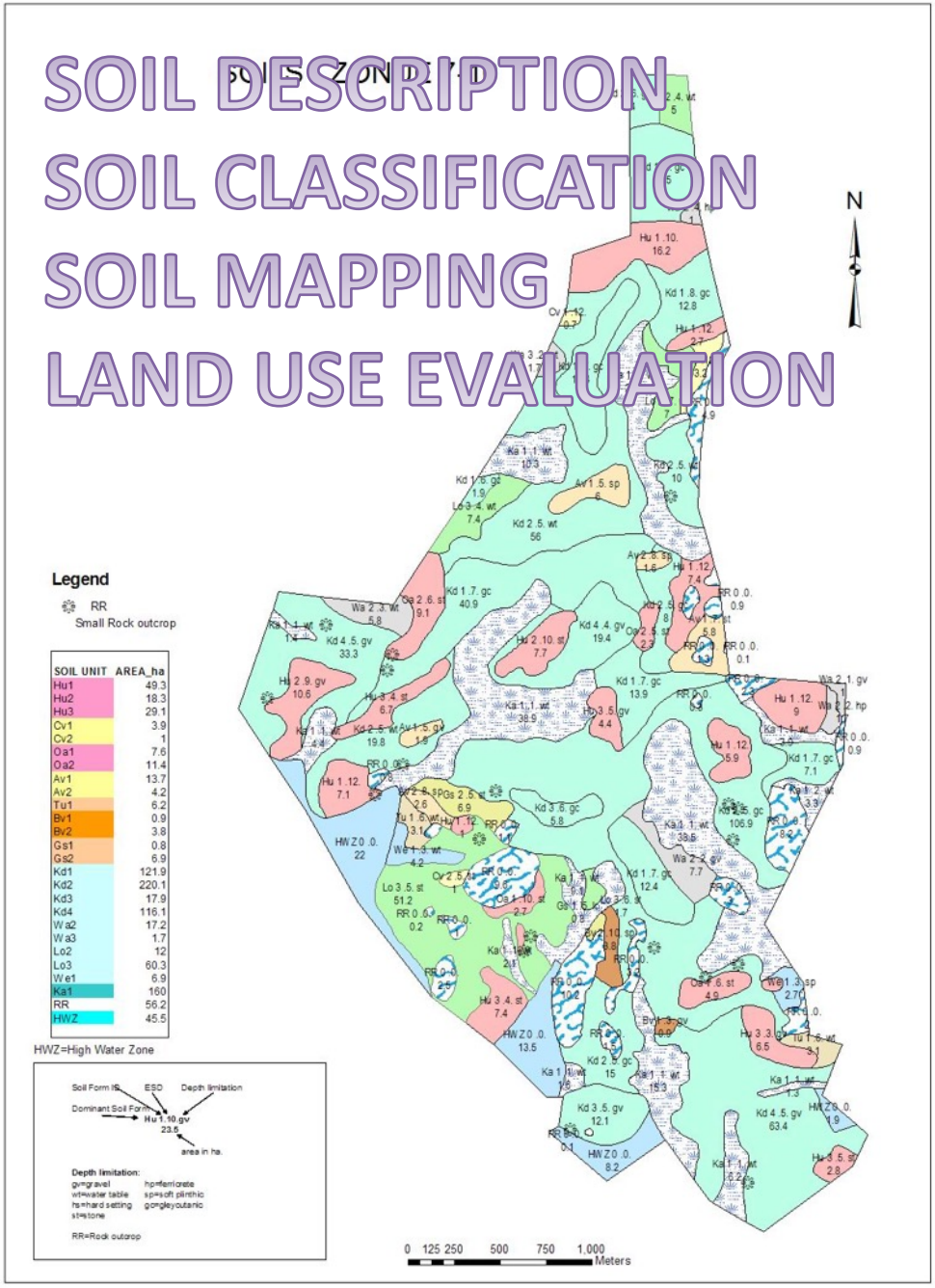
SOIL SURVEYS
SOIL CLASSIFICATION & MAPPING

Gavin Schafer

Pr.Sci.Nat., MSc.(Soil Sci)., Dip.For.

SOIL DESCRIPTION
SOIL CLASSIFICATION
SOIL MAPPING
LAND USE EVALUATION



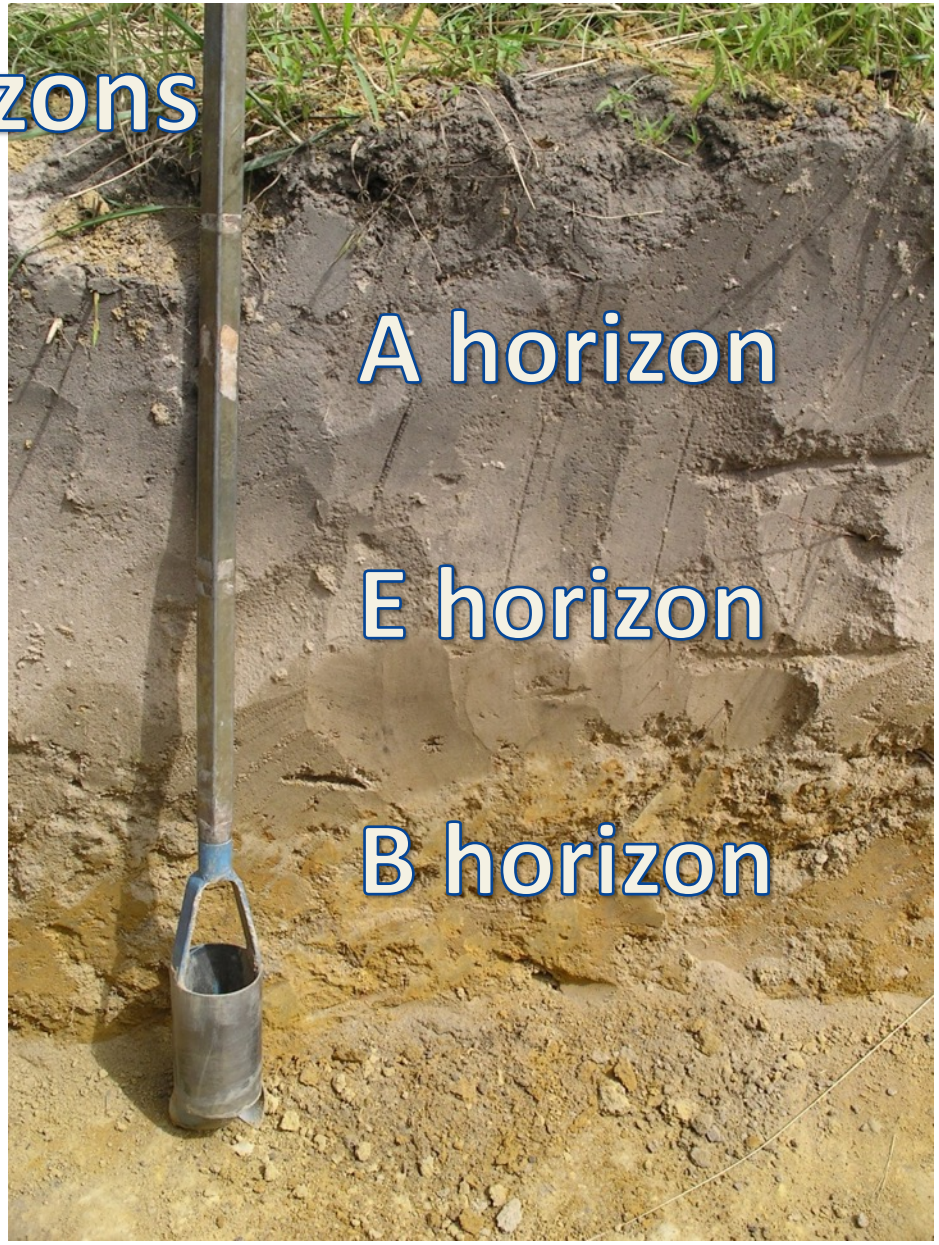

• Land use planning
• Land preparation
• Fertilization
• Irrigation planning

SOIL DESCRIPTION

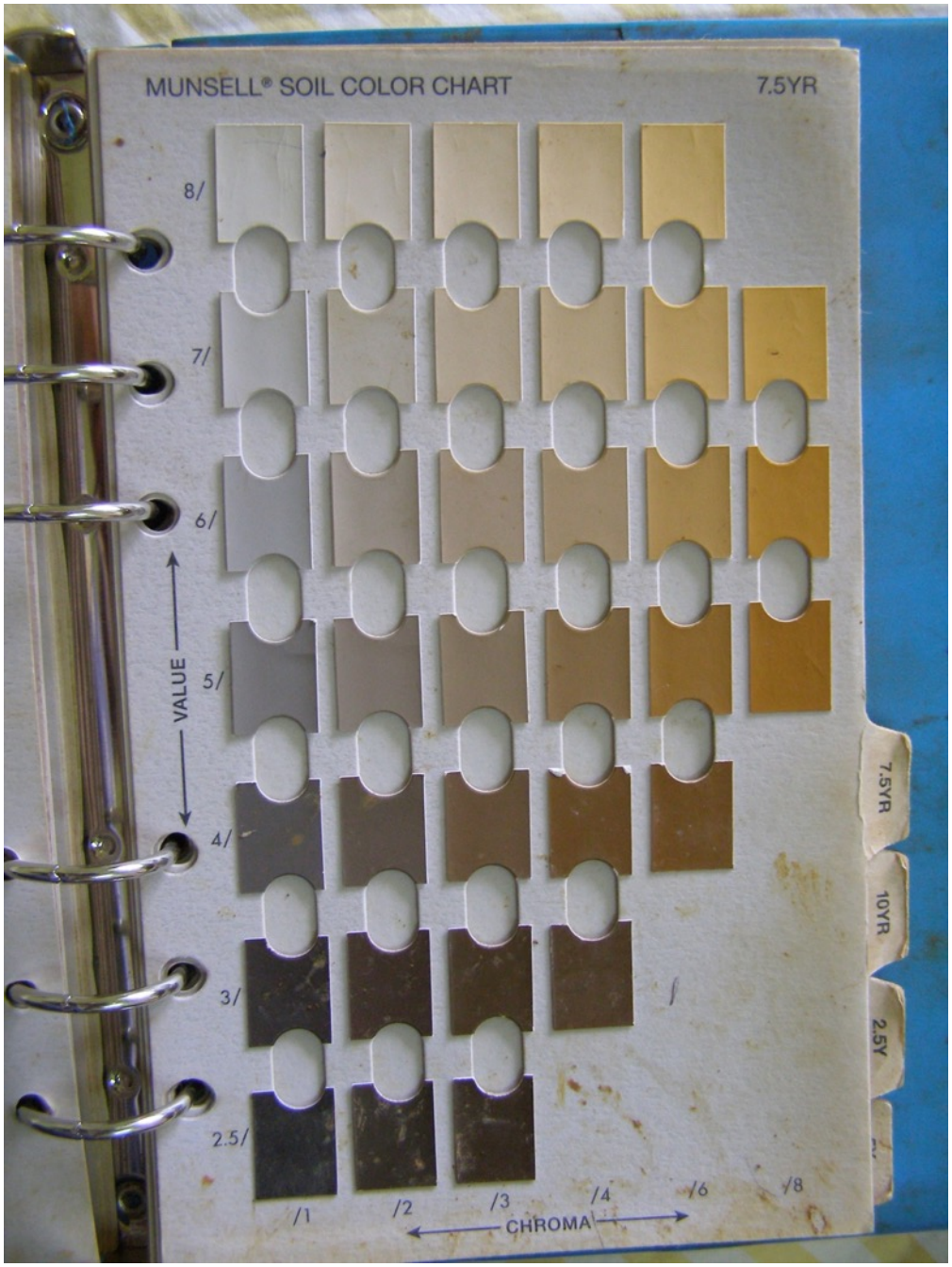
HORIZONS

- Depth
- Colour
- Texture
- Consistency
- Structure
- Coarse fragments
- Mottles
- Cutans
- Permeability
- transition

