Strategies to Improve Soil Health

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Dairy Australia

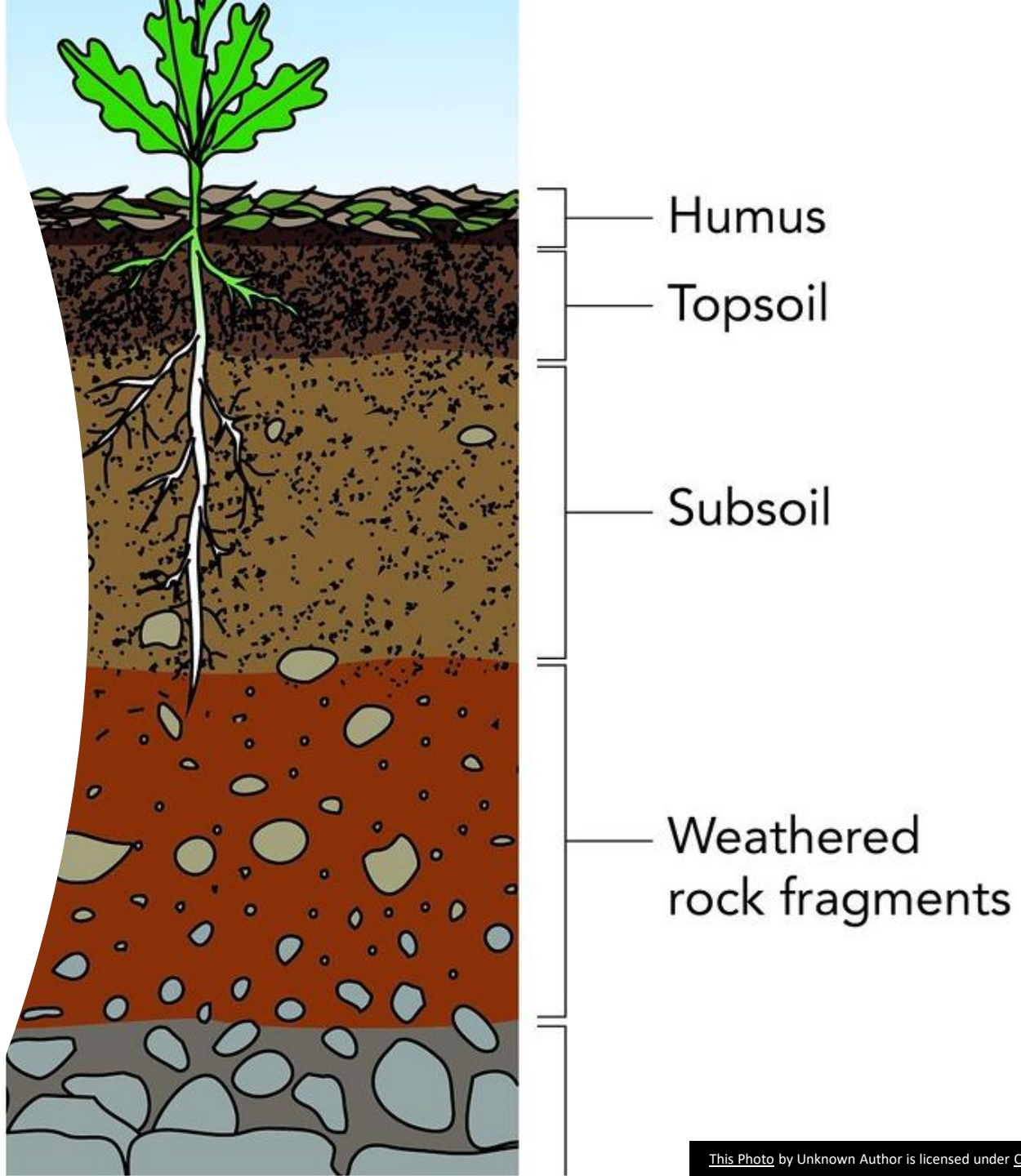
Know your baseline

- Physics
- Chemistry
- Biology

STEP ONE

Soil Physics

- **Soil Formation**: Parent material, topography, climate, OM, living organisms, time
- **Soil Classification & Groups**: Podzol, Brown Earth, etc
- **Soil Texture**: Content of sand silt & clay
- **Structure/Compaction**



