layers is known as the boundary. Boundaries vary in **distinctness** (contrast) and in **topography**.

a)	Distinctness	D	Character				Distinctness is the distance through which one horizon grades into another. It refers to the thickness of the zone within which the boundary can be located. The distinctness depends on the degree of contrast between the layers and thickness of the transitional zone. Distinctness is defined in terms of thickness of the transitional zone
	Abrupt	a	Character	cm	0.5	<2	Boundary ranges from 0.5 to less than 2 cm
	Clear	c	Character	cm	2	<5	Boundary ranges from 2 to less than 5 cm
	Gradual	g	Character	cm	<5	15	Boundary ranges from less than 5 to 15 cm
	Diffuse	d	Character	cm	>15		Boundary is greater than 15 cm
b)	Topography	T	Character				Topography is the lateral undulation and continuity of the boundary between horizons. Topography refers to the irregularities of the surface that divides the horizons
	Smooth	s	Character				The boundary is a plane one with few or no irregularities
	Wavy	w	Character				The boundary has undulations in which depressions are wider than they are deep.
	Irregular	i	Character				The boundary has pockets that are deeper than they are wide
	Broken	b	Character				Discontinuous horizons ; discrete but intermingled , or irregular pockets
4	**Diagnostic Horizon**		**Character**				This column is to be filled after thorough examination of the soil profile. Identify

							the type of the diagnostic horizon present in the soil and their upper and lower boundaries
5	**Matrix Colour**		**Character**				Soil colours are measured in the field by comparing peds with Munsell colour chart. The notation is recorded in the form: hue, value and chroma.
	Dry	d	Character				
	Moist	m	Character				
	Rubbed	r	Character				
6	**Mottle Color**		**Character**				Mottle color refers to repetitive color changes that cannot be associated with compositional properties of the soil.
a)	***Abundance***	***A***	Character				
	Few	f	Character			<2	Few-Less than 2 % of exposed surface
	Common	c	Character		2	20	Common-2 to 20 % of exposed surface
	Many	m	Character		>20		Many-greater than 20 % of exposed surface
b)	***Size***	***S***	Character	mm			Size refers to dimensions as seen on a plane surface. If the length of a mottle is not more than 2 or 3 times the width, the dimension recorded is the greater of the two. If the mottle is long and narrow, as a band of colour at the periphery of a ped, the dimension recorded is the smaller of the two and the shape and location are also described.
	Fine	1	Character			<5	Fine – smaller than 5 mm.
	Medium	2	Character		5	15	Medium – 5 to 15 mm.
	Coarse	3	Character		>15		Coarse – larger than 15 mm.
c)	***Contrast***	***C***	Character				Contrast refers to the degree of visual

							distinction that is evident between associated colours.
	Faint	f	Character				Evident only an close examination, faint mottles commonly have the same hue as the colour to which they are compared and differ by no more than 1 unit of chroma or 2 units of value. Some faint mottle of similar but low chroma and value differ by 2-5 units of hue.
	Distinct	d	Character				Readily seen but contrast only moderately with the colour to which they are compared. Distinct mottles commonly have the same hue as the colour to which they are compared but differ by 2 to 4 units of chroma or 3 to 4 units of value, or differ from the color to which they are compared by 2.5 units (one card) of hue but by no more than 1 unit of chroma or 2 units of value.
	Prominent	p	Character				Contrast strongly with the colour to which they are compared. Prominent mottles are commonly the most obvious color feature of the section described. Prominent mottles that have medium chroma and value commonly differ from the color to which they are compared by the least 5 units of hue if chroma and value are the same at least 4 units of

							value or chroma if the hue is the same or at least 1 unit of chroma or 2 units of value if hue differs by 2.5 units.
7	**Texture**		**Character**				Soil texture refers to the relative proportion (per cent by weight) of sand, silt and clay present in a soil. Texture is estimated in the field by feel method or quantitatively measured in the laboratory by hydrometer or pipette method. Soil texture includes only the fine earth fraction (< 2 mm, like sand, silt and clay). The texture classes range from sand to clay and some of the commonly occurring texture
	sand	s	Character				More than 85 % sand , the percentage of silt plus 1.5 times the % of clay is not more than 15
	loamy sand	ls	Character				Between 70 and 91 % sand and the percentage of silt plus 1.5 times the percentage of clay is 15 or more, and the percentage of silt plus twice the percentage of clay is < 30
	sandy loam	sl	Character				7 to 20 % clay , > 52 % sand , and the percentage of silt plus twice the percentage of clay is 30 or more; or less than 7 % clay, < 50 % silt, and > 43 % sand
	loam	l	Character				7 to 27 % clay, 28 to 50 % silt and less than 52 % sand
	silt loam	sil	Character				50 % or more silt and 12 to 27 % clay,

							or 50 to 80 % silt and less than 12 % clay
	silt	si	Character				80 % or more silt and less than12 % clay
	sandy clay loam	scl	Character				20 to 35 % clay , less than 28 % silt, and 45 % or more sand
	clay loam	cl	Character				27 to 40 % clay and more than 20 to 46 % sand
	silty clay loam	sicl	Character				27 to 40 % clay and less than 20 % sand
	sandy clay	sc	Character				35 % or more clay and 45 % or more sand
	silty clay	sic	Character				40 % or more clay and 40 % or more silt
	clay	c	Character				40% or more clay, < 45% sand and < 40 % silt
8	**Coarse fragments**		**Character**	**Per-cent**			This refers to the presence of coarse fragments (>2 mm in size) on or near the soil surface. The classes used are pebbles, cobbles, stones and boulders. Gravel is a collection of pebbles that have diameters ranging from 2 to 75 mm. The size of the cobbles range from 23 75 to 250 mm (3 to 10 inches), stones from 250 to 600 mm (10 to 24 inches) and boulders above 600 mm (>24 inches). Assessment for the surface fragments is done separately for the gravel and for stones and boulders. Indicate the size of the fragments observed in the field.
	fine gravel	fg	Character			<2.5	The coarse fragments that have diameters less than 2.5 cm

	coarse gravel	cg	Character		2.5	7.5	The coarse fragments that have diameters ranging from 2.5 to 7.5 cm.
	stone	st	Character		7.5	25	The coarse fragments that have diameters ranging from 7.5 to 25 cm.
9	**Structure**		**Character**				The arrangement of primary soil particles into aggregates is known as structure in soils. The individual structural unit is called as ped.
	Size	***S***	Character	mm			The size limits of the classes differ according to shape of units.
					<1	>=10	Granular/palty
	Very fine	vf	Character				<1
	Fine	f	Character				1 to <2
	Medium	m	Character				2 to <5
	Coarse	c	Character				5 to <10
	Very coarse	vc	Character				>=10
					<5	>=50	Angular/sub angular
	Very fine	vf	Character				<5
	Fine	f	Character				5 to <10
	Medium	m	Character				10 to <20
	Coarse	c	Character				20 to 50
	Very coarse	vc	Character				>=50
					<10	100 to <500	Prismatic/columnar
	Very fine	vf	Character				<10
	Fine	f	Character				10 to <20
	Medium	m	Character				20 to <50
	Coarse	c	Character				50 to <100
	Very coarse	vc	Character				100 to <500
	Grade	***G***	Character				Degree of ped development in soil
	structure	0	Character				Has no observable

	less						aggregation or no definite orderly arrangement of natural lines of weakness such as massive structure or single grain structure
	boulder	b	Character			>25	The coarse fragments that have diameters more than 25 cm
	weak	1	Character				The units are barely observable in place. When gently disturbed, the soil material parts into a mixture of whole and broken units and most of the material that exhibit no planes of weakness. Differentiating structureless from weak structure is sometimes difficult.
	moderate	2	Character				The units are well formed and evident in undisturbed soil. When disturbed, the soil material parts into a mixture of mostly whole units, some broken units, and material that is not in units.
	strong	3	Character				The units are distinct in undisturbed soil. They separate when the soil is disturbed. When removed, the soil material separates mainly into whole units. Peds have distinctive surface properties
	Type	***T***	Character				
	granular	gr	Character				The units are approximately spherical or polyhedral and are bounded by curved or very irregular faces that are not casts of adjoining peds.

	crumb	cr	Character				Are individual particles of sand, silt and clay grouped together in small, nearly spherical grains. Water circulates very easily through such soils. They are commonly found in the A-Horizon of the soil profile.
	columnar	cpr	Character				The units are similar to prisms and are bounded by flat or slightly rounded vertical faces. The tops of columns are very distinct and normally rounded
	prismatic	pr	Character				Vertically elongated units with flat tops, the individual units are bounded by flat to rounded vertical faces
	platy	pl	Character				The units are flat and plate like and horizontally oriented
	angular blocky	abk	Character				The cubes have sharp edges and distinct rectangular faces
	sub angular blocky	sbk	Character				If the faces are a mixture of rounded and plane faces and corners are mostly rounded
	single grain	sg	Character				(non-coherent)where the individual soil particles show no tendency to cling together such as pure sand
	massive	m	Character				(coherent) where the entire soil horizon appears cemented in one great mars.
10	**Consistence**		**Character**				Soil consistence refers to the degree and kind of cohesion and adhesion and/or the resistance of soil to deformation or rupture when stress is applied.
	Dry	***D***	Character				

	loose	l	Character				Intact specimen not available
	soft	s	Character				Very slight force between fingers
	slightly hard	sh	Character				Slight force between fingers
	hard	h	Character				Strong force between fingers
	very hard	vh	Character				Moderate force between hands
	extremely hard	eh	Character				Foot pressure by full body weight
	Moist	***M***	Character				
	loose	l	Character				Intact specimen not available
	very friable	vfr	Character				Very slight force between fingers
	friable	fr	Character				Slight force between fingers
	firm	fi	Character				Moderate force between fingers
	very firm	vfi	Character				Strong force between fingers
	extremely firm	efi	Character				Moderate force between hands
	Wet	***W***	**Character**				
	non-sticky	so	Character				After release of pressure, practically no soil material adheres to fingers
	slightly sticky	ss	Character				Soil adheres to both fingers, after release of pressure. Soil stretches little on separation of fingers
	sticky	s	Character				Soil adheres to both fingers, after release of pressure. Soil stretches some on separation of fingers
	very sticky	vs	Character				Soil adheres firmly to both fingers, after release of pressure. Soil stretches greatly on separation of fingers.
	non-plastic	po	Character				Will not form a 6 mm diameter roll, or if formed, cannot support itself if held on end.
	slightly plastic	ps	Character				6 mm diameter roll supports itself, 4 mm diameter roll does not.
	plastic	p	Character				4 mm diameter roll supports itself, 2

							mm diameter roll does not.
	very plastic	vp	Character				2 mm diameter roll supports itself with its weight
11	**Porosity**		**Character**				Porosity is used to represent aeration, water storage capacity, plant wilting point and drainage
	Size	***S***	Character				
	very fine	vf	Character				
	fine	f	Character				
	medium	m	Character				
	coarse	c	Character				
	Quantity	***Q***	Character				
	few	f	Character				
	common	c	Character				
	many	m	Character				
12	**Cutans**		**Character**				Cutans are the coatings or deposits of material on the surface of peds, stones , etc.
	Type	***Ty***	Character				
	Argillan	T	Character				
	ferran	Fe	Character				
	Mangan	Mn	Character				
	Organ	o	Character				
	Thickness	***Th***	Character				
	thin	tn	Character				
	moderately thick	mtk	Character				
	thick	tk	Character				
	Quantity	***Q***	Character				
	patchy	p	Character				
	broken	b	Character				
	continuous	c	Character				
13	**Nodules**		**Character**				**Nodules** are cemented bodies of various shapes (commonly spherical or tubular) that can be removed as discrete units from soil. Crystal structure is not discernible with l0X hand lens.
	Size	***S***	Character				
	very fine	vf	Character				
	fine	f	Character				
	medium	m	Character				
	coarse	c	Character				
	Quantity	***Q***	Character				
	few	f	Character				
	common	c	Character				

	many	m	Character				
14	**Roots**		**Character**				Quantity, size, and location of roots in each layer are to be recorded in the proforma. Any other features like root length, nodulation, and the relationships to special soil attributes or to structure may be recorded as notes in the field book.
	Size	***S***	Character	mm			
	very fine	vf	Character			<1	Roots size is less than 1 mm
	fine	f	Character		1	2	Roots size ranges from 1 to 2 mm
	medium	m	Character		2	5	Roots size ranges from 2 to 5 mm
	coarse	c	Character		5	10	Roots size ranges from 5 to 10 mm
	Quantity	***Q***	Character	Per unit area			Quantity of roots is described in terms of numbers of each size per unit area.
	few	f	Character			<1	
	common	c	Character		1	5	
	many	m	Character		>5		
15	**Effervescence(with dilute HCL)**		**Character**				The gaseous response (seen as bubbles) of soil to applied HCl (carbonate test), H_2O_2 (MnO2 test), or other chemicals. Normally, cold dilute (about 1:10 dilution) hydrochloric acid is used to test the presence of carbonates in the field.
	slight effervescence	e	Character				bubbles readily seen
	Strong effervescence	es	Character				bubbles form low foam
	violent effervescence	ev	Character				thick foam forms quickly
16	**Other Features (slickensides/ Pressure face, etc.)**		**Character**				**Presence of Animals** Mixing, changing and moving of soil material by animals affect some properties of soils.

							The features seen on the land surface may be described, like the presence of Termite mounds, ant hills, heaps of excavated earth beside burrows, the openings of burrows, paths, feeding grounds, earthworm or other castings, and other traces on the surface as special notes or in the proforma. The features produced by animals in the soil are described by using common words. **Krotovinas** - They are irregular tubular streaks within one layer of material transported from another layer. They are caused by the filling of tunnels made by burrowing animals in one layer with material from outside the layer. In a profile, they appear as rounded or elliptical volumes of various sizes. **Stone line -** A natural concentration of rock fragments caused by fluvial action or other transport agents, if present in the soil is to identified and described. It may be quartz or other types and the depth of its occurrence can be noted. **Tongues of argillic material,** seen in some soils needs to describe.
17	**Sample Bag No**						
11	**Soil**		**Character**				It is the practice of

	Taxonomy						describing, categorizing and naming soils
	Soil Orders						
	Alfisols	alf	Character				Alfisols are base rich, mineral soils of sub humid and humid regions. These are characterized by a light-colored surface horizon over a clay enriched argillic sub surface horizon that is rich in exchangeable cations with base saturation of more than 35 per cent alfisols are more strongly weathered than the Inceptisols but less so than the Ultisols
	Aridisols	ids	Character				These are mineral soils of dry places (arid and semi-arid) and of areas having high ground water table. The soils remain dry for most part of the year and salts accumulate as the surface and/or in the solum, resulting in the development of a salic, gypsic or calcic horizon
	Andisols	and	Character				These soils are developed on volcanic ash and are typically dark coloured, low bulk density soils that do not have an albic horizon but must have andic properties
	Entisols	ent	Character				These are very recently developed mineral soils with no diagnostic horizon other than

							an Ochric or anthropic epidon. The main feature of Entisols is a slight degree of soil formation because of either limiting time or exceeding unfavourable conditions
	Oxisols	ox	Character				These are strongly and deeply weathered mineral soils of the humid tropics that are poor in fertility. These are characterized by a uniform profile having negligible amounts of weatherable minerals and are dominated by kaolinitic and sesquioxsides rich deep sub surface horizon
	Spodosols	ods	Character				These are mineral soils with accumulation of sesquioxides and humus in the sub surface horizons. These develop under cool, humid climate and coarse texture siliceous parent material which favours free leaching conditions. These are sparesely formed in hot humid tropical and in warm humid regions where the parent material is sandy and ground water fluctuates
	Inceptisols	ept	Character				These soils represent early stage in a soil formation which is beyond that of Entisol but

							still short of the degree of development as observed in Alfisols are Inceptisols. They may have some accumulation of clay in sub-surface horizon but it is not sufficient enough to quality for an argillic horizon, which is diagnostic for Alfisols and Ultisols
	Vertisols	ert	Character				These are uniform, thick tropical black and other dark colored cracking clay mineral soil that have high content of clay. These soils swell on wetting and shrink on drying and develop wide, deep cracks associated with gilgai micro-relief or slickensides close enough to intersect.
	Ultisols	ult	Character				The Ultisols are comparable with Alfisols, except for having low base saturation on the exchange complex which is due to their advanced stage of weathereing. These are base poor, mineral soils of humid region developed under high rainfall and forest vegetation
	Mollisols	oll	Character				These are soils of grassland vegetation under sub-humid to humid environment. They have a dark coloured, well

							developed, base rich, well structured surface horizon that is rich in organic matter.
	Gelisols	el	Character				Gelisols are conceptually the soils with gelic materials underlain by permafrost. Diagnostic horizon may or may not be present in Gelisols as thawing and freezing play an important role in their evolution
	Histosols	ist	Character				A soil without permafrost is classified as histosols if half or more of the upper 80 cm is organic.