Master Horizons



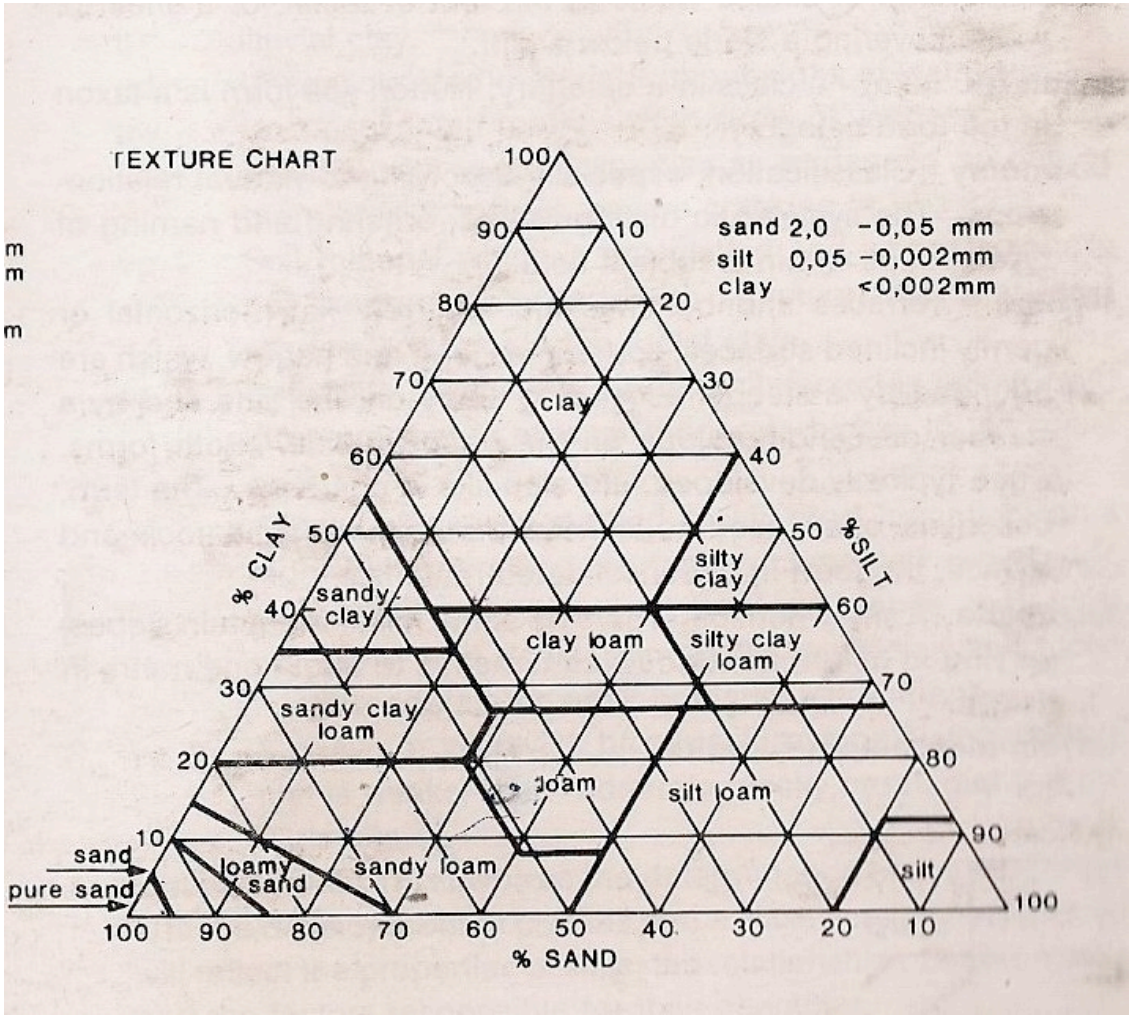
Soil colour use MUNSELL soil colour charts



