“Regenerative Grazing to Increase Soil Health and Profitability”

Regenerative Agriculture Network Tasmania

Workshop Handbook

Graeme Hand

hand for the land

Australian Government | National Landcare Program

“Regenerative Grazing to Increase Soil Health and Profitability”

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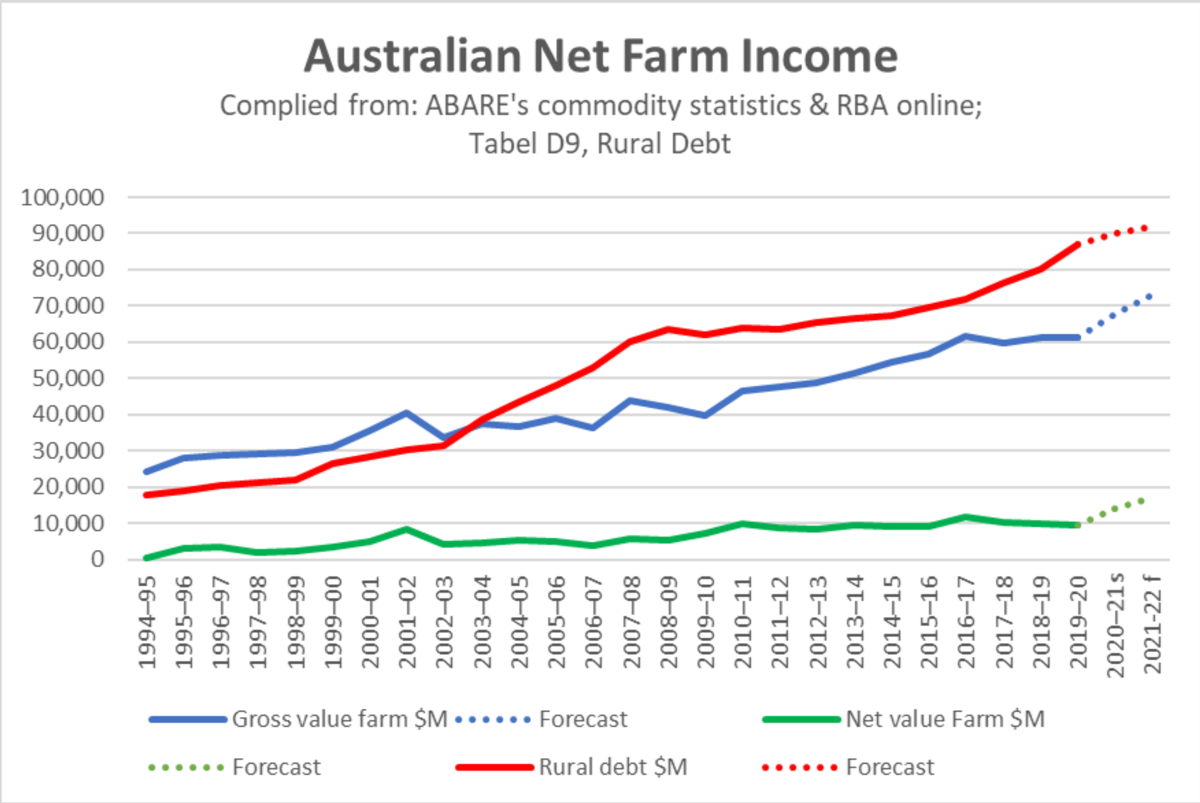
Handbrake Turn?

There is little point in slowing the car down as we go over the cliff.

The only sensible action is to turn the car around and head away from the cliff. Most advocated practices barely slow the car down, much less turn it around.



Conventional agriculture is clearly unsustainable as can be seen from this graph. Farmers are continually receiving less and less of each dollar of sales. Agribusiness and debt taking a higher and higher proportion. Only a switch to contemporary agriculture that has low risk and low expenses can be sustainable and reverse this trend of increasing debt and declining terms of trade.

"Policy-makers often talk about the need to increase productivity. What many fail to understand is that higher productivity is often associated with lower profits. This lack of understanding can lead to poor policy-making". Professor Christopher O'Donnell, School of Economics, University of Queensland

Underestimating Risk

"……..farm viability depends more on minimising losses than maximising production, and it is these accumulated losses which threaten farm business survival and growth".

Dr Tim Hutching, Charles Sturt University

This statement from Dr Tim Hutchings clearly highlights that the majority of research focused on increasing production is futile.

All new enterprises need to be designed with lower risk and lower costs. A key point is that for optimum profit there is an optimum scale or intensity.