3.2.3 Soil physical parameters

Field study of soils, as they occur in different horizons forming a profile, involves detailed characterization of the various physical properties that can be suitably assessed. This properties include Horizon, Depth, Particle size Class, Bulk-Density, Saturated Hydraulic conductivity, Moisture Retention. While some of these characters like structure and consistence can be only descriptive though specifically indicative of certain conditions, it is quite possible to describe quantitavely others like soil color, texture, pH, etc., though determination carried out in the field. The soil physical parameters and their detailed description are shown in table 3.

Table 3: Soil physical parameters and their description

S.No.	Data Element Name	Short Name	Data Type	Unit Of Measure	Minimum value	Maximum Value	Description
1	**Horizon**	**H**	**Character**				Horizon development indicates the extent and degree of soil genesis. It varies widely from soil to soil. In the early stages of soil formation, horizon development may be weak.
	Organic Material	O	Character				This layer is dominated by organic material. They consist of undecomposed or partially decomposed litter, deposited on the surface of either mineral or organic soils. The O layer may be present on the surface of a mineral soil or at any depth beneath the surface, if it is buried. A horizon formed by illuviation of organic material into mineral subsoil is not considered as an O horizon.
	Mineral Horizon	A	Character				It is a mineral horizon formed at

							the surface or below O horizon. They exhibit obliteration of all or much of the original rock structure and show an accumulation of humified organic matter intimately mixed with the mineral fraction. This horizon is not dominated by properties of either E or B horizons or properties resulting from cultivation, pasturing, or similar kinds of disturbance.
	Mineral Horizon	E	Character				Mineral horizon in which the main feature is loss of silicate clay, iron, aluminium, or some combination of these, leaving a concentration of sand and silt particles. These horizons exhibit obliteration of all or much of the original rock structure. This horizon is usually lighter in colour than B and A horizons. The organic matter is normally less than A horizon and occurs commonly near the surface (below O or A horizon and above B horizon).
	Mineral Horizon	B	Character				Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all or much of the original rock structure.
	Mineral Horizon	C	Character				Horizons or layers, excluding hard bedrock, that are

							little affected by pedogenic processes and lack properties of O, A, E, or B horizons. The material of C layers may be either like or unlike that from which the solum persumably formed. The C horizon may have been modified even if there is no evidence of pedogenesis.
	Bed Rock	R	Character				The R layer is sufficiently coherent when moist to make hand digging with a spade impractical, although it may be chipped or scrapped.
2	**Depth**	**D**	**Integer**	**cm**			Soil depth indicates the depth of the solum, which includes A and B horizons, occurring above the parent material or hard rock. Depth is measured from the soil surface.
	Extremely Shallow		Integer	cm	0	10	Soil depth ranging from 0 to 10 cm
	Very Shallow		Integer	cm	10	25	Soil depth ranging from 10 to 25 cm
	Shallow		Integer	cm	25	50	Soil depth ranging from 25 to 50 cm
	Slightly deep		Integer	cm	50	75	Soil depth ranging from 50 to 75 cm
	Moderately deep		Integer	cm	75	100	Soil depth ranging from 75to 100 cm
	Deep		Integer	cm	100	150	Soil depth ranging from 100 to 150 cm
	Very Deep		Integer	cm		>150	Soil depth > 150 cm
3	**Particle size Class**	**PSD**	**Float**	**Percent**			Particle size classes are used only for the family names of terric sub groups of Histosols and Histels. The classes are determined from the properties of the mineral soil materials in the control section

							through use of the key to particle-size classes. The classes are more generalized than those for soils in other orders.
	Fragmental	G	Float	Percent			A fine earth component of less than 10 per cent (including associated medium and finer pores) of the total volume.
	Sandy skeletal	Z	Float	Percent			A texture (of the fine earth) of sand or loamy sand, including less than 50 percent (by weight)very fine sand in the fine earth fraction
	Loamy skeletal	K	Float	Percent			Less than 35 percent clay in the fine-earth fraction and a content of rock fragments of 35 percent or more of the total volume
	Sandy	S					The texture of the fine earth includes sands and loamy sands , exclusive of loamy very fine sand and very fine sand textures; particle >2 mm occupy less than 35%(by volume).
	Clayey Skeletal	P	Float	Percent			A content of rock fragments of 35 percent or more of the total volume
	Loamy	L	Float	Percent			7 to 27 % clay, 28 to 50 % silt and 52 % or less sand
	Coarse loamy	R	Float	Percent			A loamy particle size that has 15% or more (by weight)of fine sand(0.25-0.1 mm) or coarser particles, including fragments up to 75 mm, and has less than 18%(by weight) clay in the fine earth fraction

	Fine Loamy	M	Float	Percent			A loamy particle size that has less than 15% (by weight) of fine sand (0.025-0.1mm) including fragments up to 75 mm, and has less than 18-35%(by weight) clay in the fine earth fraction
	Coarse silty	T	Float	Percent			A loamy particle size that has 15% or more (by weight)of fine sand(0.25-0.1 mm) or coarser particles, including fragments up to 75 mm, and has less than 18%(by weight) clay in the fine earth fraction
	Silty	Y	Float	Percent			80 % or more silt and less than12 % clay
	Clayey	C	Float	Percent			A clay content of 35 percent or more in the fine- earth fraction.
	Fine	F	Float	Percent			A clayey particle size that has 35-60% (by weight) clay in the fine earth fraction.
	Very Fine	V	Float	Percent			A clayey particle size that has 60% or more (by weight) clay in the fine earth fraction.
4	**Bulk-Density**	**Bd**	**Float**	**Mg/m^3**	**1.1**	**2.0**	It is defined as the mass per unit volume of total soil including both soil solids and pores expressed on oven dry basis.
5	**Saturated Hydraulic Conductivity**	**sHC**	**Float**	**cm h^{-1}**			It is a quantative measure of saturated soils ability to transmit water when subjected to hydraulic gradient
6	**Texture**		Character				Soil texture refers to the relative proportion (per cent by weight) of sand, silt and clay

							present in a soil.
	sand	s	Character				More than 85 % sand , the percentage of silt plus 1.5 times the % of clay is less than 15
	loamy sand	ls	Character				Between 70 and 91 % sand and the percentage of silt plus 1.5 times the percentage of clay is 15 or more, and the percentage of silt plus twice the percentage of clay is < 30
	sandy loam	sl	Character				7 to 20 % clay , > 52 % sand , and the percentage of silt plus twice the percentage of clay is 30 or more; or less than 7 % clay, < 50 % silt, and > 43 % sand
	loam	l	Character				7 to 27 % clay, 28 to 50 % silt and 52 % or less sand
	silty loam	sil	Character				50 % or more silt and 12 to 27 % clay, or 50 to 80 % silt and less than 12 % clay
	silt	sl	Character				80 % or more silt and less than12 % clay
	sandy clay loam	scl	Character				20 to 35 % clay , less than 28 % silt, and more than 45 % sand
	clay loam	cl	Character				27 to 40 % clay and more than 20 to 46 % sand
	silty clay loam	sicl	Character				27 to 40 % clay and 20 % or less sand
	sandy clay	sc	Character				35 % or more clay and 45 % or more sand
	silty clay	sic	Character				40 % or more clay and 40 % or more silt
	clay	c	Character				40% or more clay, 45% or more sand, and < 40 % silt
7	**Moisture Retention**		**Float**	**Percent**	**33**		At 33kPa suction, the water content in the draining zone will subsequently

							change only slowly & the soil is said to be as field capacity. Field capacity has been defined at the amount of water, expressed as percent of oven dry soil, held in a soil as soon as the excess of gravitational water has drained away & the rate of downward movement of water has materially decreased.
8	**Moisture Retention**		**Float**	**Percent**	**1500**		Water held at these tensions in pore is available water. This is the amount of soil water on which plant life depends.
9	**Available water Capacity**	**AWC**	**Integer**	**mm**			It is the capacity of soil to hold the moisture between field capacity and wilting coefficient i.e. between (1/3 atmosphere-0.3 bar) to 15 atmosphere.
10	**Water Holding Capacity**	**WHC**	**Integer**	**mm**			Water Holding Capacity of soil is its ability to hold water against the force of gravity or Water Holding Capacity is water retained by the soil after it has been saturated & allowed to drain for 12 to 48 hrs. This assumes that drainage will be negligible after this time

3.2.4 Soil chemical parameters

Field study of soils, as they occur in different horizons forming a profile, involves detailed characterization of the various chemical properties that can be suitably assessed. These properties include Soil reaction (pH), Salinity, Sodicity, Organic Carbon, Electrical Conductivity. The soil physical parameters and their detailed description are shown in table 4.

Table 4: Soil chemical parameters and their description

S.No	Data Element Name	Short Name	Data Type	Unit Of Measure	Minimum value	Maximum Value	Description
1	**Horizon**	**H**	**Character**				Horizon development indicates the extent and degree of soil genesis. It varies widely from soil to soil. In the early stages of soil formation, horizon development may be weak.
	Organic Material	O	Character				This layer is dominated by organic material. They consist of undecomposed or partially decomposed litter, deposited on the surface of either mineral or organic soils. The O layer may be present on the surface of a mineral soil or at any depth beneath the surface, if it is buried. A horizon formed by illuviation of organic material into mineral subsoil is not considered as an O horizon.
	Mineral Horizon	A	Character				It is a mineral horizon formed at the surface or

							below O horizon. They exhibit obliteration of all or much of the original rock structure and show an accumulation of humified organic matter intimately mixed with the mineral fraction. This horizon is not dominated by properties of either E or B horizons or properties resulting from cultivation, pasturing, or similar kinds of disturbance.
	Mineral Horizon	E	Character				Mineral horizon in which the main feature is loss of silicate clay, iron, aluminium, or some combination of these, leaving a concentration of sand and silt particles. These horizons exhibit obliteration of all or much of the original rock structure. This horizon is usually lighter in colour than B and A horizons. The organic matter is normally less than A horizon and occurs commonly near the surface (below O or A horizon and above B horizon).
	Mineral Horizon	B	Character				Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all

							or much of the original rock structure.
	Mineral Horizon	C	Character				Horizons or layers, excluding hard bedrock, that are little affected by pedogenic processes and lack properties of O, A, E, or B horizons. The material of C layers may be either like or unlike that from which the solum persumably formed. The C horizon may have been modified even if there is no evidence of pedogenesis.
	Bed Rock	R	Character				The R layer is sufficiently coherent when moist to make hand digging with a spade impractical, although it may be chipped or scrapped. Granite, gniess, quartzite, sandstone, indurated limestone etc are some examples of the bedrock seen in the profile and are designated as R.
2	**Depth**	**D**	**Integer**	**cm**			Soil depth indicates the depth of the solum, which includes A and B horizons, occurring above the parent material or hard rock. Depth is measured from the soil surface.
	Extremely Shallow		Integer	cm	0	10	Soil depth ranging from 0 to

							10 cm
	Very Shallow		Integer	cm	10	25	Soil depth ranging from 10 to 25 cm
	Shallow		Integer	cm	25	50	Soil depth ranging from 25 to 50 cm
	Slightly deep		Integer	cm	50	75	Soil depth ranging from 50 to 75 cm
	Moderately deep		Integer	cm	75	100	Soil depth ranging from 75to 100 cm
	Deep		Integer	cm	100	150	Soil depth ranging from 100 to 150 cm
	Very Deep		Integer	cm		>150	Soil depth > 150 cm
3	**Soil reaction (pH)**	**pH**	**Float**	**-----**	**0**	**14**	Both colorimetric and electrometric methods are used for measuring pH. It is the negative logarithm of hydrogen iron concentration.
	Strongly acidic		Float		4	4.5	pH ranges from 4 to 4.5
	Moderately acidic		Float		4.5	5.5	pH ranges from 4.5 to 5.5
	Slightly acidic		Float		5.5	6.5	pH ranges from 5.5 to 6.5
	Neutral		Float		6.5	7.5	pH ranges from 6.5 to 7.5
	Slightly alkaline		Float		7.5	8.5	pH ranges from 7.5 to 8.5
	Moderately alkaline		Float		8.5	9.5	pH ranges from 8.5 to 9.5
	Strongly alkaline		Float			>9.5	pH is greater than 9.5
4	**Salinity**		**Integer**	**ECe(dSm^{-1})**	**0**	**>50**	A non sodic soil containing an excess of soluble salt (EC >4 dSm^{-1}) that adversely affect plant growth and impair its productivity.
	Negligible	S0	Integer	ECe(dSm^{-1})	1	2	Salinity ranges from 1 to 2 ECe(dSm^{-1})
	Slight	S1	Integer	ECe(dSm^{-1})	2	4	Salinity ranges from 2 to 4 ECe(dSm^{-1})
	Moderate	S2	Integer	ECe(dSm^{-1})	4	8	Salinity ranges from 4 to 8

							ECe(dSm^{-1})
	Moderately Strong	S3	Integer	ECe(dSm^{-1})	8	15	Salinity ranges from 8 to 15 ECe(dSm^{-1})
	Strong	S4	Integer	ECe(dSm^{-1})	15	25	Salinity ranges from 15 to 25 ECe(dSm^{-1})
	Severe	S5	Integer	ECe(dSm^{-1})	25	50	Salinity ranges from 25 to 50 ECe(dSm^{-1})
	Very Severe	S6	Integer	ECe(dSm^{-1})		>50	Salinity is greater than 50 ECe(dSm^{-1})
5	**Sodicity**		**Integer**	**Per cent**	**0**	**40**	A soil containing sufficient amount of exchangeable sodium that adversely affects crop production and soil structure under most conditions of soil and plant type.
	Negligible	N0	Integer	Per cent	0	5	Sodicity ranges from 0 to 5%
	Slight	N1	Integer	Per cent	5	15	Sodicity ranges from 5 to 15%
	Moderate	N2	Integer	Per cent	15	25	Sodicity ranges from 15 to 25%
	Strong	N3	Integer	Per cent	25	40	Sodicity ranges from 25 to 40%
	Severe	N4	Integer	Per cent		>40	Sodicity is greater than 40%
6	**Electrical Conductivity**	**EC**	**Float**	**dSm^{-1}**	**0**	**1000**	It is a measure of the concentration of water soluble salts in soils.
7	**Organic Carbon**	**OC**	**Float**	**Per cent**	**0**	**100**	Carbon held within the soil, primarily in association with its organic content
8	**Calcium carbonate**	**$CaCo_3$**	**Float**	**Per cent**	**0**	**100**	Calcium carbonate is defined as the total carbonates which is contained in 100g of dry soil
9	**Base saturation Percent**	**BS**	**Integer**	**Per cent**	**0**	**100**	It refers to a measurement or estimate of the percent of the soil CEC that is occupied by a particular nutrient or the

							sum of a group of nutrients
10	**Extractable Cations**		**Integer**	**cmol(P^+) kg^{-1}**	**0**	**100**	It is a measure of the number of negatively charged sites in the soil, expressed as milli-equivallents per 100gms of soil
	Calcium	Ca	Integer	cmol(P^+) kg^{-1}			A white metallic element that burns with a brilliant light
	Magnesium	Mg	Integer	cmol(P^+) kg^{-1}			A chemical element with atomic number 12 and common oxidation number +2.It is an alkaline earth metal and the eighth most abundant element
	Sodium	Na	Integer	cmol(P^+) kg^{-1}			The chemical element of atomic number 11,a soft silver-white reactive metal of the alkali metal group
	Potassium	K	Integer	cmol(P^+) kg^{-1}			The chemical element of atomic number 19,a soft, silvery white reactive metal of the alkali metal group
11	**Sum Of Cations**		**Integer**	**cmol(P^+)kg^{-1}**	**0**	**100**	It is the sum of exchangeable calcium, magnesium, potassium and sodium ions in the soil.
12	**Exchangeable Sodium Percentage**	**ESP**	**Integer**	**Per cent**	**0**	**100**	The degree of saturation of the soil exchange complex with sodium
13	**Cation Exchange Capacity**	**CEC**	**Integer**	**cmol(P^+)kg^{-1}**	**0**	**100**	It is a calculated value that is an estimate of the soils ability to attract, retain and exchange cation elements