texture

e.g
Clay=35%
Silt=36%
Sand=29%

=clay loam



structure

- Crumb
- Blocky
- Prismatic
- platy
- columnar

Crumb structure

Strong blocky to prismatic structure in a vertic soil

consistency

1 =soft /Very friable to friable

2=slightly firm

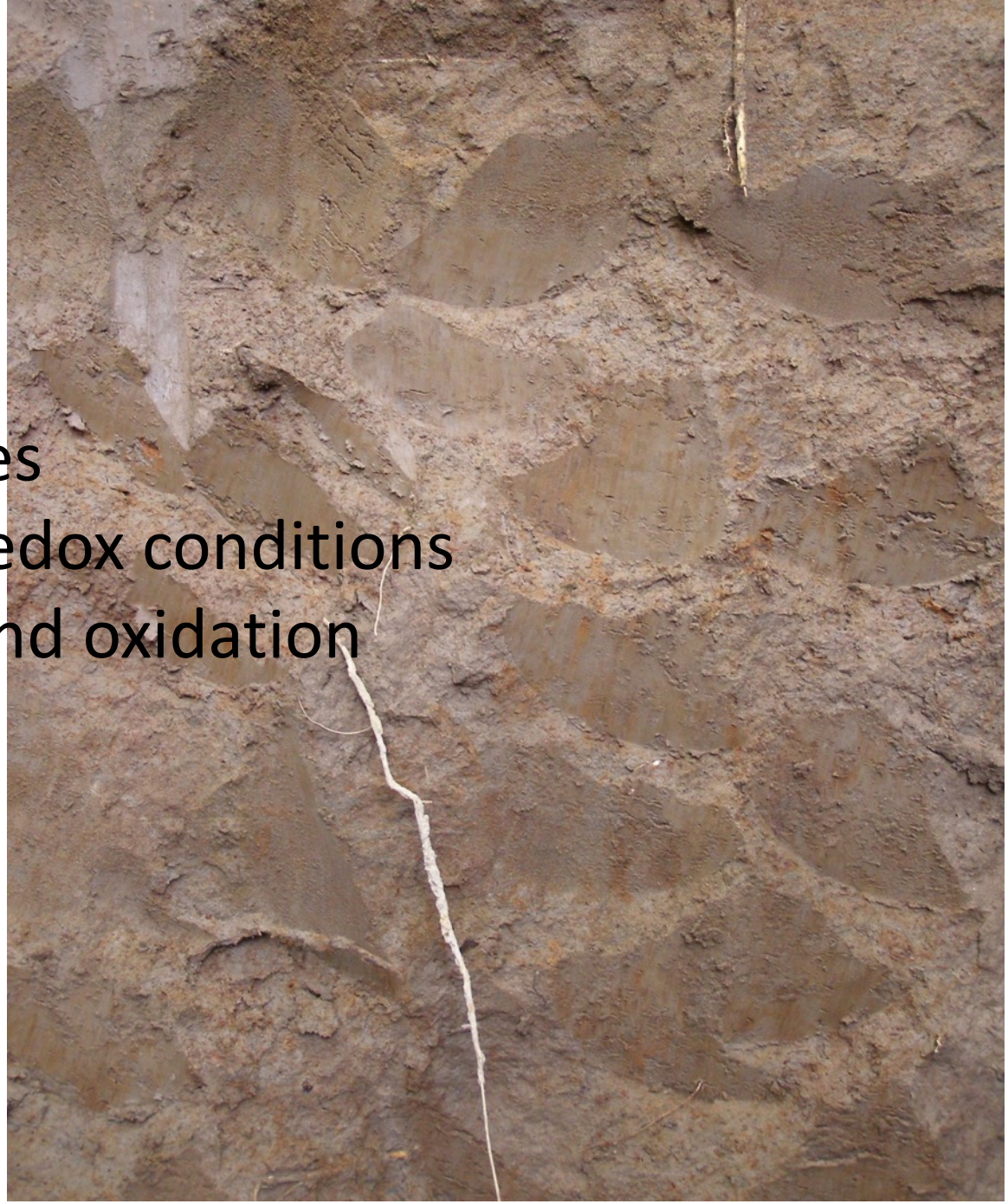
3= hard/firm

4=very hard/very firm

5= extremely hard

mottles

Rusty mottles
Caused by redox conditions
Reduction and oxidation

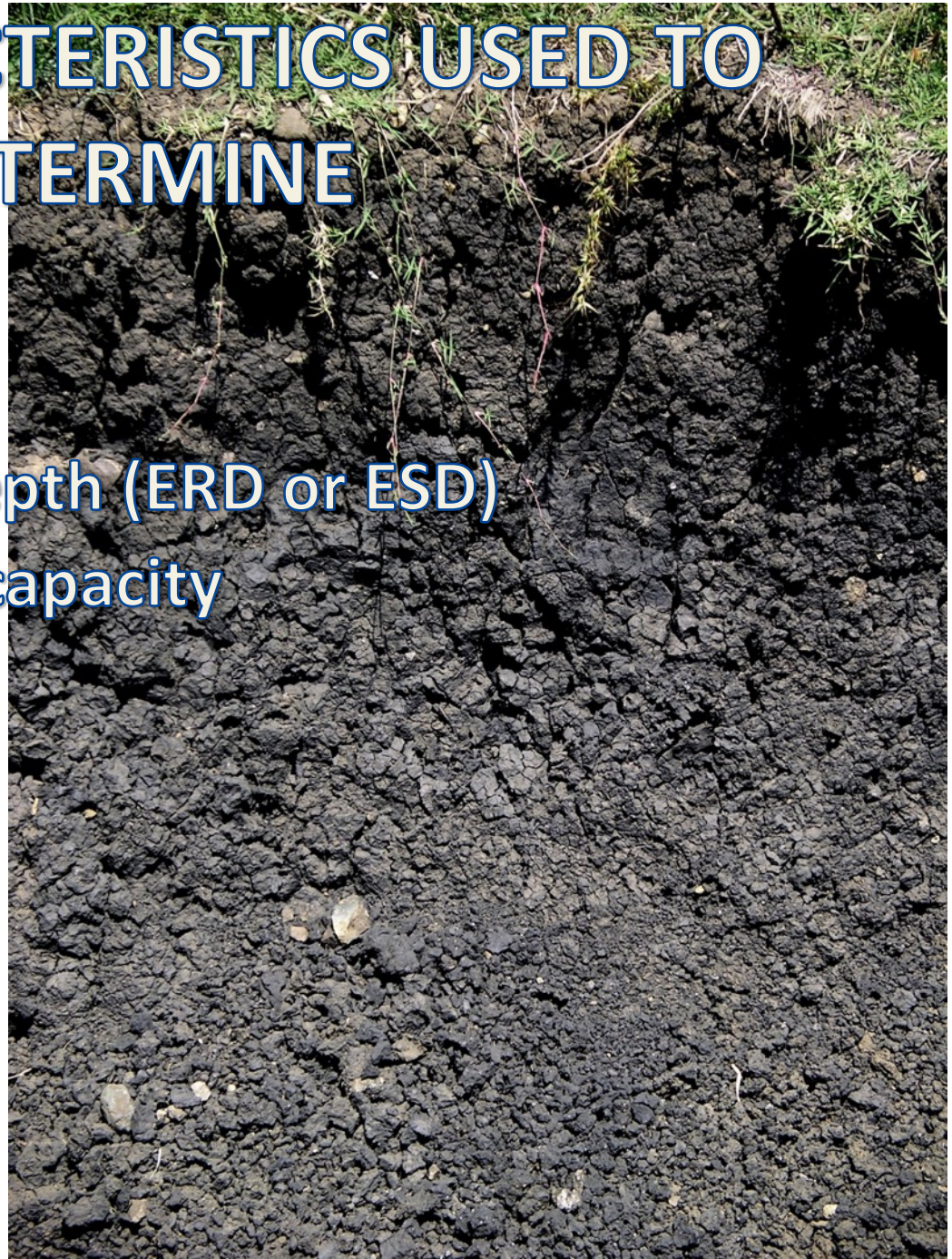


Transition

Gradual

Clear
abrupt

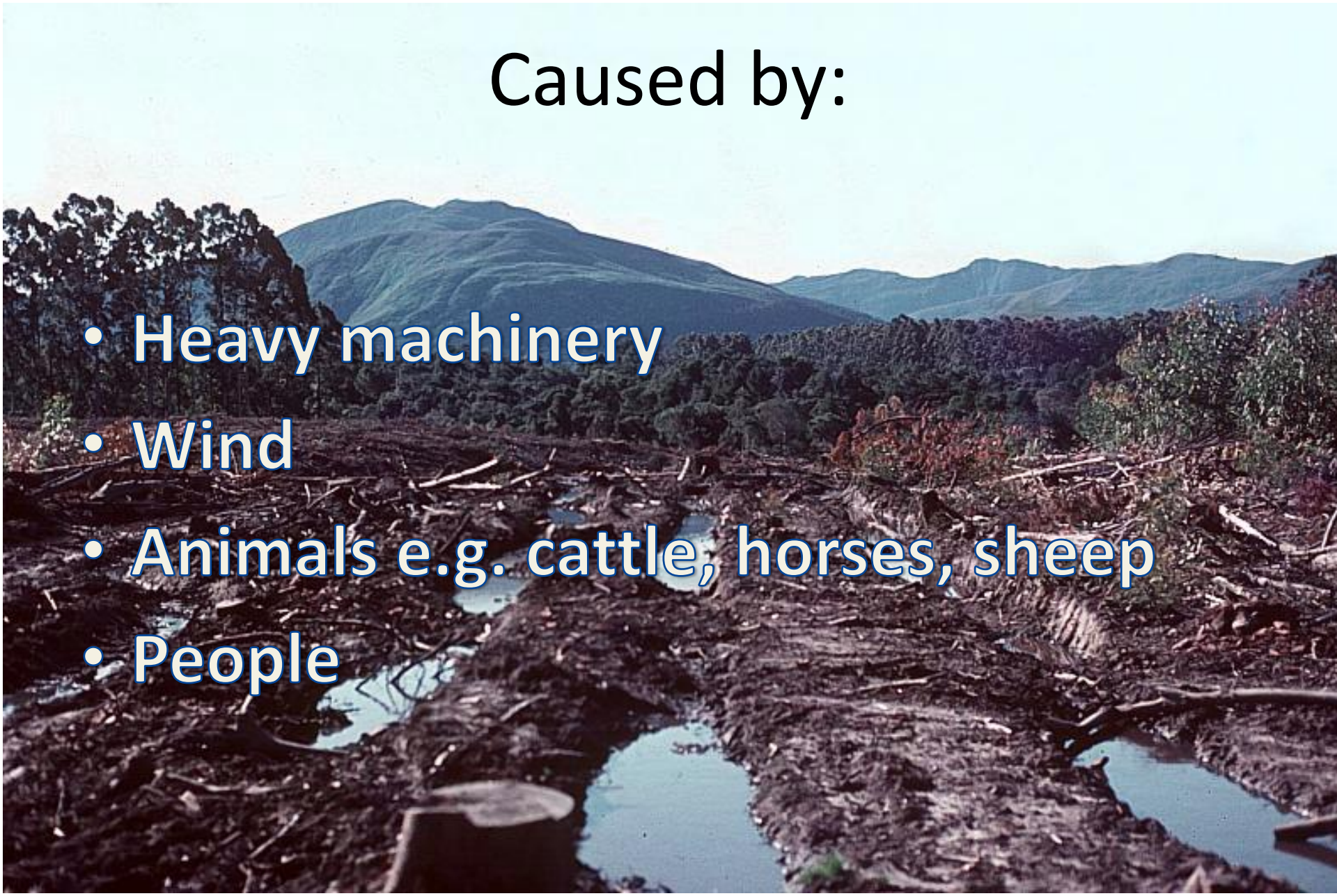
SOIL CHARACTERISTICS USED TO DETERMINE



- Effective rooting depth (ERD or ESD)
- Soil water holding capacity
- Drainage
- Water infiltration
- Erosion hazard
- Compaction hazard

COMPACTION

Caused by:



- Heavy machinery
- Wind
- Animals e.g. cattle, horses, sheep
- People

Soil compaction amelioration

- Ripping with single tine or single winged tine to 1 m
- Single rip line
- Cross rip

Ripping is done when soil is dry to shatter massive soil structure

and to prevent soil smearing

Duplex sodic soil Sterkspruit form

Dispersive; highly prone to erosion

Topsoil loss on sodic duplex soil

ERD

Gmelina arborea

Most rooting in A horizon

Rooting of Jatropha curcus due to depth restrictions

Boophone disticha

SOIL CLASSIFICATION

- FAO (WRB)
- USDA Soil Taxonomy
- Australia – Northcote
- NZ
- SA Taxonomic classification

SA Taxonomic classification

SOIL FORM

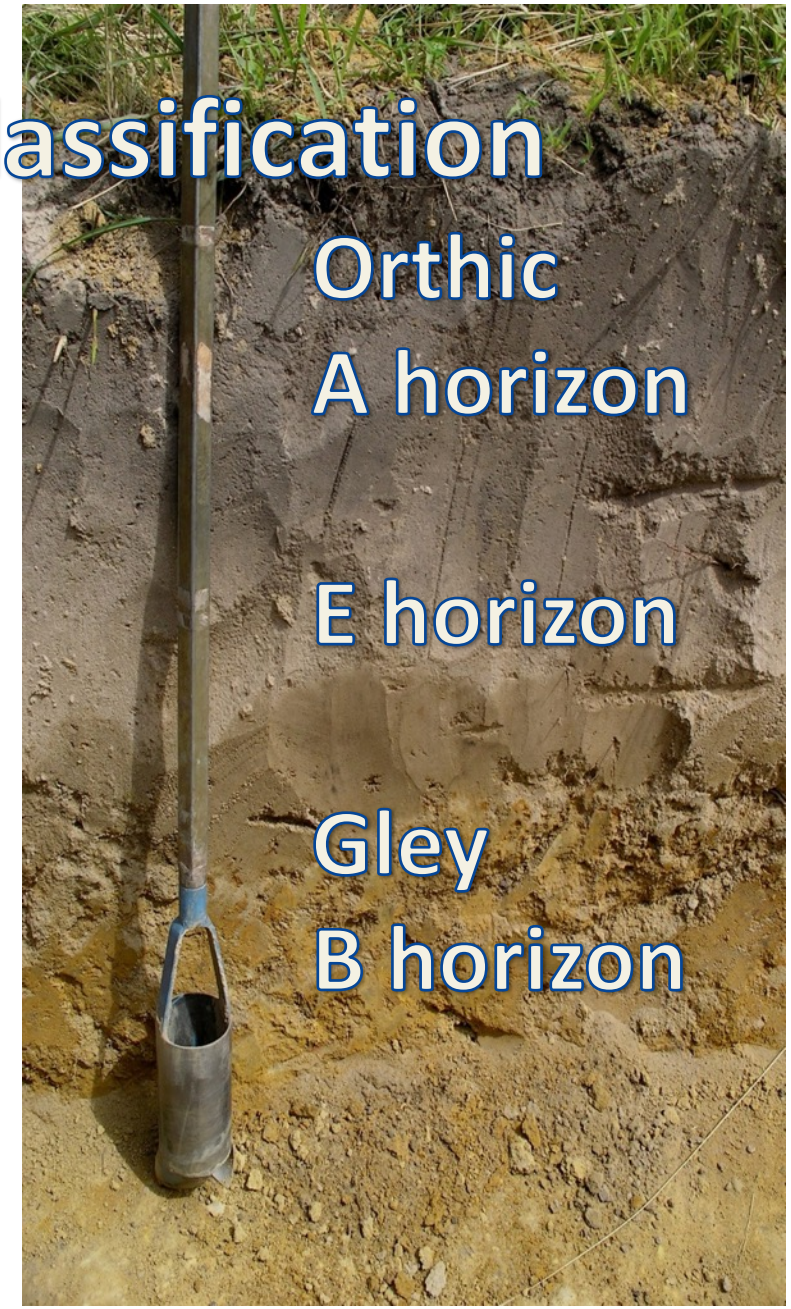
Based on DIAGNOSTIC horizons:

Orthic A

E

Gley B

=Kroonstad form



MAGWA form

INANDA form

Humic A

Red apedal B

SWEETWATER form

HUMIC A

NEOCUTANIC B

Fernwood form

Orthic A

E horizon

Unspecified

CHAMPAGNE FORM – Ch

Bonheim Form

Melanic A

Pedocutanic B

SOIL FAMILY

- Based on various characteristics such as:

- How thick is A horizon
- How hard is B horizon
- How wet is B horizon
- Luvic – non-luvic

e.g **Magwa 1100**

SOIL FAMILIES

1000 Humic A horizon thin

Non-luvic B1 horizon	**1100**	**GLENESK**
Luvic B1 horizon	**1200**	**CONNEMARA**