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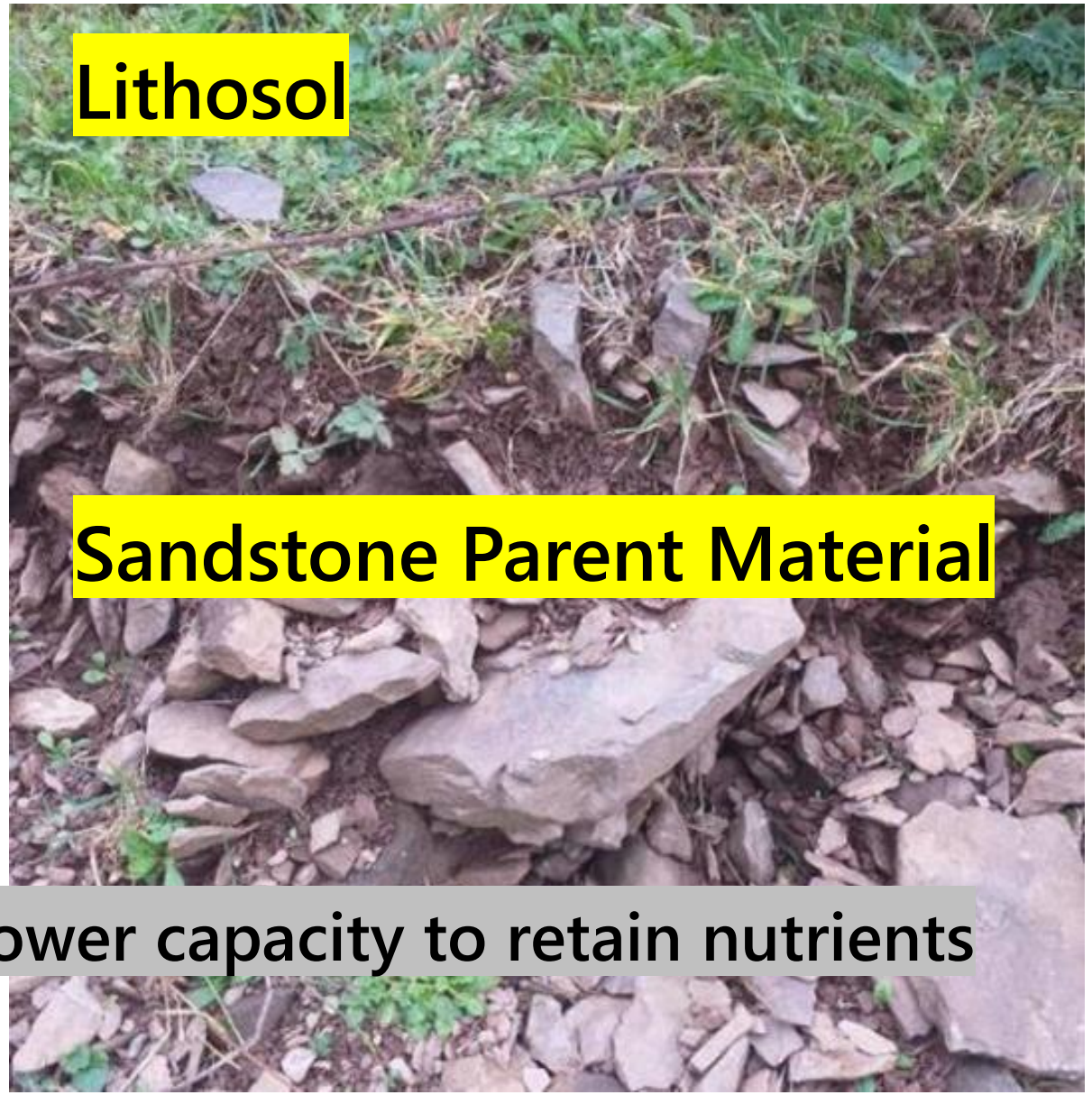
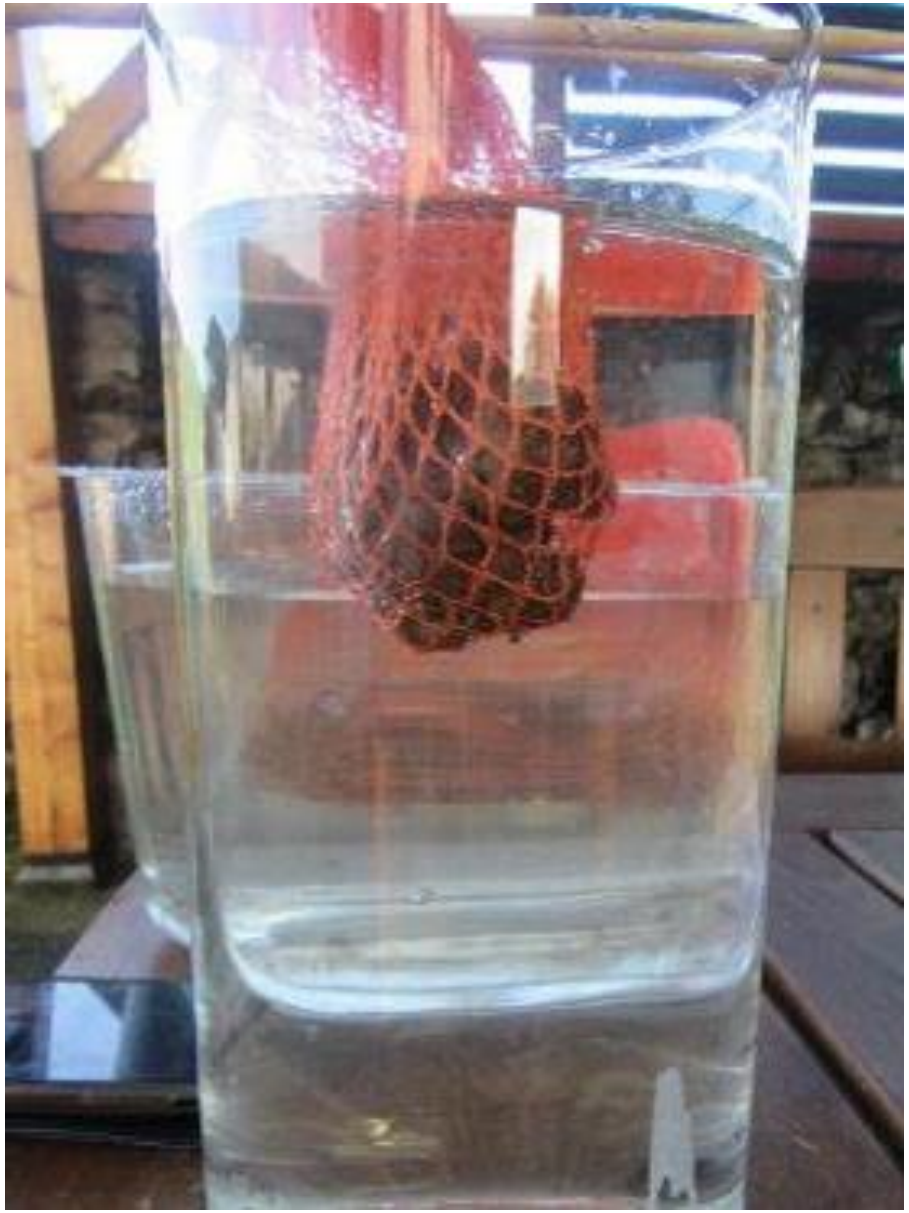