	Calcium	Ca	Integer	cmol(P^+) kg^{-1}			A white metallic element that burns with a brilliant light
	Magnesium	Mg	Integer	cmol(P^+) kg^{-1}			A chemical element with atomic number 12 and common oxidation number +2.It is an alkaline earth metal and the eighth most abundant element
	Sodium	Na	Integer	cmol(P^+) kg^{-1}			The chemical element of atomic number 11,a soft silver-white reactive metal of the alkali metal group
	Potassium	K	Integer	cmol(P^+) kg^{-1}			The chemical element of atomic number 19,a soft, silvery white reactive metal of the alkali metal group
	Aluminium	Al	Integer	cmol(P^+) kg^{-1}			A silvery ductile metallic element found primarily in bauxite
	Hydrogen	H	Integer	cmol(P^+) kg^{-1}			It is the chemical element with atomic number 1.
14	**Extractable Nutrients**		**Float**	**ppm**	**0**	**100**	It is the determination of extracted constituents by analytical process
	Nitrogen (Primary nutrients)	N	Float	ppm			The chemical element if atomic number 7,a colorless, odourless unreactive gas that forms about 78% of the earth's atmosphere
	Phosporous (Primary nutrients)	P	Float	ppm			A multivalent non metallic element of the nitrogen family that occurs commonly in inorganic phosphate rocks

							and as organic phosphates in all living cells
	Potassium (Primary nutrients)	K	Float	ppm			The chemical element of atomic number 19, a soft, silvery white reactive metal of the alkali metal group
	Sulphur (Secondary nutrients)	S	Float	ppm			It is the chemical element with atomic number 16 and an abundant, multivalent non-metal
	Calcium (Secondary nutrients)	Ca	Float	ppm			A white metallic element that burns with a brilliant light; the fifth most abundant element in the earth's crust
	Magnesium (Secondary nutrients)	Mg	Float	ppm			A chemical element with atomic number 12 and common oxidation number +2. It is an alkaline earth metal and the eighth most abundant element.
	Boron (Micronutrient anion)	B	Float	ppm			The chemical element of atomic number 5, a non metallic solid.
	Manganese (Micronutrient cations)	Mn	Float	ppm			The chemical element of atomic number 25, a hard grey metal that is an component of special steels and magnetic alloys
	Zinc (Micronutrient cations)	Zn	Float	ppm			It is a metallic chemical element with atomic number 30
	Iron (Micronutrient cations)	Fe	Float	ppm			A strong, hard, magnetic, silvery-grey metal
	Copper (Micronutrient cations)	Cu	Float	ppm			A red-brown metal, the chemical element of atomic number 29

4. Summary

The data content standards for soils have been studied and compiled for NSDI based on the available information from various sources. The efforts has been made to find out the necessary data elements pertaining to soil resource database for the Indian scenario/organizations in generation of geospatial soil resource database. The generated data content standards for soils will enable to move forward for effective geospatial database management at the respective organizations and development of metadata for NSDI.

References

AISLUS, (1971). All India Soil and Land Use Survey, Soil Survey Manual, Indian Agricultural Research Institute (IARI) Publ. New Delhi.

Klingebiel, A.A. and Montogomery, P.H. (1961). Land capability classification, U.S. Dept. Agricultural Handbook No.210.

Natarajan, A and Sarkar, D. (2009). Field Guide for Soil Survey, NBSS&LUP, Nagpur, pp 1-71.

Sehgel, J.L. (1990). Soil Resource Mapping of different states of India- Why and How, Soil Bull. 23, NBSS Publ. Nagpur India.

Soil Survey Staff (2010). Keys to soil taxonomy. 11th edn, Washington, DC: United States Department of Agriculture. Nat. Res. Conserv. Service, p. 338

Annexure-I

Soil Taxonomy (Soil Orders, Sub Orders, Great Groups and Sub Groups)

Sr.No	Orders	Sub Orders	Great Groups	Sub Groups
1	Alfisols	Aqualfs	Albaqualfs	Arenic Albaqualfs
				Aeric Vertic Albaqualfs
				Chromic Vertic Albaqualfs
				Vertic Albaqualfs
				Udollic Albaqualfs
				Aeric Albaqualfs
				Aquandic Albaqualfs
				Mollic Albaqualfs
				Umbric Albaqualfs
				Typic Albaqualfs
			Cryaqualfs	Typic Cryaqualfs
			Duraqualfs	Typic Duraqualfs
			Endoaqualfs	Aquandic Endoaqualfs
				Chromic Vertic Endoaqualfs
				Vertic Endoaqualfs
				Aeric Fragic Endoaqualfs
				Fragic Endoaqualfs
				Arenic Endoaqualfs
				Grossarenic Endoaqualfs
				Udollic Endoaqualfs
				Aeric Umbric Endoaqualfs
				Aeric Endoaqualfs
				Mollic Endoaqualfs
				Umbric Endoaqualfs
				Typic Endoaqualfs
			Epiaqualfs	Aeric Chromic Vertic Epiaqualfs
				Aeric Vertic Epiaqualfs
				Chromic Vertic Epiaqualfs
				Vertic Epiaqualfs
				Aquandic Epiaqualfs
				Aeric Fragic Epiaqualfs
				Fragic Epiaqualfs
				Arenic Epiaqualfs
				Grossarenic Epiaqualfs
				Aeric Umbric Epiaqualfs
				Udollic Epiaqualfs
				Aeric Epiaqualfs
				Mollic Epiaqualfs
				Umbric Epiaqualfs
				Typic Epiaqualfs
			Fragiaqualfs	Vermic Fragiaqualfs
				Aeric Fragiaqualfs
				Plinthic Fragiaqualfs
				Humic Fragiaqualfs
				Typic Fragiaqualfs
			Glossaqualfs	Histic Glossaqualfs
				Arenic Glossaqualfs
				Aeric Fragic Glossaqualfs
				Fragic Glossaqualfs

				Aeric Glossaqualfs
				Mollic Glossaqualfs
				Typic Glossaqualfs
			Kandiaqualfs	Arenic Kandiaqualfs
				Grossarenic Kandiaqualfs
				Plinthic Kandiaqualfs
				Aeric Umbric Kandiaqualfs
				Aeric Kandiaqualfs
				Umbric Kandiaqualfs
				Typic Kandiaqualfs
			Natraqualfs	Vertic Natraqualfs
				Vermic Natraqualfs
				Albic Glossic Natraqualfs
				Albic Natraqualfs
				Glossic Natraqualfs
				Mollic Natraqualfs
				Typic Natraqualfs
			Plinthaqualfs	Typic Plinthaqualfs
			Vermaqualfs	Natric Vermaqualfs
				Typic Vermaqualfs
		Cryalfs	Glossocryalfs	Lithic Glossocryalfs
				Vertic Glossocryalfs
				Andic Glossocryalfs
				Vitrandic Glossocryalfs
				Aquic Glossocryalfs
				Oxyaquic Glossocryalfs
				Fragic Glossocryalfs
				Xerollic Glossocryalfs
				Umbric Xeric Glossocryalfs
				Ustollic Glossocryalfs
				Xeric Glossocryalfs
				Ustic Glossocryalfs
				Mollic Glossocryalfs
				Umbric Glossocryalfs
				Eutric Glossocryalfs
				Typic Glossocryalfs
			Haplocryalfs	Lithic Haplocryalfs
				Vertic Haplocryalfs
				Andic Haplocryalfs
				Vitrandic Haplocryalfs
				Aquic Haplocryalfs
				Oxyaquic Haplocryalfs
				Lamellic Haplocryalfs
				Psammentic Haplocryalfs
				Inceptic Haplocryalfs
				Xerollic Haplocryalfs
				Umbric Xeric Haplocryalfs
				Ustollic Haplocryalfs

				Xeric Haplocryalfs
				Ustic Haplocryalfs
				Mollic Haplocryalfs
				Umbric Haplocryalfs
				Eutric Haplocryalfs
				Typic Haplocryalfs
			Palecryalfs	Andic Palecryalfs
				Vitrandic Palecryalf
				Aquic Palecryalfs
				Oxyaquic Palecryalfs
				Xeric Palecryalfs
				Ustic Palecryalfs
				Mollic Palecryalfs
				Umbric Palecryalfs
				Typic Palecryalfs
		Udalfs	Ferrudalfs	Aquic Ferrudalfs
				Typic Ferrudalfs
			Fragiudalfs	Andic Fragiudalfs
				Vitrandic Fragiudalfs
				Aquic Fragiudalfs
				Oxyaquic Fragiudalfs
				Typic Fragiudalfs
			Fraglossudalfs	Andic Fraglossudalfs
				Vitrandic Fraglossudalfs
				Aquic Fraglossudalfs
				Oxyaquic Fraglossudalfs
				Typic Fraglossudalfs
			Glossudalfs	Aquertic Glossudalfs
				Oxyaquic Vertic Glossudalfs
				Vertic Glossudalfs
				Aquandic Glossudalfs
				Andic Glossudalfs
				Vitrandic Glossudalfs
				Fragiaquic Glossudalfs
				Aquic Arenic Glossudalfs
				Aquic Glossudalfs
				Arenic Oxyaquic Glossudalfs
				Oxyaquic Glossudalfs
				Fragic Glossudalfs
				Arenic Glossudalfs
				Haplic Glossudalfs
				Typic Glossudalfs
			Hapludalfs	Lithic Hapludalfs
				Aquertic Chromic
				HapludalfsAquertic Hapludalfs
				Oxyaquic Vertic Hapludalfs
				Chromic Vertic Hapludalfs
				Vertic Hapludalfs

				Andic Hapludalfs
				Vitrandic Hapludalfs
				Fragiaquic Hapludalfs
				Fragic Oxyaquic Hapludalfs
				Aquic Arenic Hapludalfs
				Arenic Oxyaquic Hapludalfs
				Anthraquic Hapludalfs
				Albaquultic Hapludalfs
				Albaquic Hapludalfs
				Glossaquic Hapludalfs
				Aquultic Hapludalfs
				Aquollic Hapludalfs
				Aquic Hapludalfs
				Mollic Oxyaquic Hapludalfs
				Oxyaquic Hapludalfs
				Fragic Hapludalfs
				Lamellic Hapludalfs
				Psammentic Hapludalfs
				Arenic Hapludalfs
				Glossic Hapludalfs
				Inceptic Hapludalfs
				Ultic Hapludalfs
				Mollic Hapludalfs
				Typic Hapludalfs
			Kandiudalfs	Plinthaquic Kandiudalfs
				Aquic Kandiudalfs
				Oxyaquic Kandiudalfs
				Arenic Plinthic Kandiudalfs
				Grossarenic Plinthic Kandiudalfs
				Arenic Kandiudalfs
				Grossarenic Kandiudalfs
				Plinthic Kandiudalfs
				Rhodic Kandiudalfs
				Mollic Kandiudalfs
				Typic Kandiudalfs
			Kanhapludalfs	Lithic Kanhapludalfs
				Aquic Kanhapludalfs
				Oxyaquic Kanhapludalfs
				Rhodic Kanhapludalfs
				Typic Kanhapludalfs
			Natrudalfs	Vertic Natrudalfs
				Glossaquic Natrudalfs
				Aquic Natrudalfs
				Typic Natrudalfs
			Paleudalfs	Vertic Paleudalfs
				Andic Paleudalfs
				Vitrandic Paleudalfs
				Anthraquic Paleudalfs
				Fragiaquic Paleudalfs

				Plinthaquic Paleudalfs
				Glossaquic Paleudalfs
				Albaquic Paleudalfs
				Aquic Paleudalfs
				Oxyaquic Paleudalfs
				Fragic Paleudalfs
				Arenic Plinthic Paleudalfs
				Grossarenic Plinthic Paleudalfs
				Lamellic Paleudalfs
				Psammentic Paleudalfs
				Arenic Paleudalfs
				Grossarenic Paleudalfs
				Plinthic Paleudalfs
				Glossic Paleudalfs
				Rhodic Paleudalfs
				Mollic Paleudalfs
				Typic Paleudalfs
			Rhodudalfs	Typic Rhodudalfs
		Xeralfs	Durixeralfs	Natric Durixeralfs
				Vertic Durixeralfs
				Aquic Durixeralfs
				Abruptic Haplic Durixeralfs
				Abruptic Durixeralfs
				Haplic Durixeralfs
				Typic Durixeralfs
			Fragixeralfs	Andic Fragixeralfs
				Vitrandic Fragixeralfs
				Mollic Fragixeralf
				Aquic Fragixeralfs
				Inceptic Fragixeralfs
				Typic Fragixeralfs
			Haploxeralfs	Lithic Mollic Haploxeralfs
				LithicRuptic-Inceptic Haploxeralfs
				Lithic Haploxeralfs
				Vertic Haploxeralfs
				Aquandic Haploxeralfs
				Andic Haploxeralfs
				Vitrandic Haploxeralfs
				Fragiaquic Haploxeralfs
				Aquultic Haploxeralfs
				Aquic Haploxeralfs
				Natric Haploxeralfs
				Fragic Haploxeralfs
				Lamellic Haploxeralfs
				Psammentic Haploxeralfs
				Plinthic Haploxeralfs
				Calcic Haploxeralfs
				Inceptic Haploxeralfs
				Ultic Haploxeralfs

				Mollic Haploxeralfs
				Typic Haploxeralfs
			Natrixeralfs	Vertic Natrixeralfs
				Aquic Natrixeralfs
				Typic Natrixeralfs
			Palexeralfs	Vertic Palexeralfs
				Aquandic Palexeralfs
				Andic Palexeralfs
				Vitrandic Palexeralfs
				Fragiaquic Palexeralfs
				Aquic Palexeralfs
				Petrocalcic Palexeralfs
				Lamellic Palexeralfs
				Psammentic Palexeralfs
				Arenic Palexeralfs
				Natric Palexeralfs
				Fragic Palexeralfs
				Calcic Palexeralfs
				Plinthic Palexeralfs
				Ultic Palexeralfs
				Haplic Palexeralfs
				Mollic Palexeralfs
				Typic Palexeralfs
			Plinthoxeralfs	Typic Plinthoxeralfs
			Rhodoxeralfs	Lithic Rhodoxeralfs
				Vertic Rhodoxeralfs
				Petrocalcic Rhodoxeralfs
				Typic Rhodoxeralfs
				Inceptic Rhodoxeralfs
				Calcic Rhodoxeralfs
		Ustalfs	Durustalfs	Typic durustalfs
			Haplustalfs	Lithic Haplustalfs
				Aquertic Haplustalfs
				Oxyaquic Vertic Haplustalfs
				Torrertic Haplustalfs
				Udertic Haplustalfs
				Vertic Haplustalfs
				Aquic Arenic Haplustalfs
				Aquultic Haplustalfs
				Aquic Haplustalfs
				Oxyaquic Haplustalfs
				Vitrandic Haplustalfs
				Lamellic Haplustalfs
				Psammentic Haplustalfs
				Arenic Aridic Haplustalfs
				Arenic Haplustalfs
				Calcidic Haplustalfs
				Aridic Haplustalfs
				Kanhaplic Haplustalfs