2000 Humic A horizon thick

Non-luvic B1 horizon	**2100**	**LAMBASI**
Luvic B1 horizon	**2200**	**NTSUBANE**

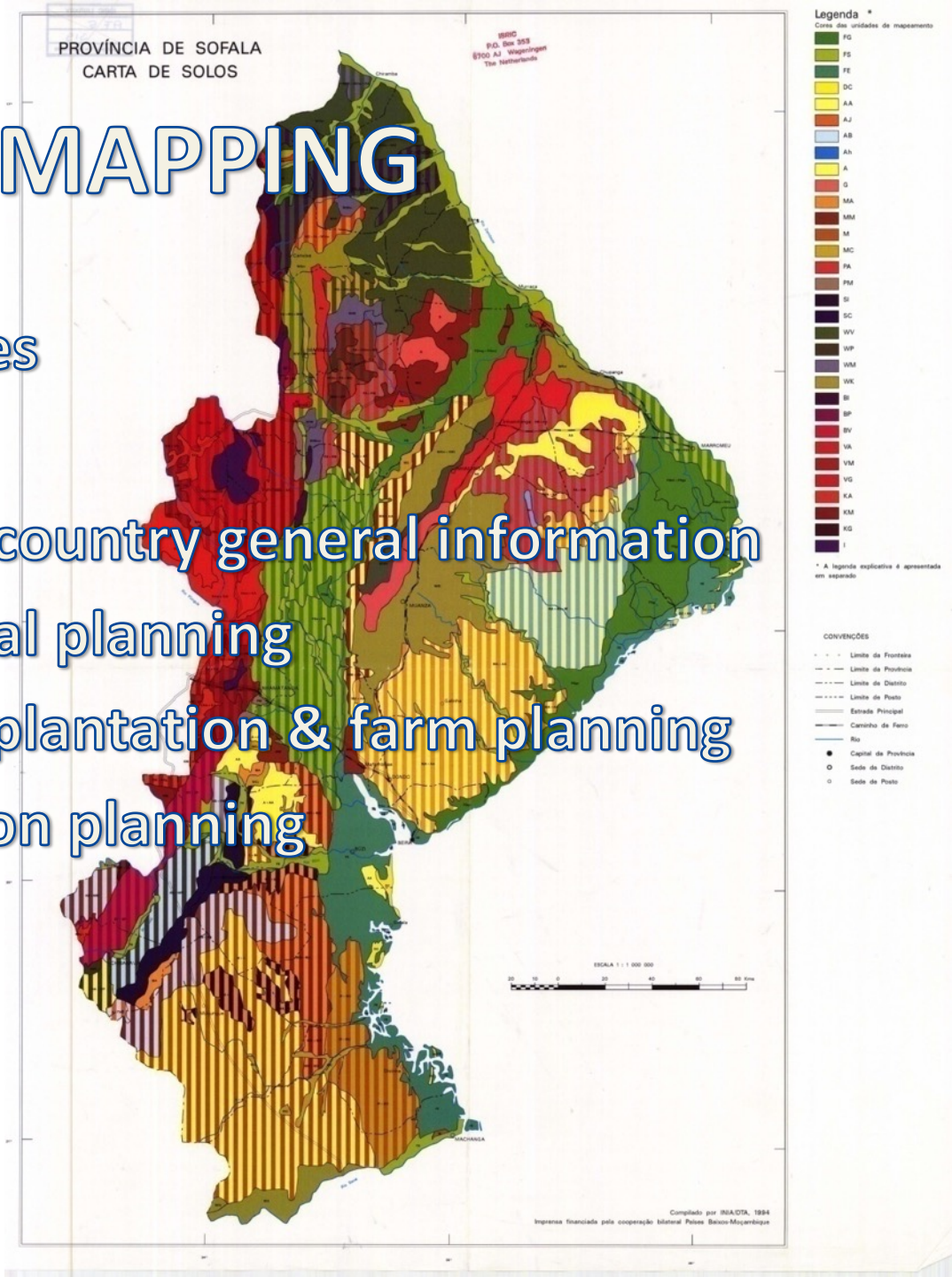
Note

The colour of the yellow-brown apedal B horizon in the example with a thin humic A horizon i
10YR 3/4 (moist) and 10YR 4/4 (dry); the yellow-brown apedal B horizon merges to feldspathi
Beaufort sandstone saprolite.

SOIL MAPPING

Common Mapping scales

- 1:1 000 000 Whole country general information
- 1:50 000 Regional planning
- 1:10 000 Forest plantation & farm planning
- 1:5 000 Irrigation planning



Soil data collection

- Soil auger and/or soil pits
- Free survey
- Grid survey

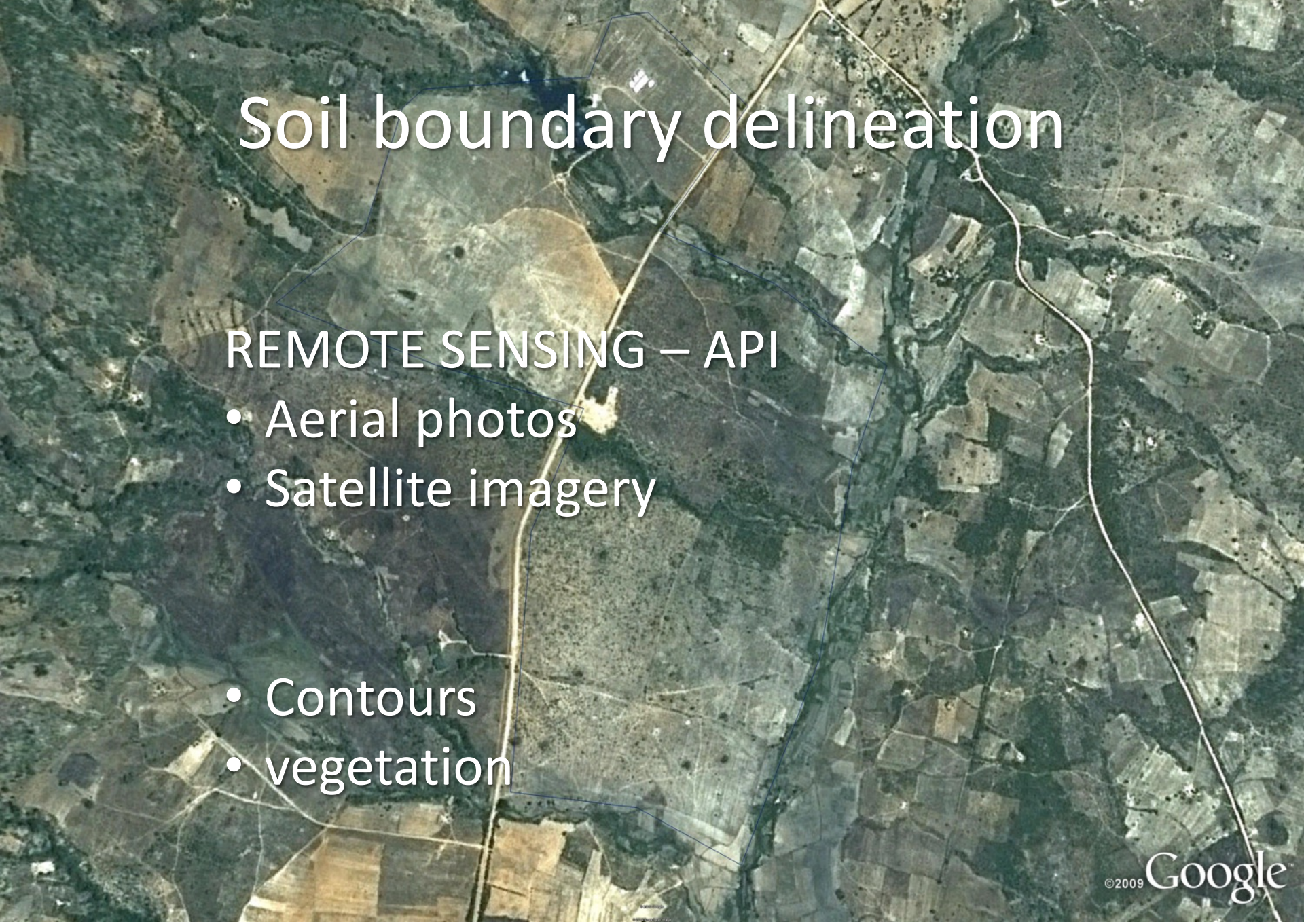
Reconnaissance	300 to 500 m espacement
Dryland crops & forestry	150x 150 m grid
Irrigated crops	50 x 50 m grid

From each soil auger the following data is collected:

Soil obs data

OBS	FORM	FAMILY	TSD	ESD	LTN	W	LITH	R	R 1	HOR1	DPTH	COL1	CL1	SG1	CON1	STR1	STO1	HOR2	DPTH	COL2	CL2	SG
2	Ma	1100	120	120			B	1		A	30	5YR43	36	f	1	mmc		B1	60	75YR44	38	f
1	Ma	1100	120	120			B	1		A	31	75YR43	36	f	1	mmc		B1	60	75YR43	38	f
3	Ma	1200	120	120			B	1		A	30	75YR34	30	f	1	mmc		B1	60	10YR33	45	f
4	Ma	1100	120	120			B	1		A	30	75YR32	45	f	1	mmc		B1	60	75YR43	50	f
5	Ma	1100	120	120			B	1		A	30	75YR34	36	f	1	mmc		B1	60	75YR44	38	f
6	Ma	1100	120	120			B	1		A	30	75YR34	36	f	1	mmc		B1	60	75YR44	38	f
7	Ma	1100	120	120			B	1		A	30	75YR32	35	f	1	mmc		B1	60	75YR32	50	f
8	Ma	1100	120	120			B	1		A	30	75YR34	35	f	1	mmc		B1	60	75YR44	55	f
9	Ma	1100	120	120			B	1		A	30	75YR33	45	f	1	mmc		B1	60	75YR33	50	f
10	Ma	1100	120	120			B	1		A	30	75YR32	30	f	1	mmc		B1	60	75YR32	45	f
11	Ma	1100	120	120			B	1		A	30	75YR32	40	f	1	mmc		B1	60	75YR43	50	f
12	Sr	1110	120	120			B	1		A	30	75YR32	35	f	1	mmc		B1	60	75YR32	45	f
13	Ma	1100	120	120			B	1		A	30	75YR33	45	f	1	mmc		B1	60	75YR43	50	f
14	Ma	1100	120	120			B	1		A	30	75YR31	26	f	1	mmc		B1	60	75YR46	45	f
15	Ma	1100	120	120			B	1		A	30	75YR33	36	f	1	mmc		B1	60	75YR43	50	f
16	Ma	1100	120	120			B	1		A	30	75YR33	45	f	1	mmc		B1	60	75YR44	50	f
17	Ma	1100	120	120			B	1		A	30	75YR33	36	f	1	mmc		B1	60	75YR33	45	f
18	Ma	1100	120	120			B	1		A	30	75YR32	36	f	1	mmc		B1	60	75YR44	45	f
19	Ma	1100	120	120			B	1		A	30	75YR32	33	f	1	mmc		B1	60	75YR44	45	f