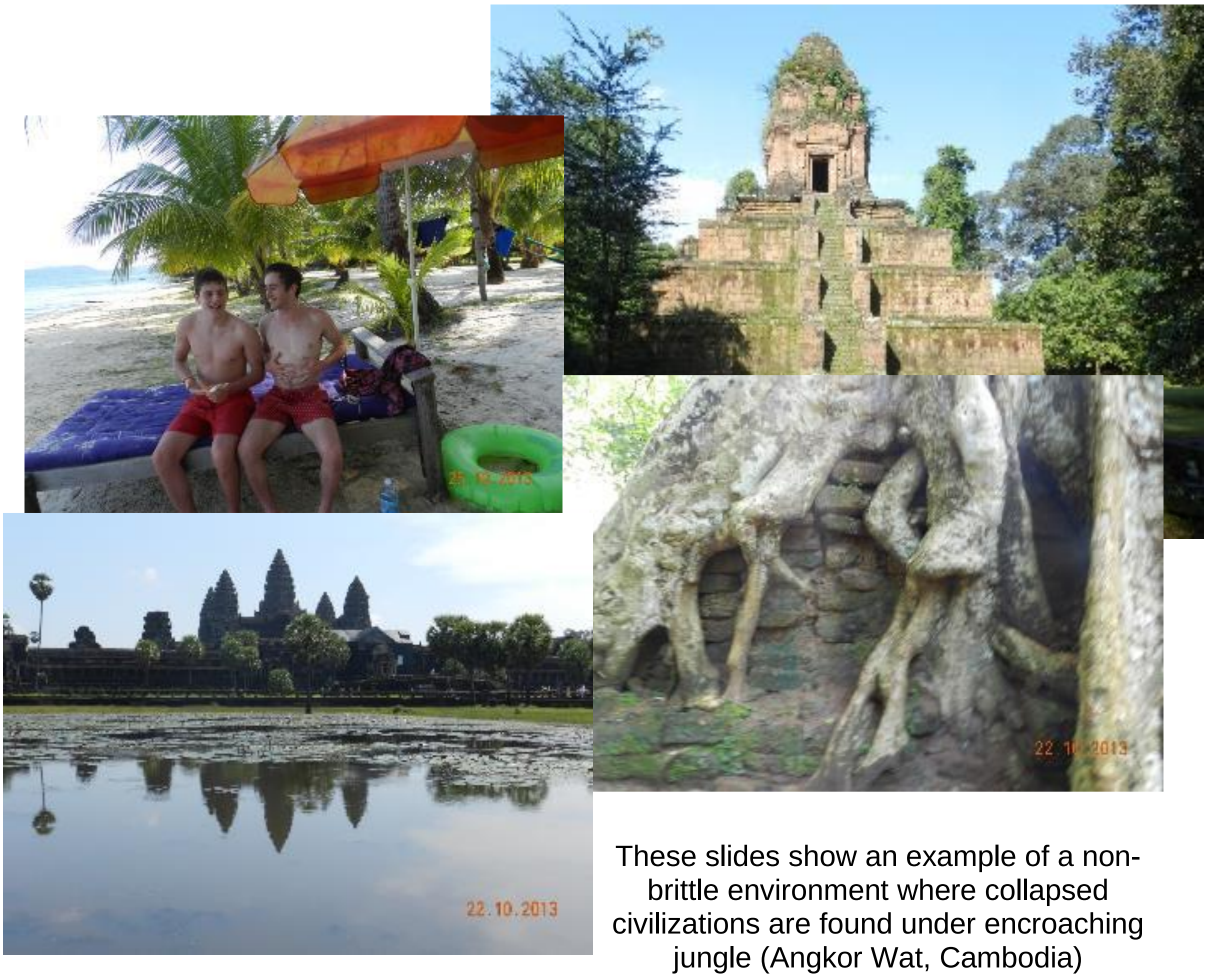
Brittleness

Allan Savory developed the brittleness scale. It is based on how carbon cycles in different environments.

This is an arbitrary scale focus on the distribution of atmospheric moisture. It explains why rest in a non-brittle environment results in increasing biodiversity, while rest in a brittle environment results in desertification.

- Arbitrary Scale
- Depends on the distribution of atmospheric moisture
- 1 (non-brittle) to 10 (brittle)
- HM Text Page31 Fig 4.1