				Inceptic Haplustalfs
				Calcic Udic Haplustalfs
				Ultic Haplustalfs
				Calcic Haplustalfs
				Udic Haplustalfs
				Typic Haplustalfs
			Kandiustalfs	Grossarenic Kandiustalfs
				Aquic Arenic Kandiustalfs
				Plinthic Kandiustalfs
				Aquic Kandiustalfs
				Arenic Aridic Kandiustalfs
				Arenic Kandiustalfs
				Aridic Kandiustalfs
				Udic Kandiustalfs
				Rhodic Kandiustalfs
				Typic Kandiustalfs
			Kanhaplustalfs	Lithic Kanhaplustalfs
				Aquic Kanhaplustal
				Aridic Kanhaplustalfs
				Udic Kanhaplustalfs
				Rhodic Kanhaplustalfs
				Typic Kanhaplustalfs
			Natrustalfs	Salidic Natrustalfs
				Leptic Torrertic Natrustalfs
				Torrertic Natrustalfs
				Aquertic Natrustalfs
				Aridic Leptic Natrustalfs
				Vertic Natrustalfs
				Aquic Arenic Natrustalfs
				Aquic Natrustalfs
				Arenic Natrustalfs
				Petrocalcic Natrustalfs
				Leptic Natrustalfs
				Haplargidic Natrustalfs
				Aridic Glossic Natrustalfs
				Aridic Natrustalfs
				Mollic Natrustalfs
				Typic Natrustalfs
			Paleustalfs	Aquertic Paleustalfs
				Oxyaquic Vertic Paleustalfs
				Udertic Paleustalfs
				Vertic Paleustalfs
				Aquic Arenic Paleustalfs
				Aquic Paleustalfs
				Oxyaquic Paleustalfs
				Lamellic Paleustalfs
				Psammentic Paleustalfs
				Arenic Aridic Paleustalfs
				Grossarenic Paleustalfs
				Arenic Paleustalfs
				Plinthic Paleustalfs

				Petrocalcic Paleustalfs
				Calcidic Paleustalfs
				Aridic Paleustalfs
				Kandic Paleustalfs
				Rhodic Paleustalfs
				Ultic Paleustalfs
				Udic Paleustalfs
				Typic Paleustalfs
			Plinthustalfs	Typic Plinthustalfs
			Rhodustalfs	Lithic Rhodustalfs
				Kanhaplic Rhodustalfs
				Udic Rhodustalfs
				Typic Rhodustalfs
2	Andisols	Aquands	Cryaquands	Lithic Cryaquands
				Histic Cryaquands
				Thaptic Cryaquands
				Typic Cryaquands
			Duraquands	Histic Duraquands
				Acraquoxic Duraquands
				Thaptic Duraquands
				Typic Duraquands
			Endoaquands	Lithic Endoaquands
				Duric Endoaquands
				Histic Endoaquands
				Alic Endoaquands
				Hydric Endoaquands
				Thaptic Endoaquands
				Typic Endoaquands
			Epiaquands	Duric Epiaquands
				Histic Epiaquands
				Alic Epiaquands
				Hydric Epiaquands
				Thaptic Epiaquands
				Typic Epiaquands
			Gelaquands	Histic Gelaquands
				Turbic Gelaquands
				Thaptic Gelaquands
				Typic Gelaquands
			Melanaquands	Lithic Melanaquands
				Acraquoxic Melanaquands
				Hydric Pachic Melanaquands
				Hydric Melanaquands
				Pachic Melanaquands
				Thaptic Melanaquands
				Typic Melanaquands
			Placaquands	Lithic Placaquands
				Duric Histic Placaquands
				Duric Placaquands
				Histic Placaquands
				Thaptic Placaquands
				Typic Placaquands

			Vitraquands	Lithic Vitraquands
				Duric Vitraquands
				Histic Vitraquands
				Thaptic Vitraquands
				Typic Vitraquands
		Cryands	Duricryands	Eutric Duricryands
				Aquic Duricryands
				Eutric Oxyaquic Duricryands
				Oxyaquic Duricryands
				Typic Duricryands
			Fulvicryands	Lithic Fulvicryands
				Folistic Fulvicryands
				Eutric Pachic Fulvicryands
				Eutric Fulvicryands
				Pachic Fulvicryands
				Vitric Fulvicryands
				Typic Fulvicryands
			Haplocryands	Lithic Haplocryands
				Folistic Haplocryands
				Aquic Haplocryands
				Oxyaquic Haplocryands
				Alic Haplocryands
				Spodic Haplocryands
				Acrudoxic Haplocryands
				Vitric Haplocryands
				Thaptic Haplocryands
				Xeric Haplocryands
				Typic Haplocryands
			Hydrocryands	Lithic Hydrocryands
				Placic Hydrocryands
				Aquic Hydrocryands
				Thaptic Hydrocryands
				Typic Hydrocryands
			Melanocryands	Lithic Melanocryands
				Typic Melanocryands
				Vitric Melanocryands
			Vitricryands	Lithic Vitricryands
				Folistic Vitricryands
				Aquic Vitricryands
				Oxyaquic Vitricryands
				Spodic Vitricryands
				Thaptic Vitricryands
				Humic Xeric Vitricryands
				Xeric Vitricryands
				Ultic Vitricryands
				Alfic Vitricryands
				Humic Vitricryands
				Typic Vitricryands
		Gelands	Vitrigelands	Typic Vitrigelands
				Turbic Vitrigelands

				Humic Vitrigelands
		Torrands	Duritorrands	Petrocalcic Duritorrands
				Vitric Duritorrands
				Typic Duritorrands
			Haplotorrands	Lithic Haplotorrands
				Duric Haplotorrands
				Calcic Haplotorrands
				Typic Haplotorrands
			Vitritorrands	Lithic Vitritorrands
				Duric Vitritorrands
				Aquic Vitritorrands
				Typic Vitritorrands
				Calcic Vitritorrands
		Udands	Durudands	Aquic Durudands
				Eutric Durudands
				Acrudoxic Durudands
				Hydric Durudands
				Pachic Durudands
				Typic Durudands
			Fulvudands	Eutric Lithic Fulvudands
				Lithic Fulvudands
				Aquic Fulvudands
				Oxyaquic Fulvudands
				Hydric Fulvudands
				Acrudoxic Fulvudands
				Ultic Fulvudands
				Eutric Pachic Fulvudands
				Eutric Fulvudands
				Pachic Fulvudands
				Thaptic Fulvudands
				Typic Fulvudands
			Hapludands	Lithic Hapludands
				Anthraquic Hapludands
				Aquic Duric Hapludands
				Duric Hapludands
				Aquic Hapludands
				Oxyaquic Hapludands
				Alic Hapludands
				Acrudoxic Hydric Hapludands
				Acrudoxic Thaptic Hapludands
				Acrudoxic Ultic Hapludands
				Acrudoxic Hapludands
				Vitric Hapludands
				Hydric Thaptic Hapludands
				Hydric Hapludands
				Eutric Thaptic Hapludands
				Thaptic Hapludands
				Eutric Hapludands
				Oxic Hapludands

				Ultic Hapludands
				Alfic Hapludands
				Typic Hapludands
			Hydrudands	Lithic Hydrudands
				Aquic Hydrudands
				Acrudoxic Thaptic Hydrudands
				Acrudoxic Hydrudands
				Thaptic Hydrudands
				Eutric Hydrudands
				Ultic Hydrudands
				Typic Hydrudands
			Melanudands	Lithic Melanudands
				Anthraquic Melanudands
				Aquic Melanudands
				Acrudoxic Vitric Melanudands
				Acrudoxic Hydric Melanudands
				Acrudoxic Melanudands
				Pachic Vitric Melanudands
				Vitric Melanudands
				Hydric Pachic Melanudands
				Pachic Melanudands
				Hydric Melanudands
				Thaptic Melanudands
				Ultic Melanudands
				Eutric Melanudands
				Typic Melanudands
			Placudands	Lithic Placudands
				Aquic Placudands
				Acrudoxic Placudands
				Hydric Placudands
				Typic Placudands
		Ustands	Durustands	Aquic Durustands
				Thaptic Durustands
				Humic Durustands
				Typic Durustands
			Haplustands	Lithic Haplustands
				Aquic Haplustands
				Dystric Vitric Haplustands
				Vitric Haplustands
				Pachic Haplustands
				Thaptic Haplustands
				Calcic Haplustands
				Dystric Haplustands
				Oxic Haplustands
				Ultic Haplustands
				Alfic Haplustands
				Humic Haplustands
				Typic Haplustands
		Vitrands	Ustivitrands	Lithic Udivitrands
				Aquic Udivitrands

				Oxyaquic Udivitrands
				Thaptic Udivitrands
				Ultic Udivitrands
				Alfic Udivitrands
				Humic Udivitrands
				Typic Udivitrands
			Udivitrands	Lithic Ustivitrands
				Aquic Ustivitrands
				Thaptic Ustivitrands
				Calcic Ustivitrands
				Humic Ustivitrands
				Typic Ustivitrands
		Xerands	Haploxerands	Lithic Haploxerands
				Aquic Haploxerands
				Thaptic Haploxerands
				Calcic Haploxerands
				Ultic Haploxerands
				Alfic Humic Haploxerands
				Alfic Haploxerands
				Humic Haploxerands
				Typic Haploxerands
			Melanoxerands	Pachic Melanoxerands
				Typic Melanoxerands
				Vitrixerands
				Lithic Vitrixerands
				Aquic Vitrixerands
				Thaptic Vitrixerands
				Alfic Humic Vitrixerands
				Ultic Vitrixerands
				Alfic Vitrixerands
				Humic Vitrixerands
				Typic Vitrixerands
			Vitrixerands	Lithic Vitrixerands
				Aquic Vitrixerands
				Thaptic Vitrixerands
				Alfic Humic Vitrixerands
				Ultic Vitrixerands
				Alfic Vitrixerands
				Alfic Vitrixerands
				Typic Vitrixerands
3	Aridisols	Argids	Calciargids	Lithic Calciargids
				Xerertic Calciargids
				Ustertic Calciargids
				Vertic Calciargids
				Aquic Calciargids
				Arenic Ustic Calciargids
				Arenic Calciargids
				Durinodic Xeric Calciargids
				Durinodic Calciargids
				Petronodic Xeric Calciargids
				Petronodic Ustic Calciargids
				Petronodic Calciargids
				Vitrixerandic Calciargids
				Vitrandic Calciargids
				Xeric Calciargids
				Ustic Calciargids
				Typic Calciargids

			Gypsiargids	Aquic Gypsiargids
				Durinodic Gypsiargids
				Vitrixerandic Gypsiargids
				Vitrandic Gypsiargids
				Xeric Gypsiargids
				Ustic Gypsiargids
				Typic Gypsiargids
			Haplargids	Lithic Ruptic-Entic Haplargids
				Lithic Xeric Haplargids
				Lithic Ustic Haplargids
				Lithic Haplargids
				Xerertic Haplargids
				Ustertic Haplargids
				Vertic Haplargids
				Aquic Haplargids
				Arenic Ustic Haplargids
				Arenic Haplargids
				Durinodic Xeric Haplargids
				Durinodic Haplargids
				Petronodic Ustic Haplargids
				Petronodic Haplargids
				Vitrixerandic Haplargids
				Vitrandic Haplargids
				Xeric Haplargids
				Ustic Haplargids
				Typic Haplargids
			Natrargids	Lithic Xeric Natrargids
				Lithic Ustic Natrargids
				Lithic Natrargids
				Xerertic Natrargids
				Ustertic Natrargids
				Vertic Natrargids
				Aquic Natrargids
				Durinodic Xeric Natrargids
				Durinodic Natrargids
				Petronodic Natrargids
				Glossic Ustic Natrargids
				Haplic Ustic Natrargids
				Haploxeralfic Natrargids
				Haplic Natrargids
				Vitrixerandic Natrargids
				Vitrandic Natrargids
				Xeric Natrargids
				Ustic Natrargids
				Glossic Natrargids
				Typic Natrargids
			Paleargids	Vertic Paleargids
				Aquic Paleargids
				Arenic Ustic Paleargids
				Arenic Paleargids
				Calcic Paleargids
				Durinodic Xeric Paleargids
				Durinodic Paleargids
				Petronodic Ustic Paleargids
				Petronodic Paleargids

				Vitrixerandic Paleargids
				Vitrandic Paleargids
				Xeric Paleargids
				Ustic Paleargids
				Typic Paleargids
			Petroargids	Petrogypsic Ustic Petroargids
				Petrogypsic Petroargids
				Duric Xeric Petroargids
				Duric Petroargids
				Natric Petroargids
				Xeric Petroargids
				Ustic Petroargids
				Typic Petroargids
		Calcids	Haplocalcids	Lithic Xeric Haplocalcids
				Lithic Ustic Haplocalcids
				Lithic Haplocalcids
				Vertic Haplocalcids
				Aquic Durinodic Haplocalcids
				Aquic Haplocalcids
				Duric Xeric Haplocalcids
				Duric Haplocalcids
				Durinodic Xeric Haplocalcids
				Durinodic Haplocalcids
				Petronodic Xeric Haplocalcids
				Petronodic Ustic Haplocalcids
				Petronodic Haplocalcids
				Sodic Xeric Haplocalcids
				Sodic Ustic Haplocalcids
				Sodic Haplocalcids
				Vitrixerandic Haplocalcids
				Vitrandic Haplocalcids
				Xeric Haplocalcids
				Ustic Haplocalcids
				Typic Haplocalcids
			Petrocalcids	Aquic Petrocalcids
				Natric Petrocalcids
				Xeralfic Petrocalcids
				Ustalfic Petrocalcids
				Argic Petrocalcids
				Calcic Lithic Petrocalcids
				Calcic Petrocalcids
				Xeric Petrocalcids
				Ustic Petrocalcids
				Typic Petrocalcids
		Cambids	Anthracambids	Typic Anthracambids
			Aquicambids	Sodic Aquicambids
				Durinodic Xeric Aquicambids
				Durinodic Aquicambids
				Petronodic Aquicambids
				Vitrixerandic Aquicambids

				Vitrandic Aquicambids
				Fluventic Aquicambids
				Xeric Aquicambids
				Typic Aquicambids
				Ustic Aquicambids
			Haplocambids	Durinodic Xeric Haplocambids
				Durinodic Haplocambids
				Petronodic Xeric Haplocambids
				Petronodic Ustic Haplocambids
				Petronodic Haplocambids
				Sodic Xeric Haplocambids
				Sodic Ustic Haplocambids
				Sodic Haplocambids
				Vitrixerandic Haplocambids
				Vitrandic Haplocambids
				Xerofluventic Haplocambids
				Ustifluventic Haplocambids
				Fluventic Haplocambids
				Xeric Haplocambids
				Typic Haplocambids
				Ustic Haplocambids
			Petrocambids	Sodic Petrocambids
				Vitrixerandic Petrocambids
				Vitrandic Petrocambids
				Xeric Petrocambids
				Ustic Petrocambids
				Typic Petrocambids
		Cryids	Argicryids	Lithic Argicryids
				Vertic Argicryids
				Natric Argicryids
				Vitrixerandic Argicryids
				Vitrandic Argicryids
				Xeric Argicryids
				Ustic Argicryids
				Typic Argicryids
			Calcicryids	Lithic Calcicryids
				Vitrixerandic Calcicryids
				Vitrandic Calcicryids
				Xeric Calcicryids
				Ustic Calcicryids
				Typic Calcicryids
			Gypsicryids	Calcic Gypsicryids
				Vitrixerandic Gypsicryids
				Vitrandic Gypsicryids
				Typic Gypsicryids
			Haplocryids	Lithic Haplocryids
				Vertic Haplocryids
				Vitrixerandic Haplocryids
				Vitrandic Haplocryids

				Xeric Haplocryids
				Ustic Haplocryids
			Petrocryids	Xereptic Petrocryids
				Duric Xeric Petrocryids
				Duric Petrocryids
				Petrogypsic Petrocryids
				Xeric Petrocryids
				Ustic Petrocryids
				Typic Petrocryids
			Salicryids	Typic Salicryids
				Aquic Salicryids
		Gypsids	Argigypsids	Lithic Argigypsids
				Vertic Argigypsids
				Calcic Argigypsids
				Petronodic Argigypsids
				Vitrixerandic Argigypsids
				Vitrandic Argigypsids
				Xeric Argigypsids
				Ustic Argigypsids
				Typic Argigypsids
			Calcigypsids	Lithic Calcigypsids
				Petronodic Calcigypsids
				Vitrixerandic Calcigypsids
				Vitrandic Calcigypsids
				Xeric Calcigypsids
				Ustic Calcigypsids
				Typic Calcigypsids
			Haplogypsids	Lithic Haplogypsids
				Leptic Haplogypsids
				Sodic Haplogypsids
				Petronodic Haplogypsids
				Vitrixerandic Haplogypsids
				Vitrandic Haplogypsids
				Xeric Haplogypsid
				Ustic Haplogypsids
				Typic Haplogypsids
			Natrigypsids	Lithic Natrigypsids
				Vertic Natrigypsids
				Petronodic Natrigypsids
				Vitrixerandic Natrigypsids
				Vitrandic Natrigypsids
				Xeric Natrigypsids
				Ustic Natrigypsids
				Typic Natrigypsids
			Petrogypsids	Petrocalcic Petrogypsids
				Calcic Petrogypsids
				Vitrixerandic Petrogypsids
				Vitrandic Petrogypsids
				Xeric Petrogypsids

