

With funding from the NSW Environmental Trust, and Bellingen Shire Council, Bellingen Landcare organised a series of workshops with Brian Wehlburg, on regenerative farm planning and monitoring.

One outcome of the workshops was the formation of small groups of landholders who will meet regularly to monitor their soils together, using this monitoring sheet, and others who will do it individually.

This fact sheet summarises the methodology and provides some key pointers which arose from the follow-up Q&A session with Brian. It should also be of use to those who did not attend the workshops, but wish to do some basic monitoring of their pastures.

As Brian explains, an essential component of managing pasture to improve soil health is to monitor the soil! And the most important part of monitoring, is to actually do it, regularly.

Extra copies of the monitoring sheet are available from the Bellingen Landcare website, on the Regenerative Farming project page (link below). This fact sheet explains the various fields to fill in. There is an electronic version in process, which will also be linked to at our project page when ready.

As a general note on the worksheet, when asked to select 0-25, 25-50 etc, it is worth writing in a number approximation (eg 10%) rather than simply ticking the closest box, if you want a higher resolution result over time.

Observations

For example, how many earthworms are in a shovelful? What is the soil structure? Roughly how deep do the roots go (you can estimate by measuring how far down the more crumbly soil becomes slippery).

Penetrometer

We have a penetrometer for groups to share, or you can buy one, though they are quite expensive. Ideally measure after soaking rain, when the paddock is very moist but not muddy. In any case, record the previous week's rainfall, and then measure:

1. What depth is the penetrometer when PSI hits 600 [soil is totally dead here]
2. At what depth does it hit 300psi, and at what depth does it drop back? This is the compaction layer. Roots barely penetrate 300psi.

You can make your own penetrometer out of a piece of bent reinforcing rod, ideally with the tip sharpened. Bend the upper section into a handle shape. Ideally, use that alongside a penetrometer to get a feel for what 300psi of pressure feels like.



SOIL MONITORING FACT SHEET

Holistic Management Basic Ecological Monitoring Sheet											
Date:	Paddock #/name:				Site#						
What percentage of the soil's surface is bare?	Capping	Evidence of Life		Usher	What percentage of the area is covered by:				Brosion		
0-25	0-25	0-25	0-25	0-25	Desirable Perennial grasses	Desirable Annual grasses	Desirable Forbs	Undesirable plants	Is water or wind erosion		
25-50	25-50	0-25	25-50	0-25	0-25	25-50	50-75	75-100	None	Low	
50-75	50-75	25-50	50-75	25-50	25-50	50-75	75-100	Very little	Very little	None	
75-100	75-100	50-75	75-100	50-75	50-75	75-100	Very little	Very little	None	None	
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
Plant species if known: Desirable Perennial Grasses Desirable Annual Grasses Desirable Forbs Undesirable plants											
Water infiltration tests: North or East (minutes): South or West (minutes):				Observations:							
10x meter tests: North or East (hex): South or West (hex):				Penetrometer (pushback): Depth 300 psi reached: Depth 600 psi reached: Depth 900 psi reached: Average average psi to 30cm							
Pasture volume: 1000 square for 1000 or 1500: North or East (side of square m): South or West (side of square m):				Adapted from the sheet provided by Inside/Outside Management							

Project Page

bellingerlandcare.org.au/projects/bellinger-landcare-regenerative-farming-network/



Setting Up The Transect

You want a representative sample of each paddock or area of interest. In highly variable paddocks you may need a few sites. Find a starting point you will be able to easily come back to in six months, and note its location on the monitoring sheet. For example, 5 metres north of a specific paddock tree, or fence post, then heading due south, or towards the macadamia tree, or a shed.

It might be useful to hammer a bright plastic tent peg down to ground level. It may be easiest at first to lay out a tape or string along your chosen line. Place the measuring square on the ground and fill in the table for quadrant 1.

The size of the square doesn't matter, as we are dealing in percentages. Brian uses an internal length of 50cm. After measuring the first quadrant, move 3-5m along the string and drop your sampling square, conduct the measurements, then repeat up to quadrant 10.