Non-Brittle Environment



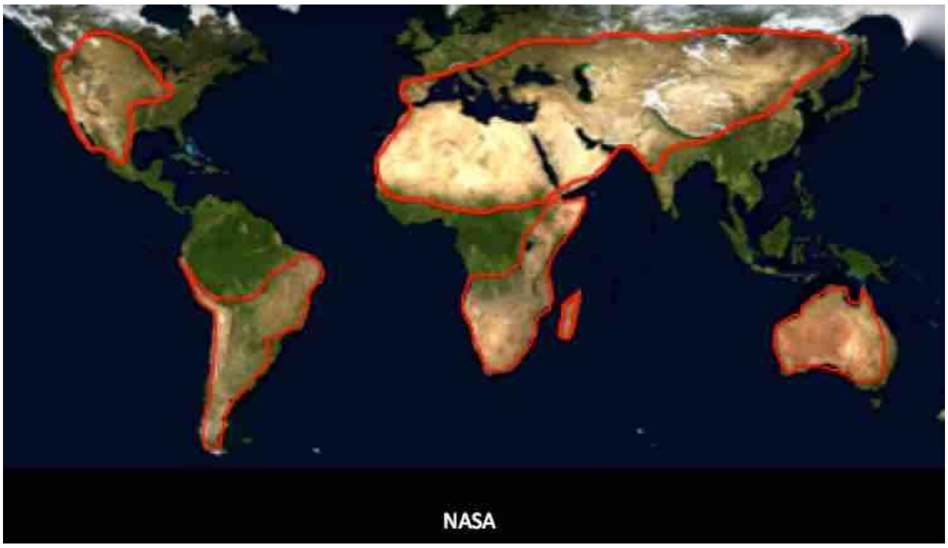
These slides show an example of a non-brittle environment where collapsed civilizations are found under encroaching jungle (Angkor Wat, Cambodia)

More examples of a non-brittle environment

Brittle Environment

In brittle environments the remains of collapsed civilizations are found under desert.

This is because the processes that were cycling carbon in these environments were disrupted by the civilization which damaged the water cycle, resulting in more frequent droughts.



This is a rough diagram of brittle environments around the planet. For these areas to be healthy, they generally need to be grasslands, or grassy woodlands/Savannah.

All environments need to have 100% ground cover with decomposing litter between the perennial plants.

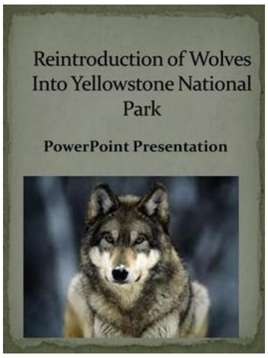
https://www.trailblazerstravel.com.au/wildebeest-migration-tanzania/

In brittle environments, mega herds of herbivores cycled the carbon throughout the year.

These herds behaved in a way that enabled and promoted landscape function and perennial grass regeneration. The behaviour was a function of the size of the herd and the role of predators. The herds moved through at high stock density, utilising the feed to a high level and not returning for a year or more.

The Role of Predators

It is well known that predators modify the behaviour of herbivores, resulting in regeneration of landscapes, not degradation.



https://www.teacherspayteachers.com/Product/Reintroduction-of-Gray-Wolves-Into-Yellowstone-National-Park-164877

It is possible to mimic the role of predators, as well as concentrate animals to mimic the behaviour of the large mega herds.

This is easily achieved through creating adaptive and flexible paddock sizes, with electric fencing and portable water systems.

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Time In and Out of the Paddock

An understanding of perennial grasses physiology is crucial to increasing landscape function in perennial grass regeneration.

Overgrazing:

- Eating leaf that is actively growing from root reserves, not severe defoliation or high utilisation.
- Recovery time and paddock time governs overgrazing (and over trampling), not big tight mobs and high utilisation.

High stock density from fencing or herding is required to create the conditions that germinate the soil seed bank of perennial grasses.

Savory, Allan. Holistic Management, Third Edition: A Commonsense Revolution to Restore Our Environment (p. 363). Island Press. Kindle Edition.

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The previous photos are examples of animals being used at very high stock density to actively promote the germination of perennial grass seed bank.

This stock density is best described as high enough to change the behaviour of the animals, so that they are more competitive. This competitive behaviour stimulates the germination of the perennial grass seed bank. Below a certain threshold of stock density, the germination of annuals is favoured.

High utilization ensures better grasses are not disadvantaged.

One of a few severely grazed perennial grass plants among millions of plants after one horse had grazed for one hour in a paddock.

Savory, Allan. Holistic Management, Third Edition: A Commonsense Revolution to Restore Our Environment . Island Press. Kindle Edition.

Grazing animals will find the perennial grass plants that are highly palatable and severely graze them in a very short period of time.

This effectively sets the recovery time. Therefore, it is always best to severely graze most of the grass plants to make sure that the better perennial grasses are not preferentially grazed, and then not fully recovered at the next grazing.

What is Landscape Function?