Free Draining, Drought prone, lower capacity to retain nutrients

Slake Test



Ribbon Test

GrassVESS

Start assessment here

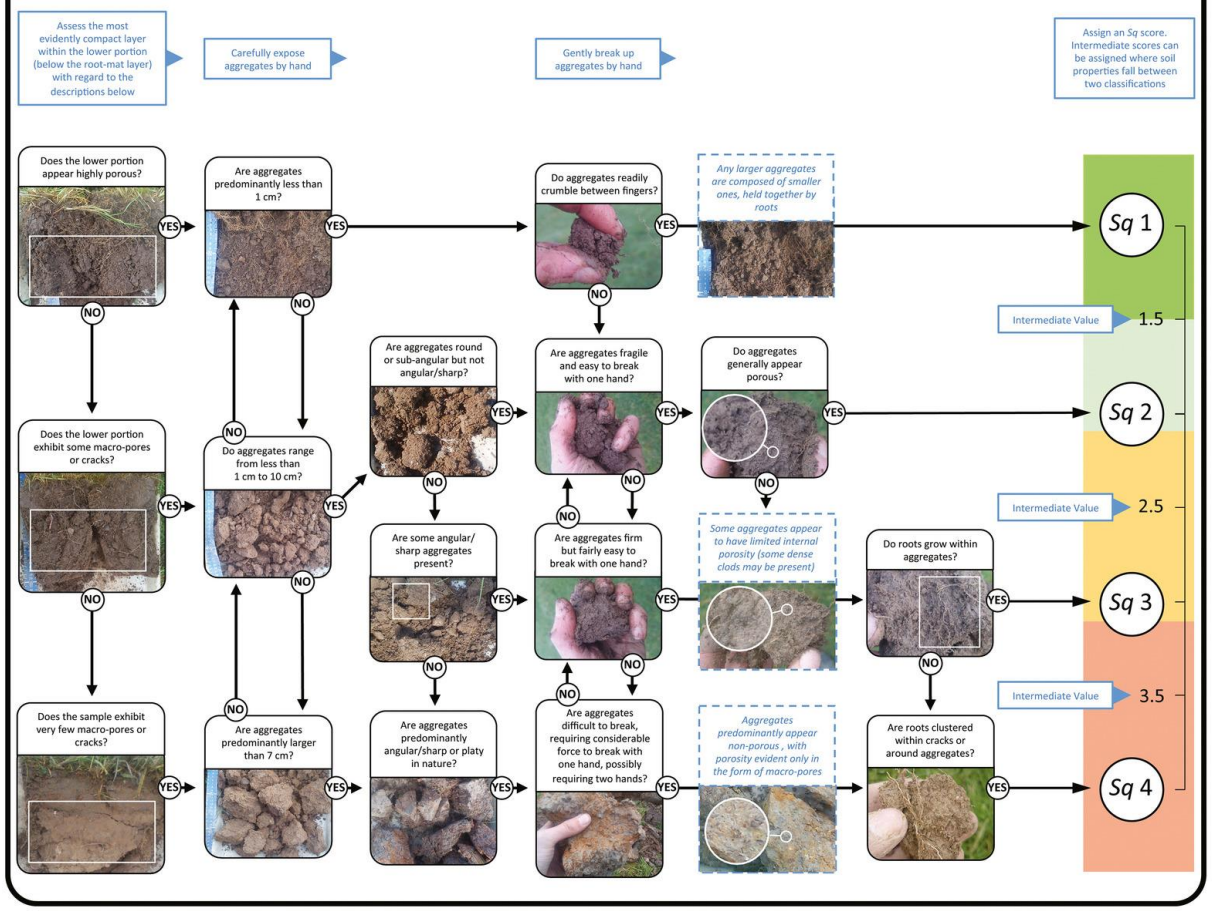
Lower Portion (*Sq*) Score

Assess the most evidently compact layer within the lower portion (below the root-mat layer) with regard to the descriptions below

Carefully expose aggregates by hand

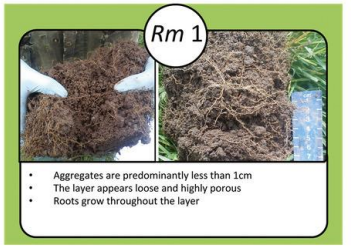
Gently break up aggregates by hand

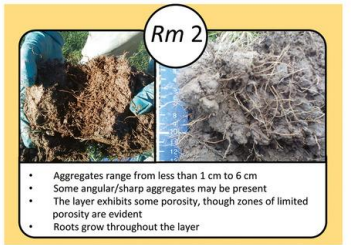
Assign an *Sq* score. Intermediate scores can be assigned where soil properties fall between two classifications

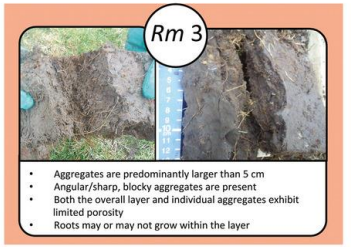


Root-Mat (*Rm*) Score

Take a root-mat layer section. While holding it upside down, gently prize it apart using your thumbs. Examine the undisturbed soil within this layer and assign one of the following *Rm* scores which best applies







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J.P. Emmet-Booth, O. Fenton, P.D. Forristal, G. Bondi, R.E. Creamer, E. Jeuken & N.M. Holden. 2017.