				Ustic Petrogypsids
				Typic Petrogypsids
		Durids	Argidurids	Vertic Argidurids
				Aquic Argidurids
				Abruptic Xeric Argidurids
				Abruptic Argidurids
				Haploxeralfic Argidurids
				Argidic Argidurids
				Vitrixerandic Argidurids
				Vitrandic Argidurids
				Xeric Argidurids
				Ustic Argidurids
				Typic Argidurids
			Haplodurids	Aquicambidic Haplodurids
				Aquic Haplodurids
				Xereptic Haplodurids
				Cambidic Haplodurids
				Vitrixerandic Haplodurids
				Vitrandic Haplodurids
				Xeric Haplodurids
				Ustic Haplodurids
				Typic Haplodurids
			Natridurids	Vertic Natridurids
				Aquic Natrargidic Natridurids
				Aquic Natridurids
				Natrixeralfic Natridurids
				Natrargidic Natridurids
				Vitrixerandic Natridurids
				Vitrandic Natridurids
				Xeric Natridurids
				Typic Natridurids
		Salids	Aquisalids	Gypsic Aquisalids
				Calcic Aquisalids
				Typic Aquisalids
			Cryaquents	Aquandic Cryaquents
				Typic Cryaquents
			Haplosalids	Duric Haplosalids
				Petrogypsic Haplosalids
				Gypsic Haplosalids
				Calcic Haplosalids
				Typic Haplosalids
4	Entisols	Aquents	Cryaquents	Aquandic Cryaquents
				Typic Cryaquents
				Aquandic Cryaquents
			Endoaquents	Sulfic Endoaquents
				Lithic Endoaquents
				Sodic Endoaquents
				Aeric Endoaquents
				Humaqueptic Endoaquents
				Mollic Endoaquents
				Typic Endoaquents

			Epiaquents	Aeric Epiaquents
				Humaqueptic Epiaquents
				Mollic Epiaquents
				Typic Epiaquents
			Fluvaquents	Sulfic Fluvaquents
				Vertic Fluvaquents
				Thapto-Histic Fluvaquents
				Aquandic Fluvaquents
				Aeric Fluvaquents
				Humaqueptic Fluvaquents
				Mollic Fluvaquents
				Typic Fluvaquents
			Gelaquents	Typic Gelaquents
			Hydraquents	Sulfic Hydraquents
				Sodic Hydraquents
				Thapto-Histic Hydraquents
				Typic Hydraquents
			Psammaquents	Lithic Psammaquents
				Sodic Psammaquents
				Spodic Psammaquents
				Humaqueptic Psammaquents
				Mollic Psammaquents
				Typic Psammaquents
			Sulfaquents	Haplic Sulfaquents
				Histic Sulfaquents
				Thapto-Histic Sulfaquents
				Typic Sulfaquents
		Arents	Torriarents	Sodic Torriarents
				Duric Torriarents
				Haplic Torriarents
			Udarent	Alfic Udarents
				Ultic Udarents
				Mollic Udarents
				Haplic Udarents
			Ustarents	Haplic Ustarents
			Xerarents	Sodic Xerarents
				Duric Xerarents
				Alfic Xerarents
				Haplic Xerarents
		Fluvents	Cryofluvents	Andic Cryofluvents
				Vitrandic Cryofluvents
				Aquic Cryofluvents
				Oxyaquic Cryofluvents
				Mollic Cryofluvents
				Typic Cryofluvents
			Gelifluvents	Aquic Gelifluvents
				Typic Gelifluvents
			Torrifluvents	Ustertic Torrifluvents
				Vertic Torrifluvents
				Vitrixerandic Torrifluvents
				Vitrandic Torrifluvents
				Aquic Torrifluvents
				Oxyaquic Torrifluvents
				Duric Xeric Torrifluvents
				Duric Torrifluvents
				Ustic Torrifluvents

				Xeric Torrifluvents
				Anthropic Torrifluvents
				Typic Torrifluvents
			Udifluvents	Aquertic Udifluvents
				Vertic Udifluvents
				Andic Udifluvents
				Vitrandic Udifluvents
				Aquic Udifluvents
				Oxyaquic Udifluvents
				Mollic Udifluvents
				Typic Udifluvents
			Ustifluvents	Aquertic Ustifluvents
				Torrertic Ustifluvents
				Vertic Ustifluvents
				Anthraquic Ustifluvents
				Aquic Ustifluvents
				Oxyaquic Ustifluvents
				Aridic Ustifluvents
				Udic Ustifluvents
				Mollic Ustifluvents
				Typic Ustifluvents
			Xerofluvents	Vertic Xerofluvents
				Aquandic Xerofluvents
				Andic Xerofluvents
				Vitrandic Xerofluvents
				Aquic Xerofluvents
				Oxyaquic Xerofluvents
				Durinodic Xerofluvents
				Mollic Xerofluvents
				Typic Xerofluvents
		Orthents	Cryorthents	Lithic Cryorthents
				Vitrandic Cryorthents
				Aquic Cryorthents
				Oxyaquic Cryorthents
				Typic Cryorthents
				Lamellic Cryorthents
			Gelorthents	Aquic Gelorthents
				Oxyaquic Gelorthents
				Typic Gelorthents
			Torriorthents	Lithic Ustic Torriorthents
				Lithic Xeric Torriorthents
				Lithic Torriorthents
				Xerertic Torriorthents
				Ustertic Torriorthents
				Vertic Torriorthents
				Vitrandic Torriorthents
				Aquic Torriorthents
				Oxyaquic Torriorthents
				Duric Torriorthents
				Ustic Torriorthents
				Xeric Torriorthents
				Typic Torriorthents
			Udorthents	Lithic Udorthents
				Vitrandic Udorthents
				Aquic Udorthents

				Oxyaquic Udorthents
				Vermic Udorthents
				Typic Udorthents
			Ustorthents	Aridic Lithic Ustorthents
				Lithic Ustorthents
				Torrertic Ustorthents
				Vertic Ustorthents
				Anthraquic Ustorthents
				Aquic Ustorthents
				Oxyaquic Ustorthents
				Durinodic Ustorthents
				Vitritorrandic Ustorthents
				Vitrandic Ustorthents
				Aridic Ustorthents
				Udic Ustorthents
				Typic Ustorthents
			Xerorthents	Lithic Xerorthents
				Vitrandic Xerorthents
				Aquic Xerorthents
				Oxyaquic Xerorthents
				Durinodic Xerorthents
				Dystric Xerorthents
				Typic Xerorthents
		Psamments	Cryopsamments	Lithic Cryopsamments
				Aquic Cryopsamments
				Oxyaquic Cryopsamments
				Vitrandic Cryopsamments
				Spodic Cryopsamments
				Lamellic Cryopsamments
				Typic Cryopsamments
			Quartzipsamments	Lithic Quartzipsamments
				Aquodic Quartzipsamments
				Aquic Quartzipsamments
				Oxyaquic Quartzipsamments
				Ustoxic Quartzipsamments
				Udoxic Quartzipsamments
				Plinthic Quartzipsamments
				Lamellic Ustic Quartzipsamments
				Lamellic Quartzipsamments
				Ustic Quartzipsamments
				Xeric Quartzipsamments
				Typic Quartzipsamments
				Spodic Quartzipsamments
			Torripsamments	Lithic Torripsamments
				Oxyaquic Torripsamments
				Vitrandic Torripsamments
				Haploduridic Torripsamments
				Ustic Torripsamments
				Xeric Torripsamments
				Rhodic Torripsamments
				Typic Torripsamments
			Udipsamments	Lithic Udipsamments
				Aquic Udipsamments
				Oxyaquic Udipsamments

				Spodic Udipsamments
				Lamellic Udipsamments
				Plagganthreptic Udipsamments
				Typic Udipsamments
			Ustipsamments	Lithic Ustipsamments
				Aquic Ustipsamments
				Oxyaquic Ustipsamments
				Aridic Ustipsamments
				Lamellic Ustipsamments
				Rhodic Ustipsamments
				Typic Ustipsamments
			Xeropsamments	Lithic Xeropsamments
				Aquic Durinodic Xeropsamments
				Aquic Xeropsamments
				Oxyaquic Xeropsamments
				Vitrandic Xeropsamments
				Durinodic Xeropsamments
				Lamellic Xeropsamments
				Dystric Xeropsamments
				Typic Xeropsamments
		Wassents	Fluviwassents	Sulfic Fluviwassents
				Lithic Fluviwassents
				Thapto-Histic Fluviwassents
				Aeric Fluviwassents
				Typic Fluviwassents
			Frasiwassents	Hydric Frasiwassents
				Lithic Frasiwassents
				Psammentic Frasiwassents
				Thapto-Histic Frasiwassents
				Fluventic Frasiwassents
				Aeric Frasiwassents
				Typic Frasiwassents
			Haplowassents	Sulfic Haplowassents
				Lithic Haplowassents
				Aeric Haplowassents
				Typic Haplowassents
			Hydrowassents	Sulfic Hydrowassents
				Grossic Hydrowassents
				Lithic Hydrowassents
				Thapto-Histic Hydrowassents
				Typic Hydrowassents
			Psammowassents	Sulfic Psammowassents
				Lithic Psammowassents
				Fluventic Psammowassents
				Aeric Psammowassents
				Typic Psammowassents
			Sulfiwassents	Lithic Sulfiwassents
				Haplic Sulfiwassents
				Thapto-Histic Sulfiwassents
				Fluventic Sulfiwassents
				Aeric Sulfiwassents
				Typic Sulfiwassents
		Histels	Fibristels	Lithic Fibristels
				Terric Fibristels
				Fluvaquentic Fibristels

				Sphagnic Fibristels
				Typic Fibristels
			Folistels	Lithic Folistels
				Glacic Folistels
				Typic Folistels
			Glacistels	Hemic Glacistels
				Sapric Glacistels
				Typic Glacistels
			Hemistels	Lithic Hemistels
				Terric Hemistels
				Fluvaquentic Hemistels
				Typic Hemistels
			Sapristels	Lithic Sapristels
				Terric Sapristels
				Fluvaquentic Sapristels
				Typic Sapristels
		Orthels	Anhyorthels	Lithic Anhyorthels
				Glacic Anhyorthels
				Petrogypsic Anhyorthels
				Gypsic Anhyorthels
				Salic Anhyorthels
				Calcic Anhyorthels
				Nitric Anhyorthels
				Typic Anhyorthels
			Aquorthels	Lithic Aquorthels
				Glacic Aquorthels
				Sulfuric Aquorthels
				Ruptic-Histic Aquorthels
				Andic Aquorthels
				Vitrandic Aquorthels
				Salic Aquorthels
				Psammentic Aquorthels
				Fluvaquentic Aquorthels
				Typic Aquorthels
			Argiorthels	Lithic Argiorthels
				Glacic Argiorthels
				Natric Argiorthels
				Typic Argiorthels
			Haplorthels	Lithic Haplorthels
				Glacic Haplorthels
				Fluvaquentic Haplorthels
				Folistic Haplorthels
				Aquic Haplorthels
				Fluventic Haplorthels
				Typic Haplorthels
			Historthels	Lithic Historthels
				Glacic Historthels
				Fluvaquentic Historthels
				Fluventic Historthels
				Ruptic Historthels
				Typic Historthels
			Mollorthels	Lithic Mollorthels
				Glacic Mollorthels
				Vertic Mollorthels

				Andic Mollorthels
				Vitrandic Mollorthels
				Folistic Mollorthels
				Cumulic Mollorthels
				Aquic Mollorthels
				Typic Mollorthels
			Psammorthels	Lithic Psammorthels
				Glacic Psammorthels
				Spodic Psammorthels
				Typic Psammorthels
			Umbrorthels	Lithic Umbrorthels
				Glacic Umbrorthels
				Vertic Umbrorthels
				Andic Umbrorthels
				Vitrandic Umbrorthels
				Folistic Umbrorthels
				Cumulic Umbrorthels
				Aquic Umbrorthels
				Typic Umbrorthels
		Turbels	Anhyturbels	Lithic Anhyturbels
				Glacic Anhyturbels
				Petrogypsic Anhyturbels
				Gypsic Anhyturbels
				Nitric Anhyturbels
				Salic Anhyturbels
				Calcic Anhyturbels
				Typic Anhyturbels
			Aquiturbels	Lithic Aquiturbels
				Glacic Aquiturbels
				Sulfuric Aquiturbels
				Ruptic-Histic Aquiturbels
				Psammentic Aquiturbels
				Typic Aquiturbels
			Haploturbels	Lithic Haploturbels
				Glacic Haploturbels
				Aquic Haploturbels
				Folistic Haploturbels
				Typic Haploturbels
			Histoturbels	Lithic Histoturbels
				Glacic Histoturbels
				Ruptic Histoturbels
				Typic Histoturbels
			Molliturbels	Lithic Molliturbels
				Glacic Molliturbels
				Vertic Molliturbels
				Andic Molliturbels
				Vitrandic Molliturbels
				Folistic Molliturbels
				Cumulic Molliturbels
				Aquic Molliturbels
				Typic Molliturbels
			Psammoturbels	Lithic Psammoturbels
				Glacic Psammoturbels
				Spodic Psammoturbels
				Typic Psammoturbels

			Umbriturbels	Lithic Umbriturbels
				Glacic Umbriturbels
				Vertic Umbriturbels
				Andic Umbriturbels
				Vitrandic Umbriturbels
				Folistic Umbriturbels
				Cumulic Umbriturbels
				Aquic Umbriturbels
				Typic Umbriturbels
6	Histosols	Fibrists	Cryofibrists	Hydric Cryofibrists
				Lithic Cryofibrists
				Terric Cryofibrists
				Fluvaquentic Cryofibrists
				Sphagnic Cryofibrists
				Typic Cryofibrists
			Haplofibrists	Hydric Haplofibrists
				Lithic Haplofibrists
				Limnic Haplofibrists
				Terric Haplofibrists
				Fluvaquentic Haplofibrists
				Hemic Haplofibrists
				Typic Haplofibrists
			Sphagnofibrists	Hydric Sphagnofibrists
				Lithic Sphagnofibrists
				Limnic Sphagnofibrists
				Terric Sphagnofibrists
				Fluvaquentic Sphagnofibrists
				Hemic Sphagnofibrists
				Typic Sphagnofibrists
		Folists	Cryofolists	Lithic Cryofolists
				Typic Cryofolists
			Torrifolists	Lithic Torrifolists
				Typic Torrifolists
			Udifolists	Lithic Udifolists
				Typic Udifolists
			Ustifolists	Lithic Ustifolists
				Typic Ustifolists
		Hemists	Cryohemists	Hydric Cryohemists
				Lithic Cryohemists
				Terric Cryohemists
				Fluvaquentic Cryohemists
				Typic Cryohemists
			Haplohemists	Hydric Haplohemists
				Lithic Haplohemists
				Limnic Haplohemists
				Terric Haplohemists
				Fluvaquentic Haplohemists
				Fibric Haplohemists
				Sapric Haplohemists
				Typic Haplohemists
			Luvihemists	Typic Luvihemists
			Sulfihemists	Terric Sulfihemists
				Typic Sulfihemists
			Sulfohemists	Typic Sulfohemists
		Saprists	Cryosaprists	Lithic Cryosaprists