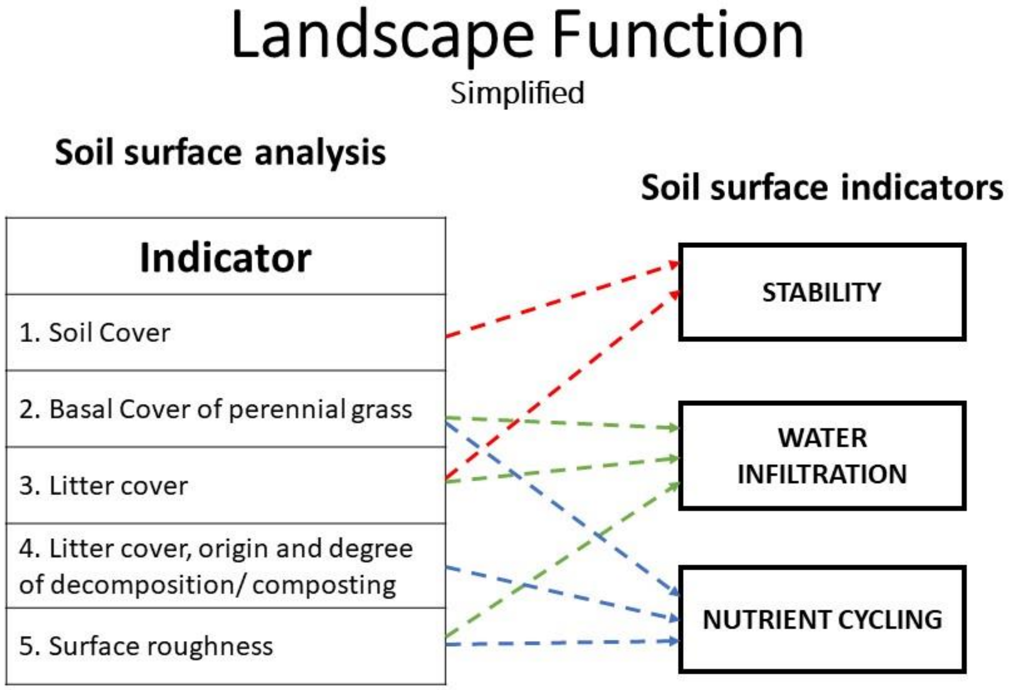
"Landscape function analysis (LFA) is a monitoring procedure that uses rapidly acquired field-assessed indicators to assess the biogeochemical functioning of landscapes….."

Source: LFA Manual © CSIRO Australia 2004


Landscape function is crucial in designing, monitoring and replanning regenerative grazing.

Landscape function can be simplified in a grassland by your active management to ensure that you produce large perennial grass basal areas and composting (decomposing) litter between perennial grass plants.

Basal area percentage can be measured by determining how much of each hectare is covered with the bases of perennial grasses greater than 2 cm x 2 cm.



David Tongway http://members.iinet.net.au/~lfa_procedures/

This graphic shows the relationships between the stability, water infiltration and nutrient cycling with the soil surface.

- Stability or lack of erosion is the result of keeping the soil covered.
- Water infiltration requires a large basal cover of perennial grasses, litter cover and surface roughness.
- Nutrient cycling also requires a high basal cover of perennial grass and the composting of the litter between the perennial grasses.
- Surface roughness impacts both water infiltration and nutrient cycling

Same Soil Type – Different Management

An Excel spreadsheet form enables the observer to calculate numbers with significant informing capacity. Here are the numbers for the soils shown earlier, showing how different they are.