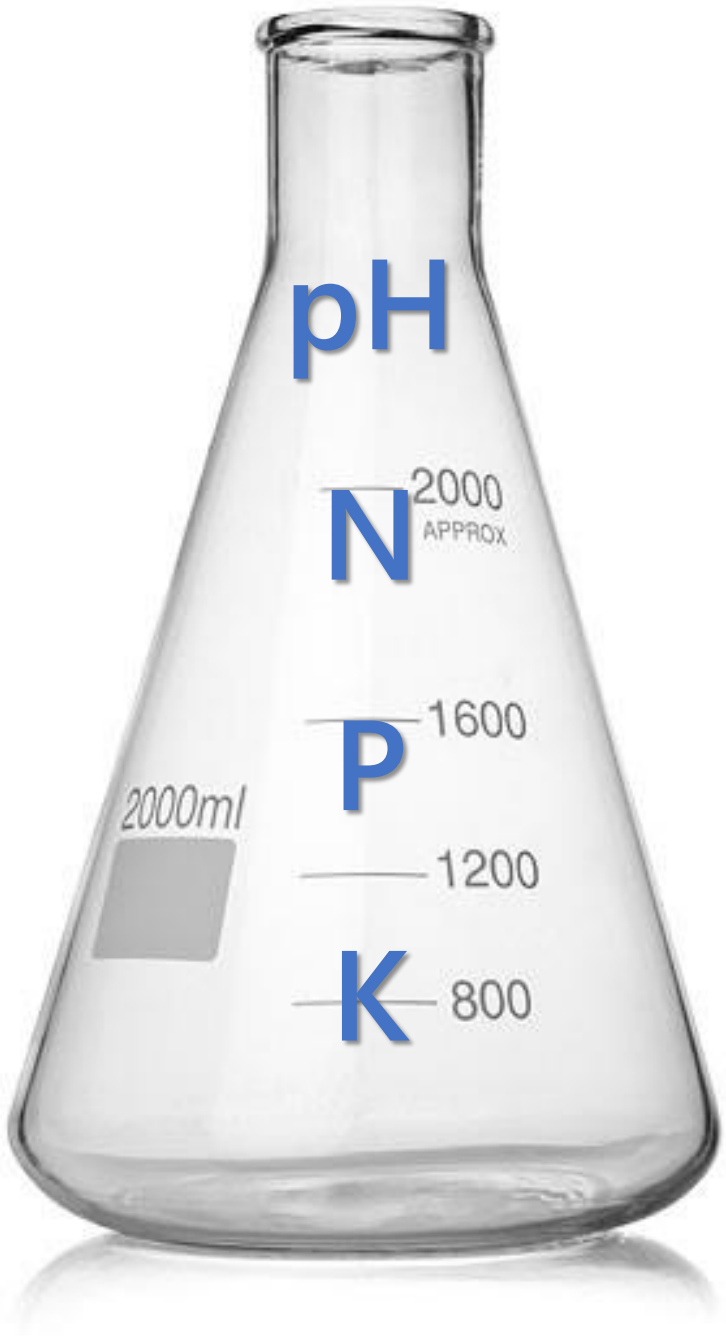
GrassVESS is based on the Visual Evaluation of Soil Structure (VESS) Method developed by B.C. Ball, R.M.L. Guimarães, T. Batey & L.J. Munkholm.

Field Number	Slake Test	Grass VESS	Lower Portion Score	Root Mat Score
Plot 2, 11, 12	★★★★		Sq 2	Rm 1
Plot 8, 9, 10	★★★★★		Sq 1	Rm 1
Plot 6, 7, 28, 27	★★★★★		Sq 1	Rm 1
Plot 3, 4, 5	★★★★★		Sq 1	Rm 1
Plot 1	★★★★		Sq 1	Rm 1
Plot 18	★★★★★		Sq 1	Rm 1
Polt 13	★★★★		Sq 2	Rm 1
Plot 14/15	★★★★★		Sq 1	Rm 1
Plot 16/17	★★★★★		Sq 1	Rm 1
Plot 20, 21, 22	★★★★★		Sq 1	Rm 1
Hanleys Top	★★★★		Sq 1	Rm 1
Hanleys Bottom & Hairpin	★★★★		Sq 2	Rm 1
Plot 25/26	★★★★★		Sq 1	Rm 1
Plot 29	★★★★		Sq 1	Rm 1

STEP TWO

Soil Chemistry

- pH
- Macro Nutrients
- Micro Nutrients
- Carbon
- Organic Matter



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Field Number	pH	P (mg/l)	K (mg/l)
Plot 2, 11, 12	7.1	12.8	205
Plot 8, 9, 10	6.9	10.2	186
Plot 6, 7, 28, 27	6.8	6.8	187
Plot 3, 4, 5	6.6	7.7	209
Plot 1	7.1	8.8	153
Plot 18	6.9	14.1	203
Polt 13	6.9	15.9	183
Plot 14/15	6.8	8.8	170
Plot 16/17	6.9	12.8	232
Plot 20, 21, 22	6.9	10.2	201