				Limnic Cryosaprists
				Terric Cryosaprists
				Fluvaquentic Cryosaprists
				Typic Cryosaprists
			Haplosaprists	Lithic Haplosaprists
				Limnic Haplosaprists
				Halic Terric Haplosaprists
				Halic Haplosaprists
				Terric Haplosaprists
				Fluvaquentic Haplosaprists
				Hemic Haplosaprists
				Typic Haplosaprists
			Sulfisaprists	Terric Sulfisaprists
				Typic Sulfisaprists
			Sulfosaprists	Typic Sulfosaprists
		Wassists	Frasiwassists	Fibric Frasiwassists
				Sapric Frasiwassists
				Typic Frasiwassists
			Haplowassists	Sulfic Haplowassists
				Fibric Haplowassists
				Sapric Haplowassists
				Typic Haplowassists
			Sulfiwassists	Fibric Sulfiwassists
				Sapric Sulfiwassists
				Typic Sulfiwassists
7	Inceptisols	Aquepts	Cryaquepts	Sulfic Cryaquepts
				Histic Lithic Cryaquepts
				Lithic Cryaquepts
				Vertic Cryaquepts
				Histic Cryaquepts
				Aquandic Cryaquepts
				Fluvaquentic Cryaquepts
				Aeric Humic Cryaquepts
				Aeric Cryaquepts
				Humic Cryaquepts
				Typic Cryaquepts
			Endoaquepts	Sulfic Endoaquepts
				Lithic Endoaquepts
				Vertic Endoaquepts
				Aquandic Endoaquepts
				Fluventic Endoaquepts
				Fluvaquentic Endoaquepts
				Fragic Endoaquepts
				Aeric Endoaquepts
				Humic Endoaquepts
				Mollic Endoaquepts
				Typic Endoaquepts
			Epiaquepts	Vertic Epiaquepts
				Aquandic Epiaquepts
				Fluvaquentic Epiaquepts
				Fragic Epiaquepts
				Aeric Epiaquepts

				Humic Epiaquepts
				Mollic Epiaquepts
				Typic Epiaquepts
			Fragiaquepts	Aeric Fragiaquepts
				Humic Fragiaquepts
				Typic Fragiaquepts
			Gelaquepts	Lithic Gelaquepts
				Histic Gelaquepts
				Aquandic Gelaquepts
				Fluvaquentic Gelaquepts
				Typic Gelaquepts
				Turbic Gelaquepts
				Humic Gelaquepts
			Halaquepts	Vertic Halaquepts
				Aquandic Halaquepts
				Duric Halaquepts
				Aeric Halaquepts
				Typic Halaquepts
			Humaquepts	Hydraquentic Humaquepts
				Histic Humaquepts
				Aquandic Humaquepts
				Cumulic Humaquepts
				Fluvaquentic Humaquepts
				Aeric Humaquepts
				Typic Humaquepts
			Petraquepts	Histic Placic Petraquepts
				Placic Petraquepts
				Plinthic Petraquepts
				Typic Petraquepts
			Sulfaquepts	Salidic Sulfaquepts
				Hydraquentic Sulfaquepts
				Typic Sulfaquepts
			Vermaquepts	Sodic Vermaquepts
				Typic Vermaquepts
		Anthrepts	Haplanthrepts	Typic Haplanthrepts
			Plagganthrepts	Typic Plagganthrepts
		Cryepts	Calcicryepts	Lithic Calcicryepts
				Oxyaquic Calcicryepts
				Xeric Calcicryepts
				Ustic Calcicryepts
				Typic Calcicryepts
			Dystrocryepts	Lithic Dystrocryepts
				Aquandic Dystrocryepts
				Haploxerandic Dystrocryepts
				Vitrixerandic Dystrocryepts
				Andic Dystrocryepts
				Vitrandic Dystrocryepts
				Fluvaquentic Dystrocryepts
				Folistic Dystrocryepts
				Aquic Dystrocryepts
				Oxyaquic Dystrocryepts
				Lamellic Dystrocryepts
				Fluventic Dystrocryepts

				Spodic Dystrocryepts
				Xeric Dystrocryepts
				Ustic Dystrocryepts
				Eutric Dystrocryepts
				Typic Dystrocryepts
			Haplocryepts	Lithic Haplocryepts
				Aquandic Haplocryepts
				Haploxerandic Haplocryepts
				Vitrixerandic Haplocryepts
				Haplustandic Haplocryepts
				Ustivitrandic Haplocryepts
				Andic Haplocryepts
				Vitrandic Haplocryepts
				Fluvaquentic Haplocryepts
				Aquic Haplocryepts
				Oxyaquic Haplocryepts
				Lamellic Haplocryepts
				Fluventic Haplocryepts
				Calcic Haplocryepts
				Xeric Haplocryepts
				Ustic Haplocryepts
				Typic Haplocryepts
			Humicryepts	Lithic Humicryepts
				Aquandic Humicryepts
				Haploxerandic Humicryepts
				Vitrixerandic Humicryepts
				Andic Humicryepts
				Vitrandic Humicryepts
				Fluvaquentic Humicryepts
				Aquic Humicryepts
				Oxyaquic Humicryepts
				Lamellic Humicryepts
				Fluventic Humicryepts
				Spodic Humicryepts
				Xeric Humicryepts
				Eutric Humicryepts
				Typic Humicryepts
		Gelepts	Dystrogelepts	Lithic Dystrogelepts
				Andic Dystrogelepts
				Aquic Dystrogelepts
				Fluventic Dystrogelepts
				Turbic Dystrogelepts
				Typic Dystrogelepts
			Haplogelepts	Lithic Haplogelepts
				Andic Haplogelepts
				Aquic Haplogelepts
				Fluventic Haplogelepts
				Typic Haplogelepts
				Turbic Haplogelepts

			Humigelepts	Lithic Humigelepts
				Andic Humigelepts
				Aquic Humigelepts
				Oxyaquic Humigelepts
				Fluventic Humigelepts
				Turbic Humigelepts
				Eutric Humigelepts
				Typic Humigelepts
		Udepts	Durudepts	Aquandic Durudepts
				Andic Durudepts
				Vitrandic Durudepts
				Aquic Durudepts
				Typic Durudepts
			Dystrudepts	Humic Lithic Dystrudepts
				Lithic Dystrudepts
				Vertic Dystrudepts
				Aquandic Dystrudepts
				Andic Oxyaquic Dystrudepts
				Andic Dystrudepts
				Vitrandic Dystrudepts
				Fragiaquic Dystrudepts
				Fluvaquentic Dystrudepts
				Aquic Humic Dystrudepts
				Aquic Dystrudepts
				Oxyaquic Dystrudepts
				Fragic Dystrudepts
				Lamellic Dystrudepts
				Humic Psammentic Dystrudepts
				Fluventic Humic Dystrudepts
				Fluventic Dystrudepts
				Spodic Dystrudepts
				Oxic Dystrudepts
				Ruptic-Alfic Dystrudepts
				Ruptic-Ultic Dystrudepts
				Humic Dystrudepts
				Typic Dystrudepts
			Eutrudepts	Humic Lithic Eutrudepts
				Lithic Eutrudepts
				Aquertic Eutrudepts
				Vertic Eutrudepts
				Andic Eutrudepts
				Vitrandic Eutrudepts
				Anthraquic Eutrudepts
				Fragiaquic Eutrudepts
				Fluvaquentic Eutrudepts
				Aquic Dystric Eutrudepts
				Aquic Eutrudepts
				Oxyaquic Eutrudepts
				Fragic Eutrudepts

				Lamellic Eutrudepts
				Dystric Fluventic Eutrudepts
				Fluventic Eutrudepts
				Arenic Eutrudepts
				Dystric Eutrudepts
				Rendollic Eutrudepts
				Humic Eutrudepts
				Ruptic-Alfic Eutrudepts
				Typic Eutrudepts
			Fragiudepts	Andic Fragiudepts
				Vitrandic Fragiudepts
				Aquic Fragiudepts
				Humic Fragiudepts
				Typic Fragiudepts
			Humudepts	Lithic Humudepts
				Vertic Humudepts
				Aquandic Humudepts
				Andic Oxyaquic Humudepts
				Andic Humudepts
				Vitrandic Humudepts
				Fluvaquentic Humudepts
				Aquic Humudepts
				Oxyaquic Humudepts
				Psammentic Humudepts
				Oxic Humudepts
				Cumulic Humudepts
				Fluventic Humudepts
				Pachic Humudepts
				Eutric Humudepts
				Entic Humudepts
				Typic Humudepts
			Sulfudepts	Typic Sulfudepts
		Ustepts	Calciustepts	Lithic Petrocalcic Calciustepts
				Lithic Calciustepts
				Torrertic Calciustepts
				Vertic Calciustepts
				Petrocalcic Calciustepts
				Gypsic Calciustepts
				Aquic Calciustepts
				Aridic Calciustepts
				Udic Calciustepts
				Typic Calciustepts
			Durustepts	Typic Durustepts
			Dystrustepts	Lithic Dystrustepts
				Torrertic Dystrustepts
				Vertic Dystrustepts
				Andic Dystrustepts
				Vitrandic Dystrustepts
				Aquic Dystrustepts
				Fluventic Dystrustepts

				Aridic Dystrustepts
				Oxic Dystrustepts
				Humic Dystrustepts
				Typic Dystrustepts
			Haplustepts	Aridic Lithic Haplustepts
				Lithic Haplustepts
				Udertic Haplustepts
				Torrertic Haplustepts
				Vertic Haplustepts
				Andic Haplustepts
				Vitrandic Haplustepts
				Anthraquic Haplustepts
				Aquic Haplustepts
				Oxyaquic Haplustepts
				Oxic Haplustepts
				Lamellic Haplustepts
				Torrifluventic Haplustepts
				Udifluventic Haplustepts
				Fluventic Haplustepts
				Gypsic Haplustepts
				Calcic Udic Haplustepts
				Calcic Haplustepts
				Aridic Haplustepts
				Dystric Haplustepts
				Udic Haplustepts
				Typic Haplustepts
			Humustepts	Lithic Humustepts
				Andic Humustepts
				Vitrandic Humustepts
				Oxyaquic Humustepts
				Oxic Humustepts
				Aridic Humustepts
				Typic Humustepts
		Xerepts	Calcixerepts	Lithic Calcixerepts
				Petrocalcic Calcixerepts
				Vertic Calcixerepts
				Sodic Calcixerepts
				Vitrandic Calcixerepts
				Aquic Calcixerepts
				Typic Calcixerepts
			Durixerepts	Aquandic Durixerepts
				Andic Durixerepts
				Vitrandic Durixerepts
				Aquic Durixerepts
				Entic Durixerepts
				Typic Durixerepts
			Dystroxerepts	Humic Lithic Dystroxerepts
				Lithic Dystroxerepts
				Aquandic Dystroxerepts

				Andic Dystroxerepts
				Vitrandic Dystroxerepts
				Fragiaquic Dystroxerepts
				Fluvaquentic Dystroxerepts
				Andic Dystroxerepts
				Vitrandic Dystroxerepts
				Fragiaquic Dystroxerepts
				Fluvaquentic Dystroxerepts
				Aquic Dystroxerepts
				Oxyaquic Dystroxerepts
				Fragic Dystroxerepts
				Fluventic Humic Dystroxerepts
				Fluventic Dystroxerepts
				Humic Dystroxerepts
				Typic Dystroxerepts
			Fragixerepts	Andic Fragixerepts
				Vitrandic Fragixerepts
				Aquic Fragixerepts
				Humic Fragixerepts
				Typic Fragixerepts
			Haploxerepts	Humic Lithic Haploxerepts
				Lithic Haploxerepts
				Vertic Haploxerepts
				Aquandic Haploxerepts
				Andic Oxyaquic Haploxerepts
				Andic Haploxerepts
				Oxyaquic Vitrandic Haploxerepts
				Vitrandic Haploxerepts
				Gypsic Haploxerepts
				Aquic Haploxerepts
				Lamellic Haploxerepts
				Fragic Haploxerepts
				Fluventic Haploxerepts
				Calcic Haploxerepts
				Humic Haploxerepts
				Typic Haploxerepts
			Humixerepts	Lithic Humixerepts
				Aquandic Humixerepts
				Andic Humixerepts
				Vitrandic Humixerepts
				Aquic Humixerepts
				Oxyaquic Humixerepts
				Cumulic Humixerepts
				Fluventic Humixerepts
				Pachic Humixerepts
				Entic Humixerepts
				Typic Humixerepts
8	Mollisols	Albolls	Argialbolls	Xerertic Argialbolls
				Vertic Argialbolls
				Argiaquic Xeric Argialbolls

				Argiaquic Argialbolls
				Xeric Argialbolls
				Aquandic Argialbolls
				Typic Argialbolls
			Natralbolls	Leptic Natralbolls
				Typic Natralbolls
		Aquolls	Argiaquolls	Arenic Argiaquolls
				Grossarenic Argiaquolls
				Vertic Argiaquolls
				Abruptic Argiaquolls
				Typic Argiaquolls
			Calciaquolls	Petrocalcic Calciaquolls
				Aeric Calciaquolls
				Typic Calciaquolls
			Cryaquolls	Thapto-Histic Cryaquolls
				Aquandic Cryaquolls
				Argic Cryaquolls
				Calcic Cryaquolls
				Cumulic Cryaquolls
				Vertic Cryaquolls
				Typic Cryaquolls
			Duraquolls	Natric Duraquolls
				Vertic Duraquolls
				Argic Duraquolls
				Typic Duraquolls
			Endoaquolls	Lithic Endoaquolls
				Cumulic Vertic Endoaquolls
				Fluvaquentic Vertic Endoaquolls
				Vertic Endoaquolls
				Histic Endoaquolls
				Thapto-Histic Endoaquolls
				Aquandic Endoaquolls
				Duric Endoaquolls
				Cumulic Endoaquolls
				Fluvaquentic Endoaquolls
				Typic Endoaquolls
			Epiaquolls	Cumulic Vertic Epiaquolls
				Fluvaquentic Vertic Epiaquolls
				Vertic Epiaquolls
				Histic Epiaquolls
				Thapto-Histic Epiaquolls
				Aquandic Epiaquolls
				Duric Epiaquolls
				Cumulic Epiaquolls
				Fluvaquentic Epiaquolls
				Typic Epiaquolls
			Natraquolls	Vertic Natraquolls
				Glossic Natraquolls
				Typic Natraquolls
		Cryolls	Argicryolls	Lithic Argicryolls

				Vertic Argicryolls
				Andic Argicryolls
				Vitrandic Argicryolls
				Abruptic Argicryolls
				Aquic Argicryolls
				Oxyaquic Argicryolls
				Calcic Pachic Argicryolls
				Pachic Argicryolls
				Calcic Argicryolls
				Alfic Argicryolls
				Ustic Argicryolls
				Xeric Argicryolls
				Typic Argicryolls
			Calcicryolls	Lithic Calcicryolls
				Vitrandic Calcicryolls
				Petrocalcic Calcicryolls
				Pachic Calcicryolls
				Ustic Calcicryolls
				Xeric Calcicryolls
				Lithic Calcicryolls
				Typic Calcicryolls
			Duricryolls	Argic Duricryolls
				Calcic Duricryolls
				Typic Duricryolls
			Haplocryolls	Lithic Haplocryolls
				Vertic Haplocryolls
				Andic Haplocryolls
				Vitrandic Haplocryolls
				Aquic Cumulic Haplocryolls
				Cumulic Haplocryolls
				Fluvaquentic Haplocryolls
				Aquic Haplocryolls
				Oxyaquic Haplocryolls
				Calcic Pachic Haplocryolls
				Pachic Haplocryolls
				Fluventic Haplocryolls
				Calcic Haplocryolls
				Ustic Haplocryolls
				Xeric Haplocryolls
				Typic Haplocryolls
			Natricryolls	Typic Natricryolls
			Palecryolls	Aquic Palecryolls
				Oxyaquic Palecryolls
				Abruptic Palecryolls
				Ustic Palecryolls
				Xeric Palecryolls
				Pachic Palecryolls
				Typic Palecryolls
		Gelolls	Haplogelolls	Lithic Haplogelolls
				Andic Haplogelolls