Higher organic matter – more stable, increased infiltration and nutrient cycling

Stability	= 69.1
Infiltration	= 39.8
Nutrient cycling	= 31.7

Low organic matter – poor stability, low water infiltration and nutrient cycling

Stability	= 43.3
Infiltration	= 24.0
Nutrient cycling	= 11.5

Leaf Emergence

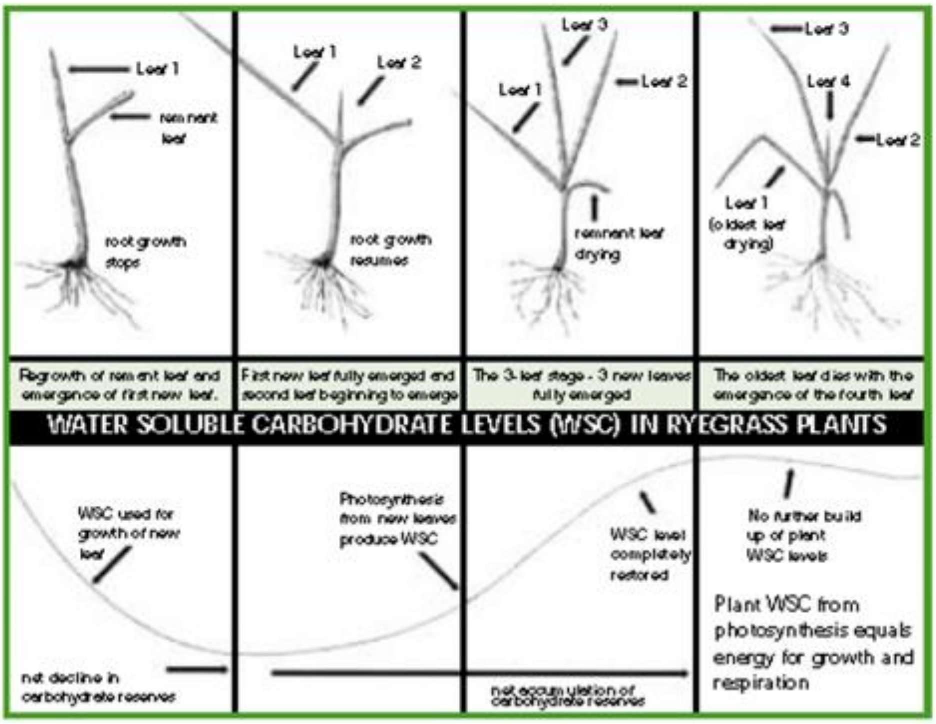


Figure 1: Regrowth of a perennial grass tiller

Observing leaf emergence is crucial in actively building landscape function.

Leaf emergence is well understood in the grazing industries, but <u>how</u> to use leaf emergence to increase landscape function is poorly understood.

Published advice from the grazing industries, including dairying, is to graze plants before litter forms. This advice is based on the false premise that the leaves that have formed the litter are wasted feed.

Nothing could be further from the truth as the litter, when it is pushed onto the soil surface, is crucial for driving soil stability, water infiltration and nutrient cycling outcomes.

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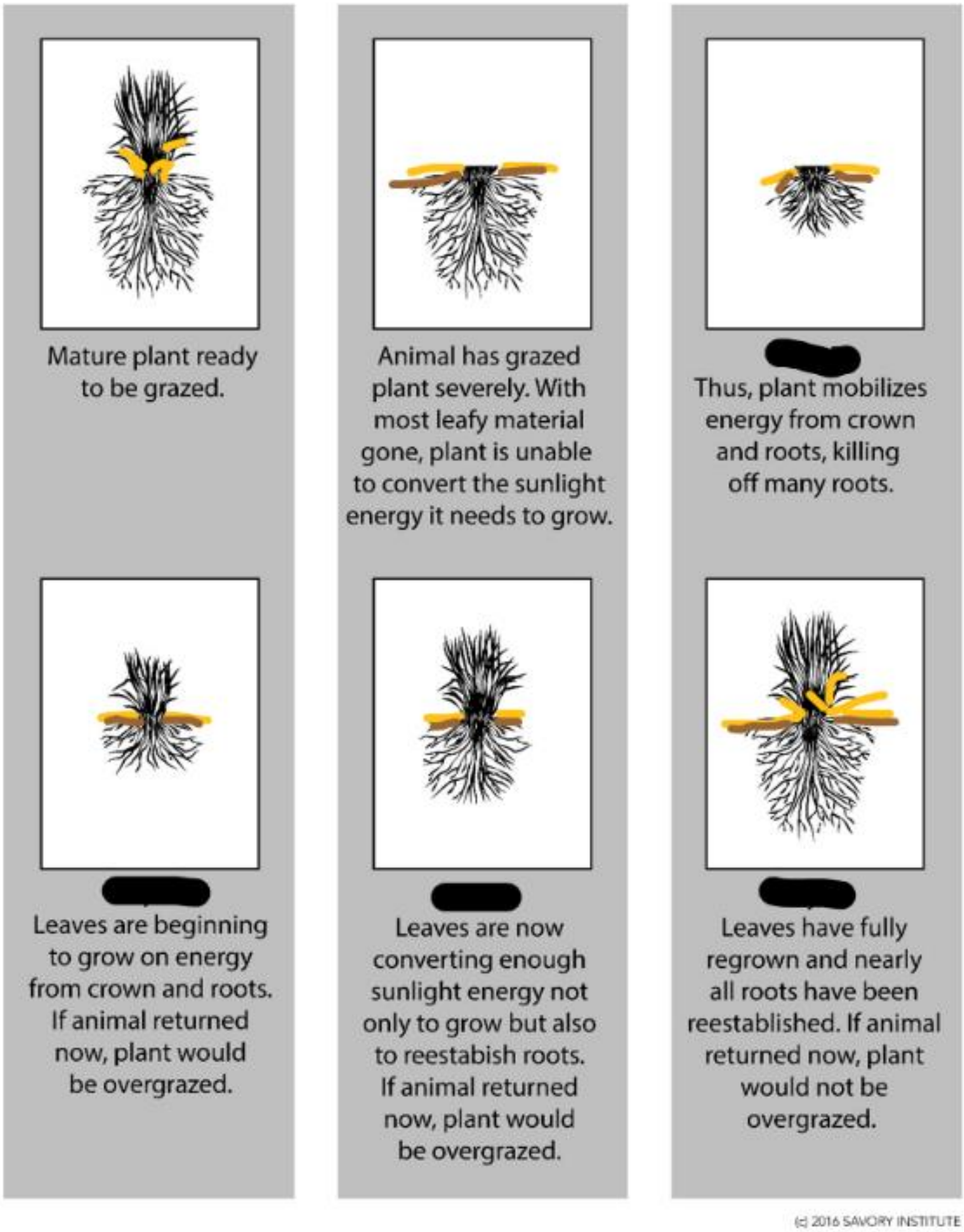

This table shows the cycle of a perennial grass plant that is been grazed. Only by adhering to this cycle, can you actively increase landscape function.