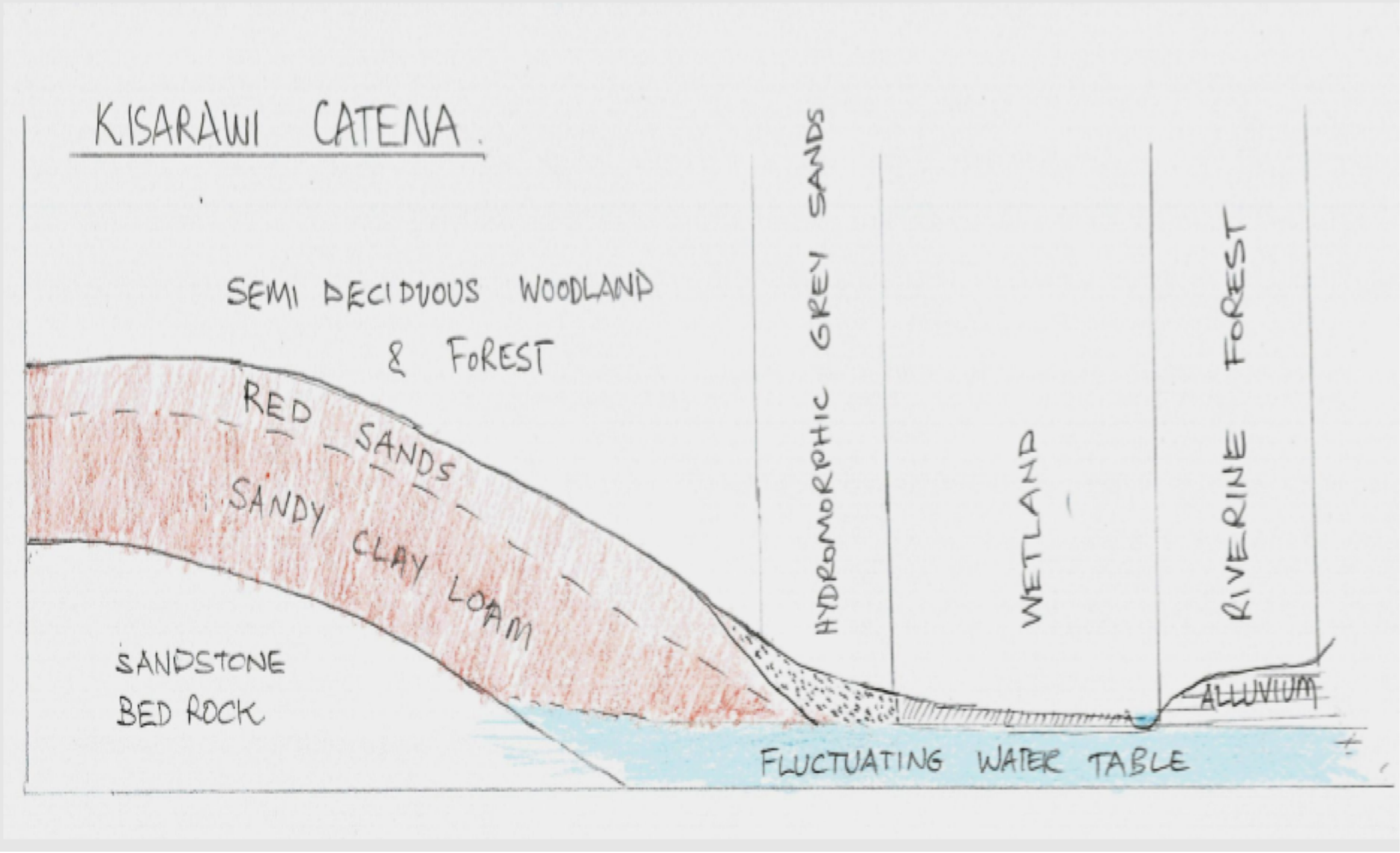
Soil boundary delineation

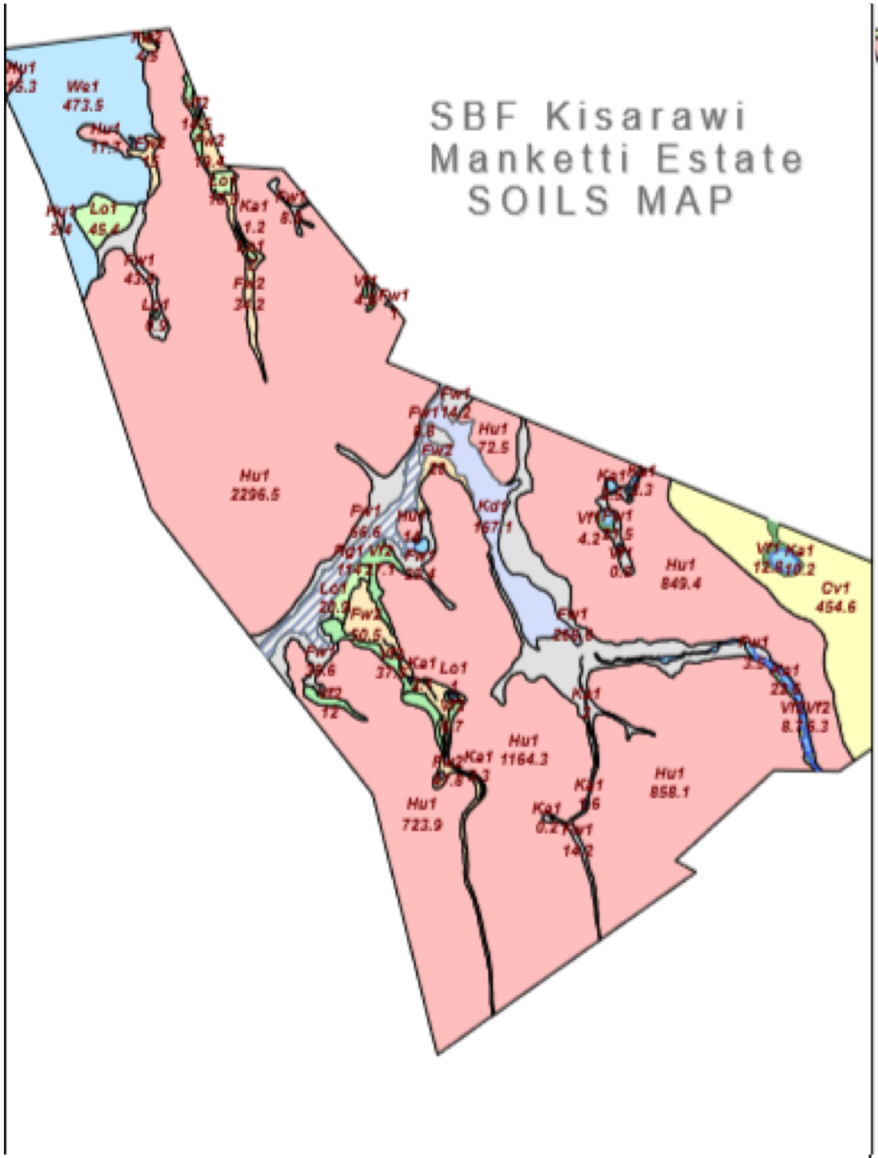


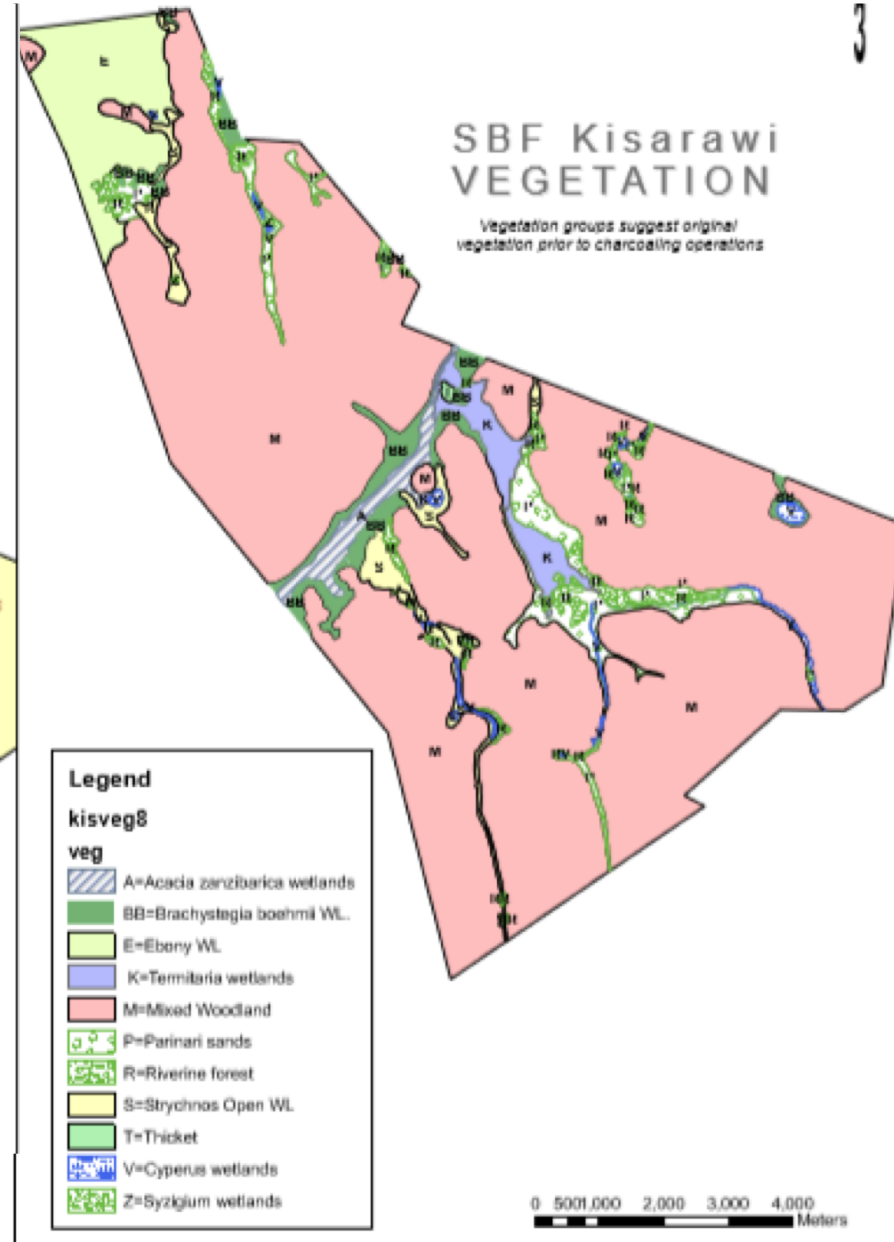
REMOTE SENSING – API

- Aerial photos
- Satellite imagery

- Contours
- vegetation


KISARAWI CATENA
SEMI DECIDUOUS WOODLAND
& FOREST
RED SANDS
SANDY CLAY LOAM
SANDSTONE
BED ROCK
HYDROMORPHIC GREY SANDS
WETLAND
RIVERINE FOREST
ALLUVIUM
FLUCTUATING WATER TABLE