				Aquic Haplogelolls
				Oxyaquic Haplogelolls
				Turbic Haplogelolls
				Cumulic Haplogelolls
				Typic Haplogelolls
		Rendolls	Cryrendolls	Typic Cryrendolls
			Haprendolls	Lithic Haprendolls
				Vertic Haprendolls
				Inceptic Haprendolls
				Entic Haprendolls
				Typic Haprendolls
		Udolls	Argiudolls	Lithic Argiudolls
				Aquertic Argiudolls
				Oxyaquic Vertic Argiudolls
				Pachic Vertic Argiudolls
				Alfic Vertic Argiudolls
				Vertic Argiudolls
				Andic Argiudolls
				Vitrandic Argiudolls
				Aquic Pachic Argiudolls
				Pachic Argiudolls
				Aquic Argiudolls
				Oxyaquic Argiudolls
				Lamellic Argiudolls
				Psammentic Argiudolls
				Arenic Argiudolls
				Abruptic Argiudolls
				Alfic Argiudolls
				Oxic Argiudolls
				Calcic Argiudolls
				Typic Argiudolls
			Calciudolls	Lithic Calciudolls
				Vertic Calciudolls
				Aquic Calciudolls
				Fluventic Calciudolls
				Typic Calciudolls
			Hapludolls	Lithic Hapludolls
				Aquertic Hapludolls
				Pachic Vertic Hapludolls
				Vertic Hapludolls
				Andic Hapludolls
				Vitrandic Hapludolls
				Aquic Cumulic Hapludolls
				Cumulic Hapludolls
				Fluvaquentic Hapludolls
				Fluventic Hapludolls
				Aquic Pachic Hapludolls
				Pachic Hapludolls
				Aquic Hapludolls
				Oxyaquic Hapludolls
				Vermic Hapludolls

				Calcic Hapludolls
				Entic Hapludolls
				Typic Hapludolls
			Natrudolls	Petrocalcic Natrudolls
				Leptic Vertic Natrudolls
				Glossic Vertic Natrudolls
				Vertic Natrudolls
				Leptic Natrudolls
				Glossic Natrudolls
				Calcic Natrudolls
				Typic Natrudolls
			Paleudolls	Vertic Paleudolls
				Petrocalcic Paleudolls
				Aquic Pachic Paleudolls
				Pachic Paleudolls
				Aquic Paleudolls
				Oxyaquic Paleudolls
				Calcic Paleudolls
				Typic Paleudolls
			Vermudolls	Lithic Vermudolls
				Haplic Vermudolls
				Typic Vermudolls
		Ustolls	Argiustolls	Aridic Lithic Argiustolls
				Alfic Lithic Argiustolls
				Lithic Argiustolls
				Aquertic Argiustolls
				Torrertic Argiustolls
				Pachic Udertic Argiustolls
				Udertic Argiustolls
				Pachic Vertic Argiustolls
				Vertic Argiustolls
				Andic Argiustolls
				Vitritorrandic Argiustolls
				Vitrandic Argiustolls
				Aquic Argiustolls
				Oxyaquic Argiustolls
				Pachic Argiustolls
				Calcidic Argiustolls
				Aridic Argiustolls
				Udic Argiustolls
				Duric Argiustolls
				Typic Argiustolls
			Calciustolls	Salidic Calciustolls
				Lithic Petrocalcic Calciustolls
				Lithic Calciustolls
				Torrertic Calciustolls
				Udertic Calciustolls
				Vertic Calciustolls
				Petrocalcic Calciustolls

				Gypsic Calciustolls
				Aquic Calciustolls
				Oxyaquic Calciustolls
				Pachic Calciustolls
				Aridic Calciustolls
				Udic Calciustolls
				Typic Calciustolls
			Durustolls	Natric Durustolls
				Haploduridic Durustolls
				Argiduridic Durustolls
				Entic Durustolls
				Haplic Durustolls
				Typic Durustolls
			Haplustolls	Salidic Haplustolls
				Ruptic-Lithic Haplustolls
				Aridic Lithic Haplustolls
				Lithic Haplustolls
				Aquertic Haplustolls
				Torrertic Haplustolls
				Pachic Udertic Haplustolls
				Udertic Haplustolls
				Pachic Vertic Haplustolls
				Vertic Haplustolls
				Torroxic Haplustolls
				Oxic Haplustolls
				Andic Haplustolls
				Vitritorrandic Haplustolls
				Vitrandic Haplustolls
				Aquic Cumulic Haplustolls
				Cumulic Haplustolls
				Anthraquic Haplustolls
				Fluvaquentic Haplustolls
				Aquic Haplustolls
				Pachic Haplustolls
				Oxyaquic Haplustolls
				Torrifluventic Haplustolls
				Torriorthentic Haplustolls
				Aridic Haplustolls
				Fluventic Haplustolls
				Duric Haplustolls
				Udorthentic Haplustolls
				Udic Haplustolls
				Entic Haplustolls
				Typic Haplustolls
			Natrustolls	Leptic Torrertic Natrustolls
				Torrertic Natrustolls
				Leptic Vertic Natrustolls
				Glossic Vertic Natrustolls
				Vertic Natrustolls

				Aridic Leptic Natrustolls
				Leptic Natrustolls
				Aquic Natrustolls
				Aridic Natrustolls
				Duric Natrustolls
				Glossic Natrustolls
				Typic Natrustolls
			Paleustolls	Torrertic Paleustolls
				Udertic Paleustolls
				Vertic Paleustolls
				Aquic Paleustolls
				Pachic Paleustolls
				Petrocalcic Paleustolls
				Calcidic Paleustolls
				Aridic Paleustollss
			Vermustolls	Lithic Vermustolls
				Aquic Vermustolls
				Pachic Vermustolls
				Entic Vermustolls
				Typic Vermustolls
		Xerolls	Argixerolls	Aridic Lithic Argixerolls
				Lithic Ultic Argixerolls
				Lithic Argixerolls
				Torrertic Argixerolls
				Vertic Argixerolls
				Andic Argixerolls
				Vitritorrandic Argixerolls
				Vitrandic Argixerolls
				Aquultic Argixerolls
				Aquic Argixerolls
				Oxyaquic Argixerolls
				Alfic Argixerolls
				Calcic Pachic Argixerolls
				Pachic Ultic Argixerolls
				Pachic Argixerolls
				Argiduridic Argixerolls
				Duric Argixerolls
				Calciargidic Argixerolls
				Aridic Argixerolls
				Calcic Argixerolls
				Ultic Argixerolls
				Typic Argixerolls
			Calcixerolls	Aridic Lithic Calcixerolls
				Lithic Calcixerolls
				Vertic Calcixerolls
				Aquic Calcixerolls
				Oxyaquic Calcixerolls
				Pachic Calcixerolls
				Vitrandic Calcixerolls

				Aridic Calcixerolls
				Vermic Calcixerolls
				Typic Calcixerolls
			Durixerolls	Vertic Durixerolls
				Vitritorrandic Durixerolls
				Vitrandic Durixerolls
				Aquic Durixerolls
				Paleargidic Durixerolls
				Cambidic Durixerolls
				Haploduridic Durixerolls
				Argidic Durixerolls
				Argiduridic Durixerolls
				Haplic Palexerollic Durixerolls
				Palexerollic Durixerolls
				Haplic Haploxerollic Durixerolls
				Haploxerollic Durixerolls
				Haplic Durixerolls
				Typic Durixerolls
			Haploxerolls	Aridic Lithic Haploxerolls
				Lithic Ultic Haploxerolls
				Lithic Haploxerolls
				Torrertic Haploxerolls
				Vertic Haploxerolls
				Andic Haploxerolls
				Vitritorrandic Haploxerolls
				Vitrandic Haploxerolls
				Aquic Cumulic Haploxerolls
				Cumulic Ultic Haploxerolls
				Cumulic Haploxerolls
				Fluvaquentic Haploxerolls
				Aquic Duric Haploxerolls
				Aquultic Haploxerolls
				Aquic Haploxerolls
				Oxyaquic Haploxerolls
				Calcic Pachic Haploxerolls
				Pachic Ultic Haploxerolls
				Pachic Haploxerolls
				Torrifluventic Haploxerolls
				Duridic Haploxerolls
				Calcidic Haploxerolls
				Torripsammentic Haploxerolls
				Torriorthentic Haploxerolls
				Aridic Haploxerolls
				Duric Haploxerolls
				Psammentic Haploxerolls
				Fluventic Haploxerolls
				Vermic Haploxerolls
				Calcic Haploxerolls
				Entic Ultic Haploxerolls

				Ultic Haploxerolls
				Entic Haploxerolls
				Typic Haploxerolls
			Natrixerolls	Vertic Natrixerolls
				Aquic Duric Natrixerolls
				Aquic Natrixerolls
				Aridic Natrixerolls
				Duric Natrixerolls
				Typic Natrixerolls
			Palexerolls	Vertic Palexerolls
				Vitrandic Palexerolls
				Aquic Palexerolls
				Pachic Palexerolls
				Petrocalcidic Palexerolls
				Duric Palexerolls
				Aridic Palexerolls
				Ultic Palexerolls
				Petrocalcic Palexerolls
				Haplic Palexerolls
				Typic Palexerolls
9	Oxisols	Aquox	Acraquox	Plinthic Acraquox
				Aeric Acraquox
				Typic Acraquox
			Eutraquox	Histic Eutraquox
				Plinthic Eutraquox
				Aeric Eutraquox
				Humic Eutraquox
				Typic Eutraquox
			Haplaquox	Histic Haplaquox
				Plinthic Haplaquox
				Aeric Haplaquox
				Humic Haplaquox
				Typic Haplaquox
			Plinthaquox	Aeric Plinthaquox
				Typic Plinthaquox
		Perox	Acroperox	Aquic Petroferric Acroperox
				Petroferric Acroperox
				Aquic Lithic Acroperox
				Lithic Acroperox
				Anionic Acroperox
				Plinthic Acroperox
				Aquic Acroperox
				Humic Rhodic Acroperox
				Humic Xanthic Acroperox
				Humic Acroperox
				Rhodic Acroperox
				Xanthic Acroperox
				Typic Acroperox
			Eutroperox	Aquic Petroferric Eutroperox

				Petroferric Eutroperox
				Aquic Lithic Eutroperox
				Lithic Eutroperox
				Plinthaquic Eutroperox
				Plinthic Eutroperox
				Aquic Eutroperox
				Kandiudalfic Eutroperox
				Humic Inceptic Eutroperox
				Inceptic Eutroperox
				Humic Rhodic Eutroperox
				Humic Xanthic Eutroperox
				Humic Eutroperox
				Rhodic Eutroperox
				Xanthic Eutroperox
				Typic Eutroperox
			Haploperox	Aquic Petroferric Haploperox
				Petroferric Haploperox
				Aquic Lithic Haploperox
				Lithic Haploperox
				Plinthaquic Haploperox
				Plinthic Haploperox
				Aquic Haploperox
				Humic Rhodic Haploperox
				Humic Xanthic Haploperox
				Humic Haploperox
				Rhodic Haploperox
				Xanthic Haploperox
				Typic Haploperox
			Kandiperox	Aquic Petroferric Kandiperox
				Petroferric Kandiperox
				Aquic Lithic Kandiperox
				Lithic Kandiperox
				Plinthaquic Kandiperox
				Plinthic Kandiperox
				Aquic Kandiperox
				Andic Kandiperox
				Humic Rhodic Kandiperox
				Humic Xanthic Kandiperox
				Humic Kandiperox
				Rhodic Kandiperox
				Xanthic Kandiperox
				Typic Kandiperox
			Sombriperox	Petroferric Sombriperox
				Lithic Sombriperox
				Humic Sombriperox
				Typic Sombriperox
		Torrox	Acrotorrox	Petroferric Acrotorrox
				Lithic Acrotorrox
				Typic Acrotorrox

			Acrudox	Aquic Petroferric Acrudox
				Petroferric Acrudox
				Aquic Lithic Acrudox
				Lithic Acrudox
				Anionic Aquic Acrudox
				Anionic Acrudox
				Plinthic Acrudox
				Aquic Acrudox
				Eutric Acrudox
				Humic Rhodic Acrudox
				Humic Xanthic Acrudox
				Humic Acrudox
				Rhodic Acrudox
				Xanthic Acrudox
				Typic Acrudox
			Eutrotorrox	Petroferric Eutrotorrox
				Lithic Eutrotorrox
				Typic Eutrotorrox
			Eutrudox	Aquic Petroferric Eutrudox
				Petroferric Eutrudox
				Aquic Lithic Eutrudox
				Lithic Eutrudox
				Plinthaquic Eutrudox
				Plinthic Eutrudox
				Aquic Eutrudox
				Kandiudalfic Eutrudox
				Humic Inceptic Eutrudox
				Inceptic Eutrudox
				Humic Rhodic Eutrudox
				Humic Xanthic Eutrudox
				Humic Eutrudox
				Rhodic Eutrudox
				Xanthic Eutrudox
				Typic Eutrudox
			Haplotorrox	Petroferric Haplotorrox
				Lithic Haplotorrox
				Typic Haplotorrox
			Hapludox	Aquic Petroferric Hapludox
				Petroferric Hapludox
				Aquic Lithic Hapludox
				Lithic Hapludox
				Plinthaquic Hapludox
				Plinthic Hapludox
				Aquic Hapludox
				Inceptic Hapludox
				Andic Hapludox
				Humic Rhodic Hapludox
				Humic Xanthic Hapludox
				Humic Hapludox

				Rhodic Hapludox
				Xanthic Hapludox
				Typic Hapludox
			Kandiudox	Aquic Petroferric Kandiudox
				Petroferric Kandiudox
				Aquic Lithic Kandiudox
				Lithic Kandiudox
				Plinthaquic Kandiudox
				Plinthic Kandiudox
				Aquic Kandiudox
				Andic Kandiudox
				Humic Rhodic Kandiudox
				Humic Xanthic Kandiudox
				Humic Kandiudox
				Rhodic Kandiudox
				Xanthic Kandiudox
				Typic Kandiudox
			Sombriudox	Petroferric Sombriudox
				Lithic Sombriudox
				Typic Sombriudox
		Ustox	Acrustox	Aquic Petroferric Acrustox
				Petroferric Acrustox
				Aquic Lithic Acrustox
				Lithic Acrustox
				Anionic Aquic Acrustox
				Anionic Acrustox
				Plinthic Acrustox
				Aquic Acrustox
				Eutric Acrustox
				Humic Rhodic Acrustox
				Humic Xanthic Acrustox
				Humic Acrustox
				Rhodic Acrustox
				Xanthic Acrustox
				Typic Acrustox
			Eutrustox	Aquic Petroferric Eutrustox
				Petroferric Eutrustox
				Aquic Lithic Eutrustox
				Lithic Eutrustox
				Plinthaquic Eutrustox
				Plinthic Eutrustox
				Aquic Eutrustox
				Kandiustalfic Eutrustox
				Humic Inceptic Eutrustox
				Inceptic Eutrustox
				Humic Rhodic Eutrustox
				Humic Xanthic Eutrustox
				Humic Eutrustox
				Rhodic Eutrustox

				Xanthic Eutrustox
				Typic Eutrustox
			Haplustox	Aquic Petroferric Haplustox
				Petroferric Haplustox
				Aquic Lithic Haplustox
				Lithic Haplustox
				Plinthaquic Haplustox
				Plinthic Haplustox
				Aqueptic Haplustox
				Aquic Haplustox
				Oxyaquic Haplustox
				Inceptic Haplustox
				Humic Rhodic Haplustox
				Humic Xanthic Haplustox
				Humic Haplustox
				Rhodic Haplustox
				Xanthic Haplustox
				Typic Haplustox
			Kandiustox	Aquic Petroferric Kandiustox
				Petroferric Kandiustox
				Aquic Lithic Kandiustox
				Lithic Kandiustox
				Plinthaquic Kandiustox
				Plinthic Kandiustox
				Aquic Kandiustox
				Humic Rhodic Kandiustox
				Humic Xanthic Kandiustox
				Humic Kandiustox
				Rhodic Kandiustox
				Xanthic Kandiustox
				Typic Kandiustox
			Sombriustox	Petroferric Sombriustox
				Lithic Sombriustox
				Humic Sombriustox
				Typic Sombriustox
10	Spodosols	Aquods	Alaquods	Lithic Alaquods
				Duric Alaquods
				Histic Alaquods
				Alfic Arenic Alaquods
				Arenic Ultic Alaquods
				Arenic Umbric Alaquods
				Arenic Alaquods
				Grossarenic Alaquods
				Alfic Alaquods
				Ultic Alaquods
				Aeric Alaquods
				Typic Alaquods
			Cryaquods	Lithic Cryaquods
				Placic Cryaquods