Please note grazing plants at the stage in the fourth diagram, results in significant exposure of the animals to nonprotein nitrogen, which leads metabolic diseases.

To be safe, we assume that the grazing has been severe, because some plants are always grazed severely, and thus we focus on plant growth rate.

Savory, Allan. Holistic Management, Third Edition: A Commonsense Revolution to Restore Our Environment (p. 334). Island Press. Kindle Edition.

Definition of Perennial Grass Recovery

A perennial grass plant is recovered when it looks like an ungrazed plant and contains fresh yellow litter (leaves).

A clear definition of perennial grass recovery does not include soil recovery, which also needs to be taken into consideration. Not only do the plants have to be recovered but the soil needs to be re-aerated by the fibrous roots of the grasses after they have recovered.

How perennial grass recovery is monitored, depends on the temperature and soil moisture and previous management.

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The 4 Main Barriers to Successful Landscape Function Grazing

1. Use frameworks that account for complexity (Holistic Management & Cynefin frameworks) to design enterprises for low cost, low risk profit and to reduce unintended consequences.

2. Use Safe to Fail trials (S2F) to determine the combination of recoveries, stock density and utilisation required to rapidly regenerate your land, and also find what you need to avoid.

3. Develop convenient infrastructure to action this evidence (flexible strip fencing and water).

4. Select animal phenotypes and adaption (epigenetics) that thrive under this management.

The first two barriers are based around managing complexity.

Complexity requires that we design flexibility into our system, and we continue to do trials to ensure that we do not miss changes in rainfall, markets, people and circumstances etc.

Once the enterprise is in infrastructure are designed and in place the biggest barrier will be animal phenotypes strive under this management rather than being propped up seed supplements, minerals, resown pastures and the like.

Case Study
“Inverary”, Branxholme, Vic

2002 when we started managing. The property had been sold to Timbercorp for blue gum plantations and had been leased to neighbouring farmers and not resown after cropping.

After approximately two years using regenerative grazing, the same areas returned to perennial grasslands. No inputs or seed were used for this natural regeneration. This technique is the lowest cost lowest risk form of pasture regeneration.

Another paddock on Inverary that was dominated by capeweed and thistles.

Again, with no inputs, this paddock was regenerated to perennial grass dominant pasture.

This is the minimum skill required to decide if low-cost low-risk regenerative grazing suits your business.

The same area showing the dominance of perennial grasses.

Inverary Hill Paddock

Another example of taking bare ground and capeweed and restoring it to perennial grasslands.

2002

Returned to perennial grass by 2004, and was maintained through to 2018 when this photo was taken.

Safe to Fail Practice Areas

Safe to Fail Practice Areas are the lowest risk way of determining what your land requires for rapid regeneration.

I developed this idea from the work of Dave Snowden at Cognitive Edge. It saves money and time by allowing you to experiment.

It is the only way to understand a complex system like soils and plants.

Sheep in the trial at the required stock density

Trial area after grazing

Safe to Fail Trials are:

- Small in size
- Grazed for a couple of hours
- Animals are put into these small areas at significant stock density - greater than one sheep per square metre, or one cow per 3 m². This is so that a rapid result is obtained on the combination of recoveries, stock density and plant utilisation required.
- The animals are monitored closely
- The soil surface is left covered with grass plants and litter
- Take photos and monitor
- Establish one to several practice areas with a range of recoveries. Exclude stock from these areas for range of recoveries - at least one at 6 months and one at 12 months

Steps in Planned Grazing

There are three steps in successfully planning regenerative grazing.

1. **Plan** the recovery and grazing time in each paddock. Plan how long you need to be in paddock to make sure that you get your land is recoveries (as informed by your safe to fail trial areas).

2. **Schedule** the moves to make sure you are in the right paddock at the right time

3. **Monitor** to make sure the plan is continually put back on track. Managing complex systems requires active adaptive management and therefore you need to monitor to make sure the plan is continually on track stop

Calculating Recovery Time: Key formulas

If we use estimation model these are the key formulas.

- Average paddock size = Total grazing area/number of paddocks
- Average grazing time = Recovery period/(number of paddocks – 1)

Example Plan

- 11 paddocks
- 180 days recovery
- 110 ha
- Average Paddock size = 10 ha
- Average Grazing time = 180/11-1 = 18days

This is a simplified example of how to calculate average paddock size and average graze on time

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Grazing/Paddock Plan

A table is required so that you can see clearly how many days you need to be in each paddock, so that you achieve your recovery identified in your safe to fail trials.