SBF Kisarawi
Manketti Estate
SOILS MAP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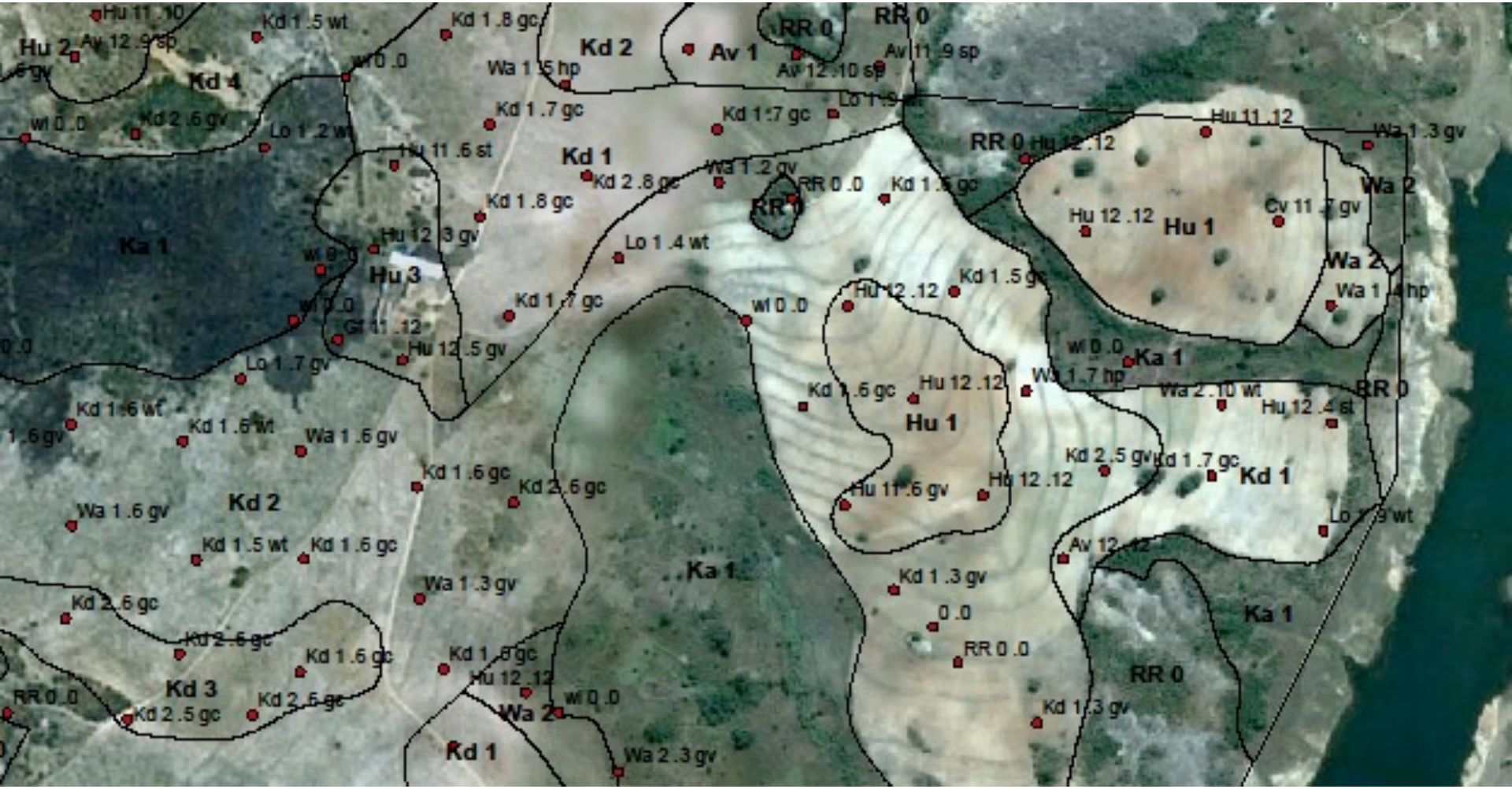
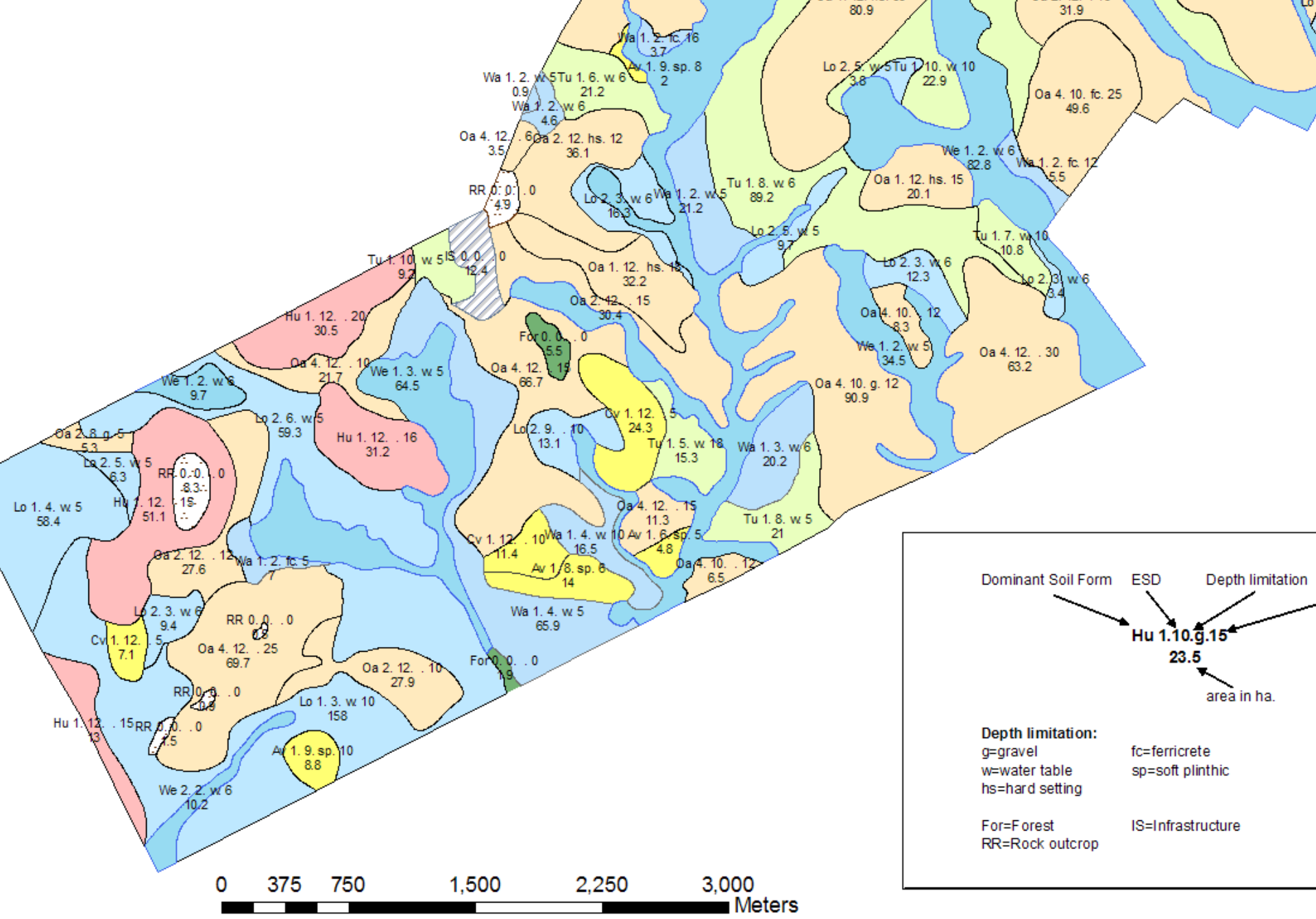
SBF Kisarawi
VEGETATION
Vegetation groups suggest original vegetation prior to charcoaling operations
Legend
kisveg8
veg
A=Acacia zanzibarica wetlands
BB=Brachystegia boehmii WL.
E=Ebony WL
K=Termitaria wetlands
M=Mixed Woodland
P=Parinari sands
R=Riverine forest
S=Strychnos Open WL
T=Thicket
V=Cyperus wetlands
Z=Syzigium wetlands
0 5001,000 2,000 3,000 4,000
Meters

Soil map drawn from selected soil auger data

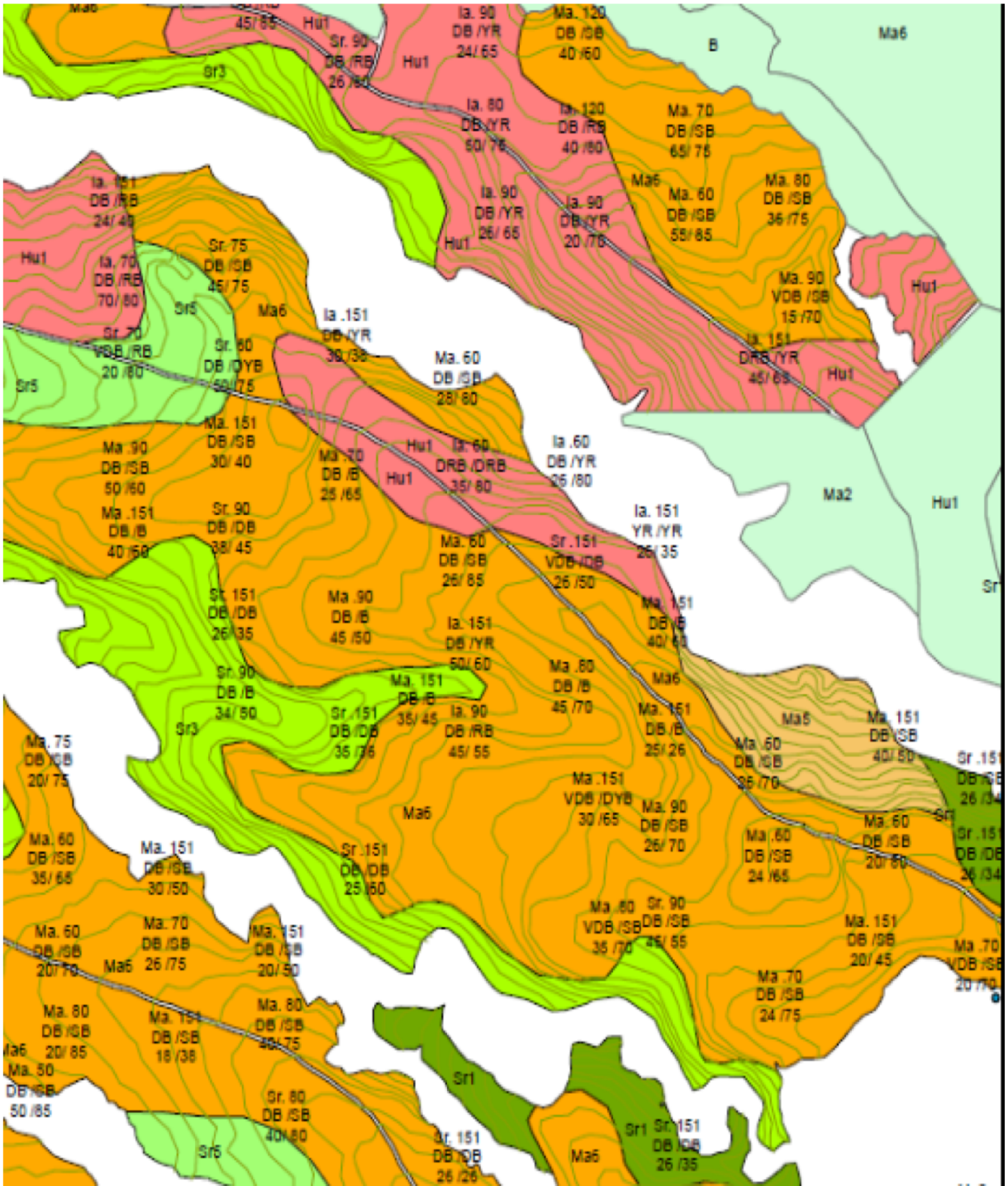



Dominant Soil Form
ESD
Depth limitation
Hu 1.10.g.15
23.5
area in ha.
Depth limitation:
g=gravel
w=water table
hs=hard setting
fc=ferricrete
sp=soft plinthic
For=Forest
RR=Rock outcrop
IS=Infrastructure
0
375
750
1,500
2,250
3,000
Meters