				Duric Cryaquods
				Andic Cryaquods
				Entic Cryaquods
				Typic Cryaquods
			Duraquods	Histic Duraquods
				Andic Duraquods
				Typic Duraquods
			Endoaquods	Lithic Endoaquods
				Histic Endoaquods
				Andic Endoaquods
				Argic Endoaquods
				Umbric Endoaquods
				Typic Endoaquods
			Epiaquods	Lithic Epiaquods
				Histic Epiaquods
				Andic Epiaquods
				Alfic Epiaquods
				Ultic Epiaquods
				Umbric Epiaquods
				Typic Epiaquods
			Fragiaquods	Histic Fragiaquods
				Plagganthreptic Fragiaquods
				Argic Fragiaquods
				Typic Fragiaquods
			Placaquods	Andic Placaquods
				Typic Placaquods
		Cryods	Duricryods	Andic Duricryods
				Aquic Duricryods
				Oxyaquic Duricryods
				Humic Duricryods
				Typic Duricryods
			Haplocryods	Lithic Haplocryods
				Aquandic Haplocryods
				Andic Haplocryods
				Folistic Haplocryods
				Aquic Haplocryods
				Oxyaquic Haplocryods
				Entic Haplocryods
				Typic Haplocryods
			Humicryods	Lithic Humicryods
				Aquandic Humicryods
				Andic Humicryods
				Folistic Humicryods
				Aquic Humicryods
				Oxyaquic Humicryods
				Typic Humicryods
			Placocryods	Andic Placocryods
				Humic Placocryods
				Typic Placocryods
		Gelods	Haplogelods	Lithic Haplogelods

				Andic Haplogelods
				Aquic Haplogelod
				Turbic Haplogelods
				Typic Haplogelods
			Humigelods	Lithic Humigelods
				Andic Humigelods
				Aquic Humigelods
				Turbic Humigelods
				Typic Humigelods
		Humods	Durihumods	Andic Durihumods
				Typic Durihumods
			Fragihumods	Typic Fragihumods
			Haplohumods	Lithic Haplohumods
				Andic Haplohumods
				Plagganthreptic Haplohumods
				Typic Haplohumods
			Placohumods	Andic Placohumods
				Typic Placohumods
		Orthods	Alorthods	Oxyaquic Alorthods
				Arenic Ultic Alorthods
				Arenic Alorthods
				Entic Grossarenic Alorthods
				Entic Alorthods
				Grossarenic Alorthods
				Plagganthreptic Alorthods
				Alfic Alorthods
				Ultic Alorthods
				Typic Alorthods
			Durorthods	Andic Durorthods
				Typic Durorthods
			Fragiorthods	Aquic Fragiorthods
				Alfic Oxyaquic Fragiorthods
				Oxyaquic Fragiorthods
				Plagganthreptic Fragiorthods
				Alfic Fragiorthods
				Ultic Fragiorthods
				Entic Fragiorthods
				Typic Fragiorthods
			Haplorthods	Entic Lithic Haplorthods
				Lithic Haplorthods
				Fragiaquic Haplorthods
				Aqualfic Haplorthods
				Aquentic Haplorthods
				Aquic Haplorthods
				Alfic Oxyaquic Haplorthods
				Oxyaquic Ultic Haplorthods
				Fragic Haplorthods
				Lamellic Oxyaquic Haplorthods
				Lamellic Haplorthods

				Oxyaquic Haplorthods
				Andic Haplorthods
				Alfic Haplorthods
				Ultic Haplorthods
				Entic Haplorthods
				Typic Haplorthods
			Placorthods	Typic Placorthods
11	Ultisols	Aquults	Albaquults	Vertic Albaquults
				Kandic Albaquults
				Aeric Albaquults
				Typic Albaquults
			Endoaquults	Arenic Endoaquults
				Grossarenic Endoaquults
				Aeric Endoaquults
				Typic Endoaquults
			Epiaquults	Vertic Epiaquults
				Aeric Fragic Epiaquults
				Arenic Epiaquults
				Grossarenic Epiaquults
				Fragic Epiaquults
				Typic Epiaquults
				Aeric Epiaquults
			Fragiaquults	Aeric Fragiaquults
				Plinthic Fragiaquults
				Umbric Fragiaquults
				Typic Fragiaquults
			Kandiaquults	Acraquoxic Kandiaquults
				Arenic Plinthic Kandiaquults
				Arenic Umbric Kandiaquults
				Arenic Kandiaquults
				Grossarenic Kandiaquults
				Plinthic Kandiaquults
				Aeric Kandiaquults
				Umbric Kandiaquults
				Typic Kandiaquults
			Kanhaplaquults	Aquandic Kanhaplaquults
				Plinthic Kanhaplaquults
				Aeric Umbric Kanhaplaquults
				Aeric Kanhaplaquults
				Umbric Kanhaplaquults
				Typic Kanhaplaquults
			Paleaquults	Vertic Paleaquults
				Arenic Plinthic Paleaquults
				Arenic Umbric Paleaquults
				Arenic Paleaquults
				Grossarenic Paleaquults
				Plinthic Paleaquults
				Aeric Paleaquults
				Umbric Paleaquults
				Typic Paleaquults

			Plinthaquults	Kandic Plinthaquults
				Typic Plinthaquults
			Umbraquults	Plinthic Umbraquults
				Typic Umbraquults
		Humults	Haplohumults	Lithic Haplohumults
				Aquandic Haplohumults
				Aquic Haplohumults
				Andic Haplohumults
				Plinthic Haplohumults
				Typic Haplohumults
				Ustic Haplohumults
				Xeric Haplohumults
				Oxyaquic Haplohumults
			Kandihumults	Andic Ombroaquic Kandihumults
				Ustandic Kandihumults
				Andic Kandihumults
				Aquic Kandihumults
				Ombroaquic Kandihumults
				Plinthic Kandihumults
				Ustic Kandihumults
				Xeric Kandihumults
				Anthropic Kandihumults
				Typic Kandihumults
			Kanhaplohumults	Lithic Kanhaplohumults
				Ustandic Kanhaplohumults
				Andic Kanhaplohumults
				Aquic Kanhaplohumults
				Ombroaquic Kanhaplohumults
				Ustic Kanhaplohumults
				Xeric Kanhaplohumults
				Typic Kanhaplohumults
				Anthropic Kanhaplohumults
			Palehumults	Aquandic Palehumults
				Andic Palehumults
				Aquic Palehumults
				Plinthic Palehumults
				Oxyaquic Palehumults
				Ustic Palehumults
				Xeric Palehumults
				Typic Palehumults
			Plinthohumults	Typic Plinthohumults
			Sombrihumults	Typic Sombrihumults
		Udults	Fragiudults	Arenic Fragiudults
				Plinthaquic Fragiudults
				Glossaquic Fragiudults
				Aquic Fragiudults
				Plinthic Fragiudults
				Glossic Fragiudults
				Humic Fragiudults
				Typic Fragiudults

			Hapludults	Lithic-Ruptic-Entic Hapludults
				Lithic Hapludults
				Vertic Hapludults
				Fragiaquic Hapludults
				Aquic Arenic Hapludults
				Aquic Hapludults
				Fragic Hapludults
				Oxyaquic Hapludults
				Lamellic Hapludults
				Psammentic Hapludults
				Arenic Hapludults
				Grossarenic Hapludults
				Inceptic Hapludults
				Humic Hapludults
				Typic Hapludults
			Kandiudults	Arenic Plinthaquic Kandiudults
				Aquic Arenic Kandiudults
				Arenic Plinthic Kandiudults
				Arenic Rhodic Kandiudults
				Arenic Kandiudults
				Grossarenic Plinthic Kandiudults
				Grossarenic Kandiudults
				Acrudoxic Plinthic Kandiudults
				Acrudoxic Kandiudults
				Plinthaquic Kandiudults
				Aquandic Kandiudults
				Andic Kandiudults
				Aquic Kandiudults
				Plinthic Kandiudults
				Ombroaquic Kandiudults
				Oxyaquic Kandiudults
				Sombric Kandiudults
				Rhodic Kandiudults
				Typic Kandiudults
			Kanhapludults	Lithic Kanhapludults
				Plinthaquic Kanhapludults
				Arenic Plinthic Kanhapludults
				Arenic Kanhapludults
				Acrudoxic Kanhapludults
				Fragiaquic Kanhapludults
				Andic Kanhapludults
				Aquic Kanhapludults
				Ombroaquic Kanhapludults
				Oxyaquic Kanhapludults
				Plinthic Kanhapludults
				Fragic Kanhapludults
				Rhodic Kanhapludults
				Typic Kanhapludults
			Paleudults	Vertic Paleudults

				Spodic Paleudults
				Arenic Plinthaquic Paleudults
				Aquic Arenic Paleudults
				Anthraquic Paleudults
				Plinthaquic Paleudults
				Fragiaquic Paleudults
				Aquic Paleudults
				Oxyaquic Paleudults
				Lamellic Paleudults
				Arenic Plinthic Paleudults
				Psammentic Paleudults
				Grossarenic Plinthic Paleudults
				Plinthic Paleudults
				Arenic Rhodic Paleudults
				Arenic Paleudults
				Grossarenic Paleudults
				Fragic Paleudults
				Rhodic Paleudults
				Typic Paleudults
			Plinthudults	Typic Plinthudults
			Rhodudults	Lithic Rhodudults
				Psammentic Rhodudults
				Typic Rhodudults
		Ustults	Haplustults	Lithic Haplustults
				Petroferric Haplustults
				Aquic Haplustults
				Arenic Haplustults
				Ombroaquic Haplustults
				Plinthic Haplustults
				Kanhaplic Haplustults
				Typic Haplustults
			Kandiustults	Acrustoxic Kandiustults
				Aquic Kandiustults
				Arenic Plinthic Kandiustults
				Arenic Kandiustults
				Udandic Kandiustults
				Andic Kandiustults
				Plinthic Kandiustults
				Aridic Kandiustults
				Udic Kandiustults
				Rhodic Kandiustults
				Typic Kandiustults
			Kanhaplustults	Lithic Kanhaplustults
				Acrustoxic Kanhaplustults
				Aquic Kanhaplustults
				Arenic Kanhaplustults
				Udandic Kanhaplustults
				Andic Kanhaplustults
				Plinthic Kanhaplustults

				Ombroaquic Kanhaplustults
				Aridic Kanhaplustults
				Udic Kanhaplustults
				Rhodic Kanhaplustults
				Typic Kanhaplustults
			Paleustults	Typic Paleustults
			Plinthustults	Plinthustults
				Haplic Plinthustults
				Typic Plinthustults
			Rhodustults	Rhodustults
				Lithic Rhodustults
				Psammentic Rhodustults
				Typic Rhodustults
		Xerults	Haploxerults	Lithic Ruptic-Inceptic Haploxerults
				Lithic Haploxerults
				Aquic Haploxerults
				Andic Haploxerults
				Lamellic Haploxerults
				Psammentic Haploxerults
				Arenic Haploxerults
				Grossarenic Haploxerults
				Typic Haploxerults
			Palexerults	Aquandic Palexerults
				Aquic Palexerults
				Andic Palexerults
				Typic Palexerults
12	Vertisols	Aquerts	Calciaquerts	Aeric Calciaquerts
				Typic Calciaquerts
			Duraquerts	Aridic Duraquerts
				Xeric Duraquerts
				Ustic Duraquerts
				Aeric Duraquerts
				Chromic Duraquerts
				Typic Duraquerts
			Dystraquerts	Sulfaqueptic Dystraquerts
				Aridic Dystraquerts
				Ustic Dystraquerts
				Aeric Dystraquerts
				Leptic Dystraquerts
				Entic Dystraquerts
				Chromic Dystraquerts
				Typic Dystraquerts
			Endoaquerts	Halic Endoaquerts
				Sodic Endoaquerts
				Aridic Endoaquerts
				Xeric Endoaquerts
				Ustic Endoaquerts
				Aeric Endoaquerts
				Leptic Endoaquerts
				Entic Endoaquerts

				Chromic Endoaquerts
				Typic Endoaquerts
			Epiaquerts	Halic Epiaquerts
				Sodic Epiaquerts
				Aridic Epiaquerts
				Xeric Epiaquerts
				Ustic Epiaquerts
				Aeric Epiaquerts
				Leptic Epiaquerts
				Entic Epiaquerts
				Chromic Epiaquerts
				Typic Epiaquerts
			Natraquerts	Typic Natraquerts
			Salaquerts	Aridic Salaquerts
				Ustic Salaquerts
				Leptic Salaquerts
				Entic Salaquerts
				Chromic Salaquerts
				Typic Salaquerts
			Sulfaquerts	Salic Sulfaquerts
				Sulfic Sulfaquerts
				Typic Sulfaquerts
		Cryerts	Haplocryerts	Sodic Haplocryerts
				Chromic Haplocryerts
				Typic Haplocryerts
			Humicryerts	Sodic Humicryerts
				Typic Humicryerts
		Torrerts	Calcitorrerts	Petrocalcic Calcitorrerts
				Leptic Calcitorrerts
				Entic Calcitorrerts
				Chromic Calcitorrerts
				Typic Calcitorrerts
			Gypsitorrerts	Chromic Gypsitorrerts
				Typic Gypsitorrerts
			Haplotorrerts	Halic Haplotorrerts
				Sodic Haplotorrerts
				Leptic Haplotorrerts
				Entic Haplotorrerts
				Chromic Haplotorrerts
				Typic Haplotorrerts
			Salitorrerts	Aquic Salitorrerts
				Leptic Salitorrerts
				Entic Salitorrerts
				Chromic Salitorrerts
				Typic Salitorrerts
		Uderts	Dystruderts	Aquic Dystruderts
				Oxyaquic Dystruderts
				Leptic Dystruderts
				Entic Dystruderts
				Chromic Dystruderts

				Typic Dystruderts
			Hapluderts	Lithic Hapluderts
				Aquic Hapluderts
				Oxyaquic Hapluderts
				Leptic Hapluderts
				Entic Hapluderts
				Chromic Hapluderts
				Typic Hapluderts
		Usterts	Calciusterts	Lithic Calciusterts
				Lithic Calciusterts
				Sodic Calciusterts
				Petrocalcic Calciusterts
				Aridic Calciusterts
				Udic Calciusterts
				Leptic Calciusterts
				Entic Calciusterts
				Chromic Calciusterts
				Typic Calciusterts
			Dystrusterts	Lithic Dystrusterts
				Aquic Dystrusterts
				Aridic Dystrusterts
				Udic Dystrusterts
				Leptic Dystrusterts
				Entic Dystrusterts
				Chromic Dystrusterts
				Typic Dystrusterts
			Gypsiusterts	Lithic Gypsiusterts
				Halic Gypsiusterts
				Sodic Gypsiusterts
				Aridic Gypsiusterts
				Udic Gypsiusterts
				Leptic Gypsiusterts
				Entic Gypsiusterts
				Chromic Gypsiusterts
				Typic Gypsiusterts
			Haplusterts	Lithic Haplusterts
				Halic Haplusterts
				Sodic Haplusterts
				Petrocalcic Haplusterts
				Gypsic Haplusterts
				Calcic Haplusterts
				Aridic Leptic Haplusterts
				Aridic Haplusterts
				Leptic Udic Haplusterts
				Entic Udic Haplusterts
				Chromic Udic Haplusterts
				Udic Haplusterts
				Leptic Haplusterts
				Entic Haplusterts

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				Chromic Haplusterts
				Typic Haplusterts
			Salusterts	Lithic Salusterts
				Sodic Salusterts
				Aquic Salusterts
				Aridic Salusterts
				Leptic Salusterts
				Entic Salusterts
				Chromic Salusterts
				Typic Salusterts
		Xererts	Calcixererts	Lithic Calcixererts
				Petrocalcic Calcixererts
				Aridic Calcixererts
				Leptic Calcixererts
				Entic Calcixererts
				Chromic Calcixererts
				Typic Calcixererts
			Durixererts	Halic Durixererts
				Sodic Durixererts
				Aquic Durixererts
				Aridic Durixererts
				Udic Durixererts
				Haplic Durixererts
				Chromic Durixererts
				Typic Durixererts
			Haploxererts	Lithic Haploxererts
				Halic Haploxererts
				Sodic Haploxererts
				Aridic Haploxererts
				Aquic Haploxererts
				Udic Haploxererts
				Leptic Haploxererts
				Entic Haploxererts
				Chromic Haploxererts
				TypicHaploxererts