The water infiltration, pH, brix meter, pasture volume and penetrometer readings are conducted around quadrant 1 and 10. The rest at every quadrant. In our field tests, the process became much quicker once performed a couple of times, especially if there are 2-3 people to measure and record.

It is vital to take photos, at least at each end of the transect looking along the transect and a top-down photo of each quadrant that will allow you to go back and compare your data as the years go by. Additional photos will help you go back and identify plant species later. If you are keen. Brian recommends at minimum annual monitoring, better every six months especially if you have some year-round plant growth.

Soil surface

Bare soil is any soil which is exposed to raindrops or direct sunlight.

Capping

Capping can occur when heavy rain falls on exposed soil, followed by warm dry weather. The cap is an impenetrable barrier which makes seed emergence difficult and can increase rainfall runoff. You are looking for a solid crust on the top of the soil which you can lift off.

Evidence of (animal) Life

Your insights will improve over time. Are there ants, moths, spider webs, earthworm holes, etc?

Litter Density

The ideal litter density is when the soil is covered but some light manages to get through to the soil surface to stimulate germination. Instead of a tick you could use 'm' for 'mulching litter' which is simply covering bare ground, or 'c' for 'composting' which is actively breaking down and starting to create new soil.

Desirable Grasses & Forbs

'Desirable' means that your livestock will eat it. Our project page will have links to ID books and apps for grasses and forbs (everything that isn't a grass), including weeds. Consider recording actual percentages instead of just ticks.

Plant Species If Known

All the species you saw in the transect. If unknown, take more photos, you can always get someone to help ID them later.

Water Infiltration

Do once at each end of the transect (ie either North/South or East/West). Pull away the plant material, and hammer in 100mm downpipe screw junction (you may need to shave its edges sharp). Make sure no water leaks out of the ring, and time how long until 240ml of water is absorbed into the soil (this approximated 1" of rain). You can use a piece of 100mm pipe, though it's a little less tough- in that case add 200ml of water. You can use 190ml (or 160ml) to simulate 20mm of rainfall instead.

Brix Meter

Brix meters are calibrated for 20°C, so try to take measurements close to that temperature, or record the temperature.

First rinse and calibrate the meter with distilled water, there should be a sharp line at zero Brix.

Then harvest whatever plant you are interested in, crush in a garlic press or pliers, and put some of the solution on the Brix meter (avoid any solids). Record your Brix value, and the fuzziness range. The value itself is a measure of dissolved

sucrose (and other minerals) and give an indication, but not direct correlation, of nutrient value.

Because Brix readings vary through the day and with temperature, it is worth investing in your own, and monitoring Brix more often than shown on this monitoring sheet. A handheld manual one is quite cheap.

More detail on sampling and a comprehensive video on using Brix for pasture and forage management are on our project page.

Pasture Volume

There are many ways to measure this. We suggest the feed square. Measure out 1m² of ground, and collect all of the pasture which your animals would eat into a bag, either simply rip it up, or cut with shears. For a sheep*, see how what fraction of a hessian shopping bag that 1m² fills (squash the grass right down into it). Then work out how many m² would be needed to fill the bag (eg if 1/8 of the bag is full, you would need 8m²).

This is roughly how many m² of pasture the sheep would eat in a day. That's what you record, at each end of the quadrant. You may want to make some adjustments depending on how representative those samples look compared to the rest of the paddock.

This enables you to estimate how many sheep you can run, and/or how quickly you need to move them to the next paddock, or when you will need to start supplement feeding if you do not want to sell. If you want a more accurate figure, you can dry the collected material in an oven or microwave, to work out the kilograms of dry matter you have per hectare, and then use one of the MLA calculators to work out stocking rates, or how long a paddock will last (<https://etools.mla.com.au/hub/>), or use that to check your estimates the first few times you monitor.

*Based on one Dry Sheep Equivalent, ie a 50kg merino at two years of age. A dry cow east approximately 7 times more, which is roughly a large produce bag (or simply times the DSE by 7).

You can also use the MLA pasture ruler as a rough guide and record the readings in 'Observations'. The ruler can be obtained direct from MLA, or a quick version printed off from the Bellinger Landcare website, on the Regenerative Farming project page.