GIS soil map unit data

SOIL UNIT	TERRAIN	SLOPE GRADIENT	DOMINANT SOIL	SUB-DOMINANT SOIL	ESD	TSD	DEPTH LIM.	CLAY A_HOR	CLAY B_HOR	COMP. HAZARD	RATINGS GMEA	TECG
Ma 1	1	1(2)	Magwa 1100	Magwa 1200	40	120	d	40	60	VH	L	L
Ma 2	3(4)	2(3)	Magwa 1100	Magwa 1200	120	120		45	55	VH	M	M
Ma 3	3(4)	3(4)	Magwa 1100	Sweetwater 1110	90-120	120	st	26	35	H	MH	MH
Sr 1	3(4)(5)	4(3)(2)	Sweetwater 1110	Magwa 1100	90-120	120	st	26	35	M	H	H
Sr 2	1(2)	1(2)	Sweetwater 1110	Sweetwater 1210	120	120		45	60	VH	H	H
Sr 3	5(4)	1(3)	Sweetwater 1110	Tukulu 1110	90	120	w	16	25	VH	H	H
Sr 4	1	1(2)	Sweetwater 1210	Magwa 1100	120	120		50	65	VH	MH	MH
Ia 1	1(3)	1(2)	Inanda 1100	Inanda 1200 Magwa 1100	60	120	d	55	65	H	MH	MH
Ia 2	3(2)	3(2)(4)	Inanda 1100	Magwa 1100	120	120		35	45	MH	H	H
Tu 1	5	1	Tukulu 1110	Dundee 1120	90	120	w	18	20	M	H	H
Gs 1	4	4	Glenrosa 1121	Westleigh 1000	40	90	w (so)	25	30	H	ML	M

Ma 90
DB/SB
45/60




TOYOTA
K163

SOIL GROUP: Ai1

ha: 19.9

	Form & family	% of unit	ESD cm
DOMINANT SOIL	Magwa 1100	80	60-120
SUB-DOMINANT	Inanda 1100	20	60-110

PRODUCTIVITY CLASS	II
DEPTH LIMITATION	saprolite
LITHOLOGY	sandstone
SLOPE CATEGORY	gentle - moderate

Depth cm.	Description
30-40	Dark greyish brown, 2Sf, apedal, very friable
60-120	Dark yellowish brown, 30-40f, apedal, very friable

Wetness	0
Organic C	eh
Ground roughness	1
Ground strength	1.3.4
Compaction hazard	MH
Erosion hazard	M

SILVICULTURE

Preferred spp.	P.elliottii	Alternative spp	E. macarthurii
Fertilizer -Eucs	125g 3:2:1 (25) +Zn per tree		E. benthamii
Fertilizer - Pines	200g single supers (10.5%P) per tree		P. greggii
Site preparation	Pitting		

SOIL GROUP: An1

Area in ha: 200.4

	Form & family	% of unit	ESD cm
DOMINANT SOIL	Nomanci 1210	70	30-40
SUB-DOMINANT	Mispah 1000	30	30-40

PRODUCTIVITY CLASS	IV
DEPTH LIMITATION	rock
LITHOLOGY	sandstone
SLOPE CATEGORY	gentle - moderate

Depth cm.	Description
30-40	Dark greyish brown, 15m, apedal, very friable
	Hard rock

Wetness	0
Organic C	vh
Ground roughness	2
Ground strength	1.3.4
Compaction hazard	M

Legend to soils map

SOIL UNIT	DOMINANT SOIL FORM & family	SOIL TYPE FAO classification	GENERAL DESCRIPTION OF SOILS	TERRAIN	SITE POTENTIAL	LIMITATIONS	AREA (ha)
Hu1	Hutton 1100	Rhodic ferralsols	Dark reddish brown sandy clay loam to loam overlies an apedal, dark red sandy clay loam to clay loam to 151 cm.	Level to gentle top to mid slopes	HIGH		1802
Hu2	Hutton 1100 Glenrosa 1211	Rhodic ferralsols	Dark reddish brown sandy clay loam to loam overlies a stony, apedal, red sandy clay loam to 60-90 cm.	Gentle to moderate hill pediment slopes	MOD. HIGH	Dense stone layer	325
Hu3	Hutton 1100 Glenrosa 1211	Rhodic ferralsols	Dark reddish brown sandy clay loam to loam overlies a gravelly, apedal, red sandy clay loam to 60-90 cm.	Gentle to moderate hill pediment slopes	MOD. HIGH	Dense gravel or stone layer	25
Oa1	Oakleaf 1220	Chromic cambisols	Black silty clay loam to loam overlies a firm, weak coarse blocky, dark reddish brown clay to 90-150cm. This may overlie saprolite or a gravel layer	Level to gentle top slopes	HIGH	Compaction in upper 60cm.	189
Oa2	Oakleaf 1110 Tukulu 1100	Humic cambisols; Cambic arenosols	Dark brown coarse sandy loam overlies an apedal, dark brown sandy loam 90-150cm. A mottled subsoil occurs in the case of Tukulu form.	Upper and mid slopes	HIGH	Sub-optimal WHC.*1	1048