Paddock No	Area (ha)	Quality	Grazing days
1	10	Average	18
2	15	Average	27
3	5	Good	15
4	30	Poor	40
5	8	Average	15
6	2	Poor	3
7	6	Good	18
8	12	Poor	15
9	7	Average	15
10	2	Good	10
11	13	Average	21
Totals	110		

This table combines two ideas:

- to estimate the number of days paddock size and
- to estimate the paddock quality.

I have found this method to be equally as accurate as mathematical models.

Scheduling Moves

Planning steps

- What is happening during this time?
- Develop a list of critical activities
- Plan backwards from the most critical activity
- Use your Grazing &/or Paddock Plan to plan the moves so that you end up in the right paddock at the right time

Planning Sheet – example of “Inverary” planning 2016

Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Joining							↔	↔				
Calving				↔	↔							
Marking							↔					
Weaning												↔
Growth				↔	↔	↔	↔	↔	↔	↔	↔	↔
Sales	↔											
Holidays	↔											

This planning sheet from Allan Savory is a very rapid technique to determine where you need to be with the animals at the right time.

- Regenerative grazing requires active monitoring.
- Looking at early warning signs before the plan runs off track is crucial.
- Monitoring occurs at two levels.
  - Daily monitoring ensures the animals are fully fed, watered and performing well, and that the allocated daily amount of feed is on track. Failure comes from running out of grass. If you are moving through the grass faster than planned, you will need to sell animals to avoid this.
  - Annual monitoring is to determine that the rate of land regeneration is occurring as planned

Estimating stocking rate during slow or no growth periods

- Estimate how many days/ months of feed available with current mob
- Estimate how many days/ months of non-growth likely
- Divide number of months feed available by months non growth
- Adjust stock numbers by lack of months of feed available / months non growth
- This is a simple technique to determine if you are overstocked during periods of slow growth or low rainfall

Estimating stocking rate during no growth periods – example

- Feed available for the current mob is 4 months worth
- There is an estimated 6 months of a non-growing period
- Therefore, need to reduce mob by 1/3 (ie 2months/ 6 months)

Moving Animals Through the Micro Grazing Area Strips

Process

- Move the stock at high density along strips away from the water point.
- The animals are moved to the next grazing area within the strip, when 10-20% of the animals have a gut fill score of 3 (see the photos on the next page).
- To move to the next strip, the animals walk back to the water and through into the next strip.

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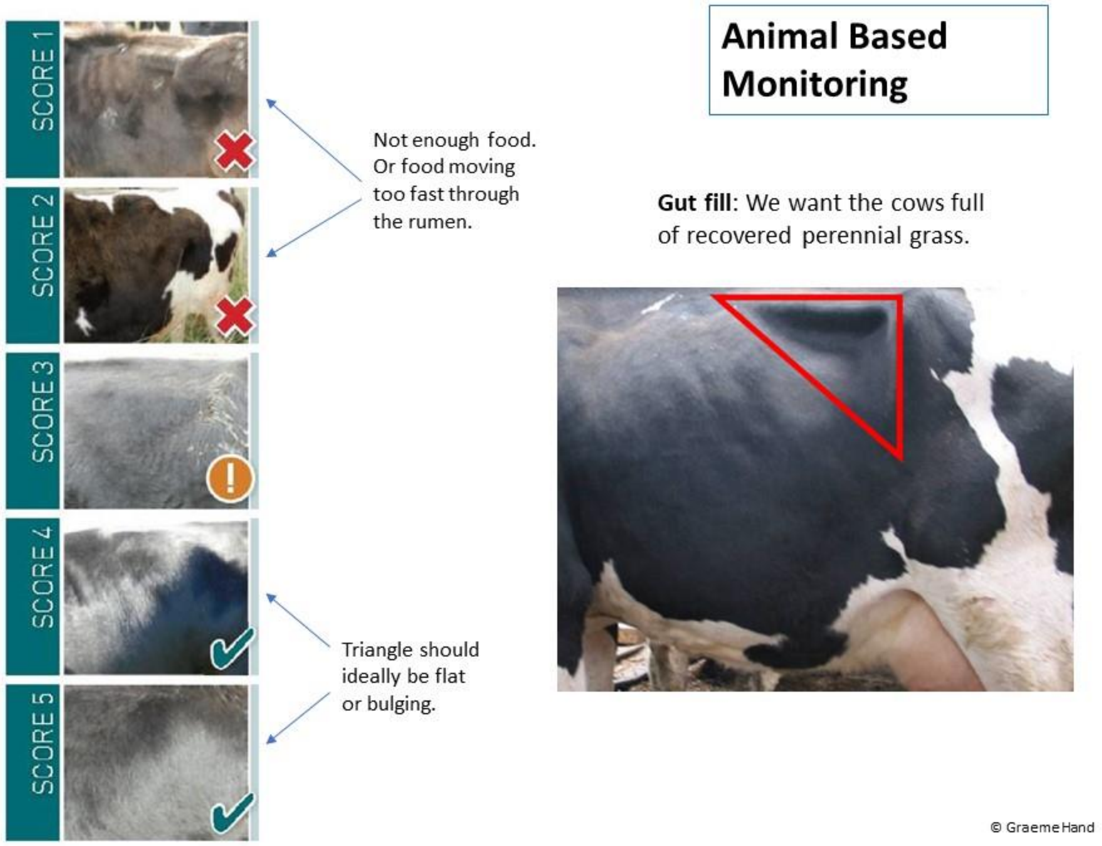
Animal Based Monitoring