Field Number	BORON PPM	IRON PPM	MANGANESE PPM	COPPER PPM	ZINC PPM	Mo PPM	SULFUR PPM	SELENIUM PPM	COBALT PPM
Plot 2, 11, 12	0.4	465	145	3.3	4.3	<0.1	26.6	<0.2	0.51
Plot 8, 9, 10	0.68	635	80.9	2.4	5.4	<0.1	27.6	<0.2	0.29
Plot 6, 7, 28, 27	0.64	593	86.5	1.9	3.7	<0.1	22.7	<0.2	0.37
Plot 3, 4, 5	0.7	583	79.6	2.5	6.6	<0.1	30.7	<0.2	0.38
Plot 1									
Plot 18	0.74	476	166	2.8	4.4	<0.1	22.2	<0.2	0.48
Polt 13	0.63	509	151	3.1	4.6	<0.1	23.5	<0.2	0.44
Plot 14/15	0.53	456	186	2.1	4.5	<0.1	31.7	<0.2	0.68
Plot 16/17	0.7	511	164	2	4.3	<0.1	22.9	<0.2	0.47
Plot 20, 21, 22	0.4	375	189	3.4	4.2	<0.1	21.9	<0.2	0.75
Hanleys Top	0.67	426	125	2.4	3.7	<0.1	21.5	<0.2	0.53
Hanleys Bottom & Hairpin	0.97	395	143	2.7	3.9	<0.1	26.5	0.34	0.46
Plot 25/26									
Plot 29									
Average	0.64	493	138	2.6	4.51	<0.1	25.25	<0.2	0.49
Reference Ranges*	2-100	20-300	20-3000	2-100	10-200	0.2-3.0		0.2-2.0	1.0-25
	LOW	HIGH			LOW	LOW		LOW	LOW

McGrath. Fleming.(2006) Trace Elements and Heavy Metals in Irish Soils. Johnstown Castle. Teagasc

Field Number	C.E.C.	Organic Matter %	Soil Organic Carbon
Plot 2, 11, 12	14.6	6.4	3.4
Plot 8, 9, 10	20.6	9.0	5.2
Plot 6, 7, 28, 27	19.5	8.3	5
Plot 3, 4, 5	22.9	12.1	7
Plot 1			
Plot 18	15.6	7.9	4.5
Polt 13	16.6	9.1	5.3
Plot 14/15	17.2	7.4	4.2
Plot 16/17	18.1	8.1	4.7
Plot 20, 21, 22	15	6.9	4
Hanleys Top	15.3	8.3	4.7
Hanleys Bottom & Hairpin	13.1	6.6	3.1
Plot 25/26			
Plot 29			

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STEP THREE

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Soil Biology

- **Earthworm counts**


Easy,
Repeatable,
Fieldside Test

Field Number	Pasture Type	Earth worm Count*	Small <8cm	Medium	Large	Adults
Plot 2, 11, 12	*Ryegrass/Clover*	11	2	9	1	4
Plot 8, 9, 10	*Ryegrass/Clover*	22	17	5	0	1
Plot 6, 7, 28, 27	*Ryegrass*	12	4	6	2	2
Plot 3, 4, 5	*Ryegrass*	21	16	4	1	4
Plot 1	*Ryegrass/Clover*	18	4	13	1	6
Plot 18	*Ryegrass*	14	6	7	1	4
Polt 13	*Ryegrass*	9	3	4	2	2
Plot 14/15	*Ryegrass*	14	6	6	2	1
Plot 16/17	*Ryegrass*	18	3	12	3	2
Plot 20, 21, 22	*Ryegrass*	17	5	10	2	4
Hanleys Top	*Ryegrass*	19	6	11	2	5
Hanleys Bottom & Hairpin	*Ryegrass*	18	4	12	2	4
Plot 25/26	*Multispecies 7 species*	24	4	15	5	12
Plot 29	*Multispecies 7 species*	20	9	8	3	7

**Spade dimensions 15cmx15cm soil pit*

STEP FOUR

Make A Plan

What did we do???


Ryegrass


Multispecies


AGRI


PROBLEMS **TIVE ACTIONS/TOOLS**

Drought Prone asture

Compaction/E

Waterlogged

Low pH Lime

Low biological ment Plan

Soil Traffic

Right Action, Right Time Right Location

= Incremental Soil Health Improvements


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Thank You
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