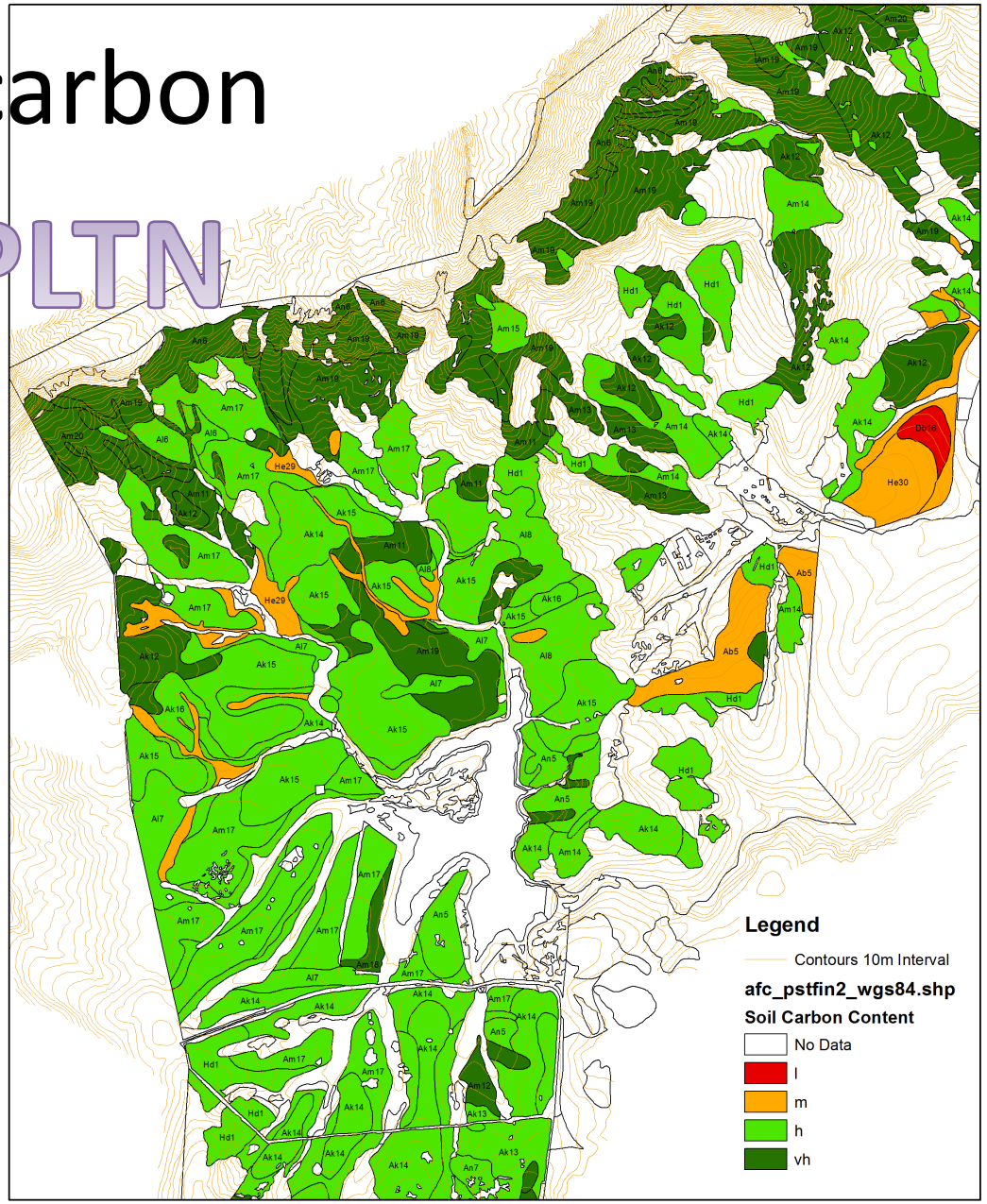

Land suitability
Land capability
Productivity potential

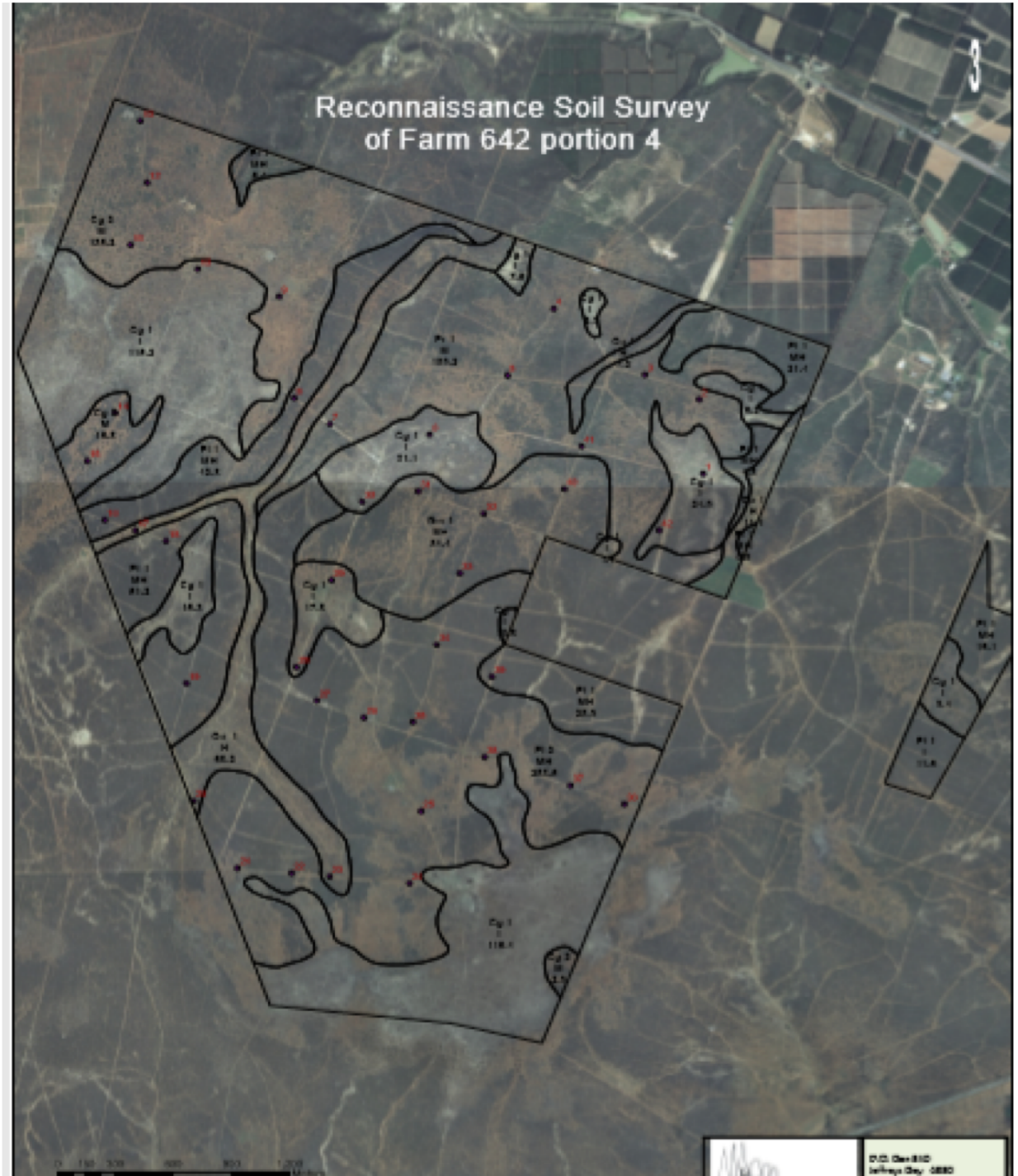
Table 1: Suggested management of Productivity Classes.

MANAGEMENT PRACTICE & RECOMMENDED SPECIES	P.C.	PREDICTED MAI_{20}
Veneer or sawtimber:-*P.radiata, Eucalyptus* spp or furniture timber species	I	>20
Sawtimber/poles:-*P.radiata*	II	16-20
Sawtimber/poles: *P.radiata*	III	10-15
Poles/short rotation: *P. radiata*	IV	5-9
P. pinaster	V	<5

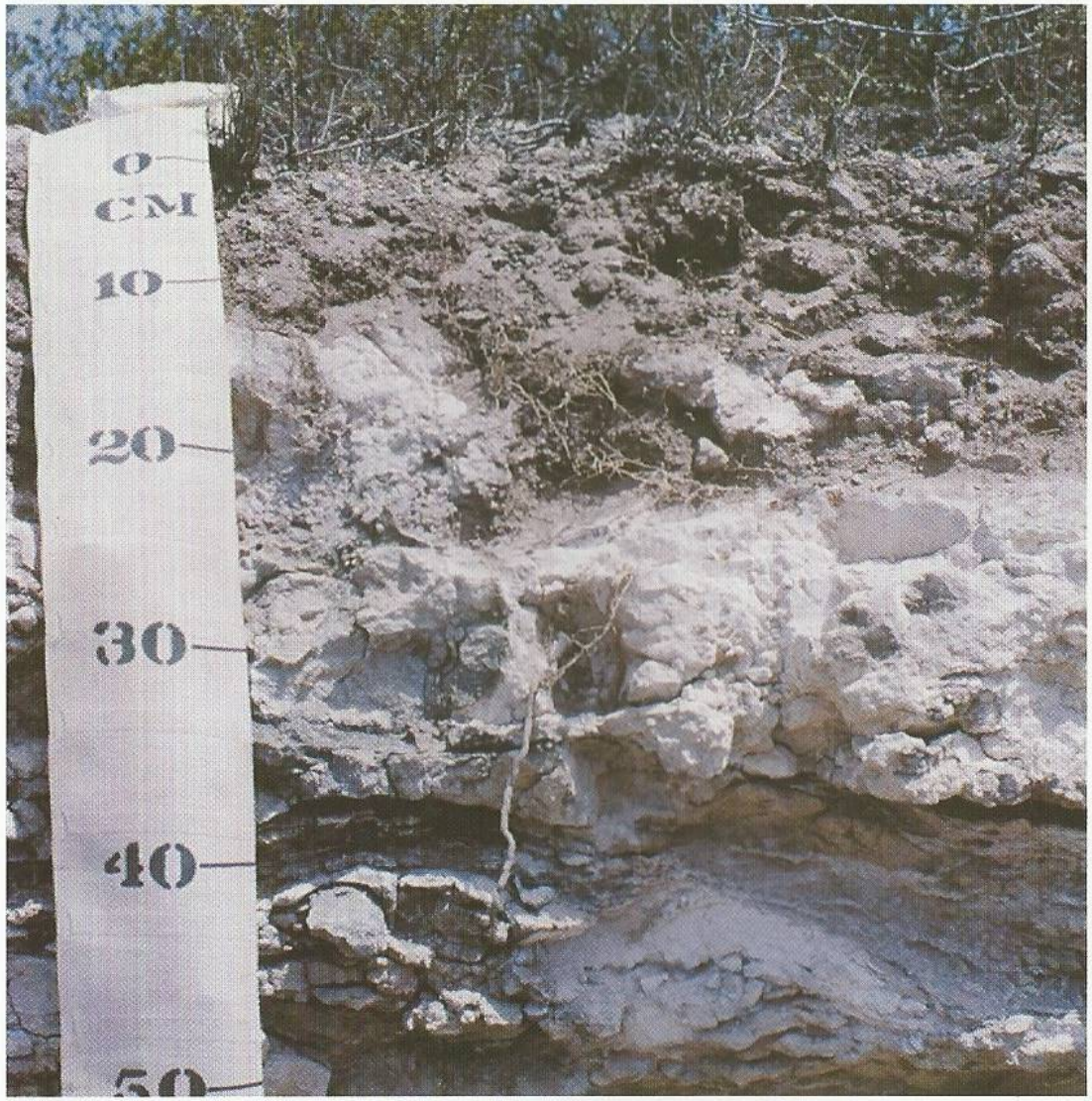
Soil organic carbon

KUBUSI PLTN




Reconnaissance Soil Survey
of Farm 642 portion 4
3

COEGA FORM – Cg



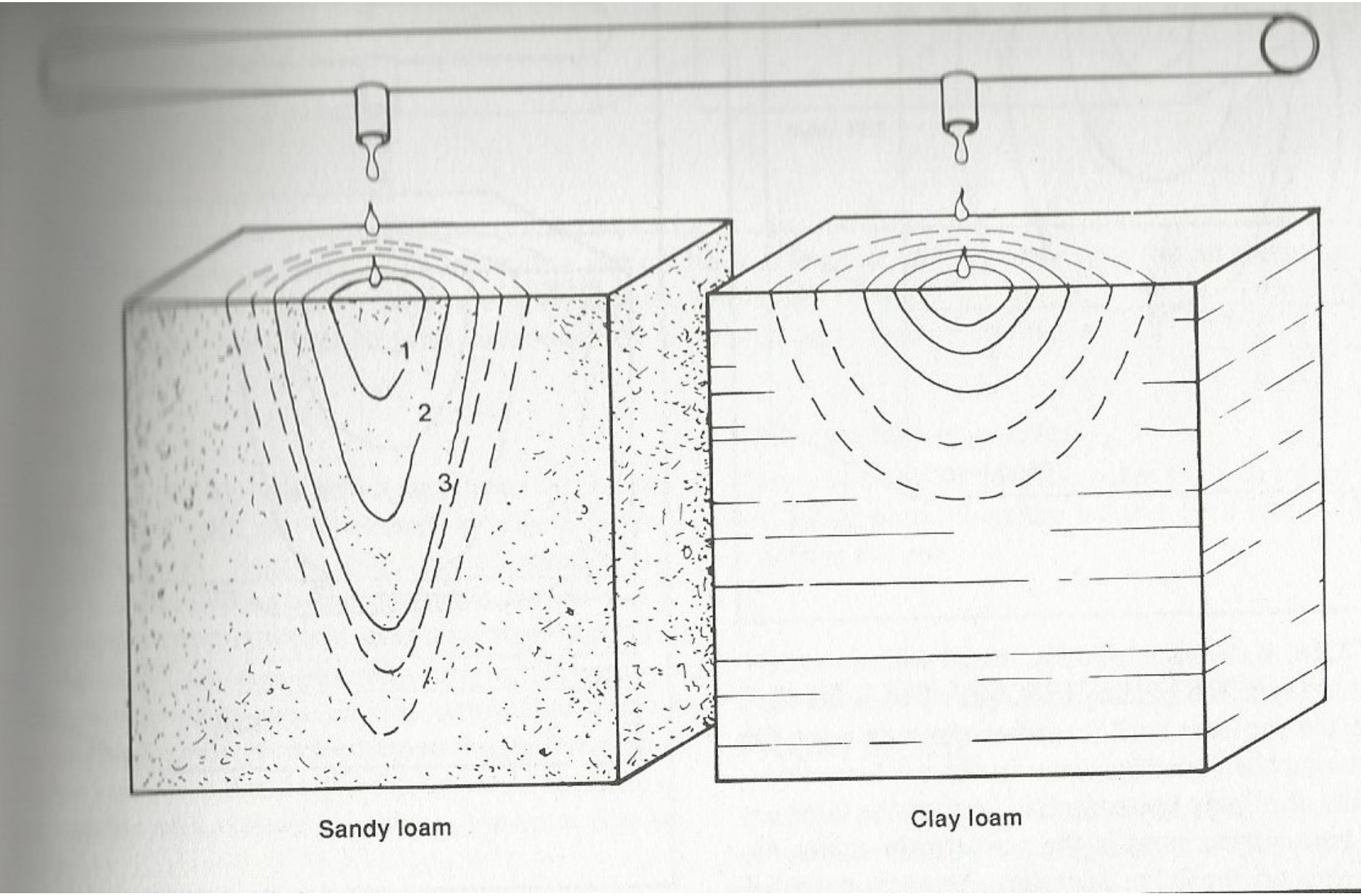
ORTHIC A

HARDPAN CARBONATE HORIZON

Deep rip for apple orchards

Ridging in hydromorphic soils

Irrigation planning


1
2
3
Sandy loam
Clay loam