Gut Fill - Ensuring animals have adequate feed is crucial to success.

Gut fill scoring ensures that there is enough material in the rumen.

On the properties that we have managed we have found that with our pastures and our cows that shifting cows when approximately 20% have gut fill 3 scores (just showing triangle) three provides us performance we require.

During times of dry feed gut fill score may need to be increased



Animal Based Monitoring

Dung Score: Is this perennial grass too young? (!)

© Graeme Hand

Dung scores are crucial for performance and animal health.

Most metabolic problems are produced by grass that is too young and not fully recovered.

It is better to have higher dung scores (slightly lower performance) rather than lower scores (animal health problems).

Animal Based Monitoring

https://www.lifestyleblock.co.nz/lifestyle-file/livestock-a-pets/sheep/item/136-diarrhoea-in-sheep

Land Monitoring and Corrective Action Form

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Date ______________

Variation to Landscape Goal	Possible Cause of Variation	Possible Corrective Action	Who/ When
Bare ground between perennial grass plants – no raw litter present	1. Litter not grown. Perennial grass not fully recovered between each grazing. Unrecovered grass has chewed off tips and no fresh litter. Recovered grass has all fresh tips and fresh yellow litter. Grazing. Recoveries are too short for growth rate. 2. Animals picking up litter as not being moved on gut fill.	1. Check increasing recovery between each grazing in a safe to fail practice (S2F) area. Usual cause is overstocked for growth rate. Determine why recoveries less than what is working in S2F areas. Reduce stocking rate and paddock size while maintaining S2F stock density and utilisation. 2. Check litter before and after grazing to confirm. Usual cause is overstocked for seasonal growth. Determine why stock densities are lower than what is working in S2F areas. Reduce stocking rate and paddock sizes	
Raw litter present but not composting/ decomposing	1. Litter not in contact with soil surface and not available to soil life.	1. Check increasing stock density/ animal impact in a S2F trial area. Usual cause is low stock density and/ or moving animals on too fast. Check animals are moved on gut fill and increase utilisation by reducing paddock size.	
Perennial grass spacing increasing. Annual forbs and grasses increasing	1. Perennial grass dying/ weakened from recovery too short	1. Check increasing recovery between each grazing in a safe to fail practice (S2F) area. Usual cause is overstocked for growth rate. Determine why recoveries less than what is working in S2F areas. Reduce stocking rate and paddock size to achieve S2F stock density and utilisation.	

Land Monitoring and Corrective Action Form
continued

hand for the land

Date _______________

Variation to Landscape Goal	Possible Cause of Variation	Possible Corrective Action	Who/ When
Seedlings are not present at start of growing season	1. Animal impact/ stock density below level to initiate germination of soil perennial grass seed bank. 2. Lack of perennial grass recovery	1. Check increasing stock density/ animal impact in a S2F trial area. Usual cause is low stock density and/ or moving animals on too fast. Check animals are moved on gut fill and increase utilisation by reducing paddock size. 2. Check if seedlings present before grazing. If present and not establishing increase recovery. Usual cause is overstocked for seasonal growth. Determine why recoveries less than what is working in S2F areas. Reduce stocking rate and paddock size while maintaining S2F stock density and utilisation	
Decline in better perennial grasses	1. Perennial grass dying/ weakened from recovery too short	1. Check increasing recovery between each grazing in a safe to fail practice (S2F) area. Usual cause is overstocked for growth rate. Determine why recoveries less than what is working in S2F areas. Reduce stocking rate and paddock size to achieve S2F stock density and utilisation.	
Grey oxidising grass noted as increasing	1. Paddock too large to allow even grazing	1. Check increasing stock density/ animal impact in a S2F trial area. Usual cause is low stock density and/ or moving animals on too fast. Check animals are moved on gut fill and increase utilisation by reducing paddock size.	
Woody plants noted as increasing	1. Perennial grass dying/ weakened from not having growth points cleared.	1. Check increasing stock density/ animal impact in a S2F trial area. Usual cause is low stock density and/ or moving animals on too fast. Check animals are moved on gut fill and increase utilisation by reducing paddock size.	

Acknowledgements

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