Weed Succession Management

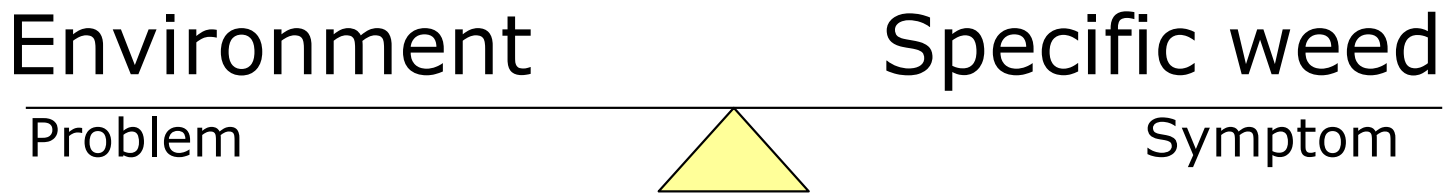
An “eco” - logical approach to (plant) weed management

Intro

- Weeds do not just happen; there is normally a logical reason why a particular plant species can more than survive, but thrive.
- The key is to understand what triggers the problem weed[s] in the first place and create an environment that limits its opportunities.
- We need to think about new solutions for old weed problems.

General Themes

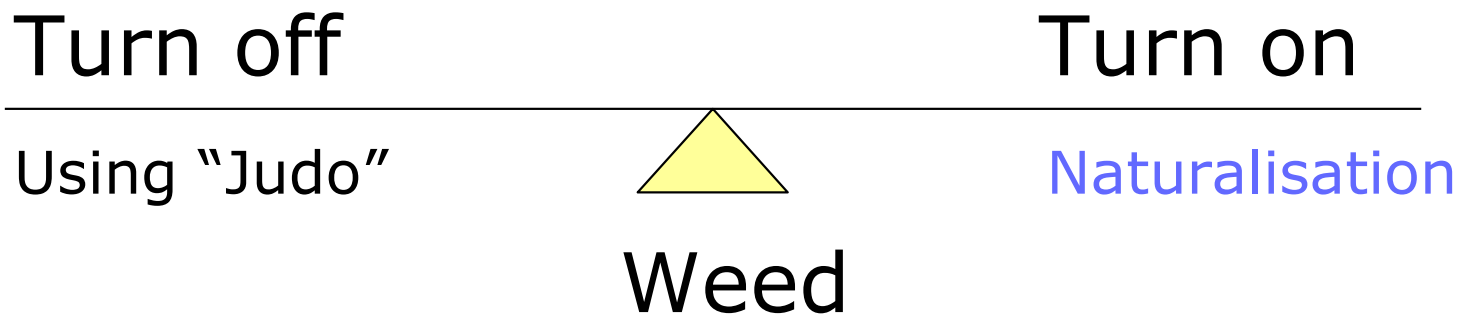
- What to focus on?



  - As the environment and climate changes the plant community will respond and adjust.

General Themes

- Learning to turn weeds – On or Off ✓



General Themes

- If I kill weeds will they return – Why?
- Stuart Hill reminds us: "*If you kill that plant and its associated role, you now have to do what that plant was doing*."
- If I successfully kill the weed, what will replace it [something worse]?
- IPM notes that a previous pest gets worse and is even harder to kill.

Plant Successional (End point) Order

- Plants are in a dynamic successional order.
- Plant succession is part of ecological succession, which involves the directional change of ecological communities over time.
- Directional changes are naturally [accumulatively] progressive, but after disturbance [drought] they can be regressive.

Plant Successional (End point) Order

- Plant successional order is associated with the building of soil.
- Soil is a by-product of plant production.
- Higher order plant succession is associated with creating / modifying micro climates. Hence the word "*Rain*forest"

Reference: Role of weeds in Regenerative Agriculture

- The biological development of soil requires plants. "The plants themselves, by adding humus to the soil through the decomposition of their tissues, and in this way changing the physical and chemical composition of the soil, prepare the way for a new and higher form of life, hence in a way **work out their own destruction**" (Sampson, 1919, p.3).

- Sampson, A.W., 1919, Plant Succession in Relation to Range Management, U.S.D.A., Bulletin No. 791.

Scott, J. K., 2000, Weed invasion, distribution and succession

- "*Bare rock will, over time, be subjected to weathering and microbial activity leading to the formation of soil. The plants that initially colonise the soil will themselves be replaced by other plants often in a recognisable sequence over time …* ***Weeds form part of this successional process****, but are not confined to a particular stage in plant succession*" (Scott, 2000, pp.31-32).

- Scott, J. K., 2000, Weed invasion, distribution and succession. In B. M. Sindel (Ed.), **Australian weed management systems** (pp. 19-38), Melbourne: R. G. and F. J. Richardson.

Plant Successional (End point) Order

- Plants are in a successional order.
- "**Primary**" succession first colonizer

Moss, Lichen, Herbs, Forbs, Grasses etc.

"**Secondary**" succession after a major disturbance eg Human intervention / farming

Moss, Lichen, "Weeds", Grasses etc.

The plants have not changed, but their names and associated values have been rebranded.

?

- Humans eat herbs, but cows eat weeds.

The naming of plants, depends on your needs.

When is a weed an “indicator” plant.

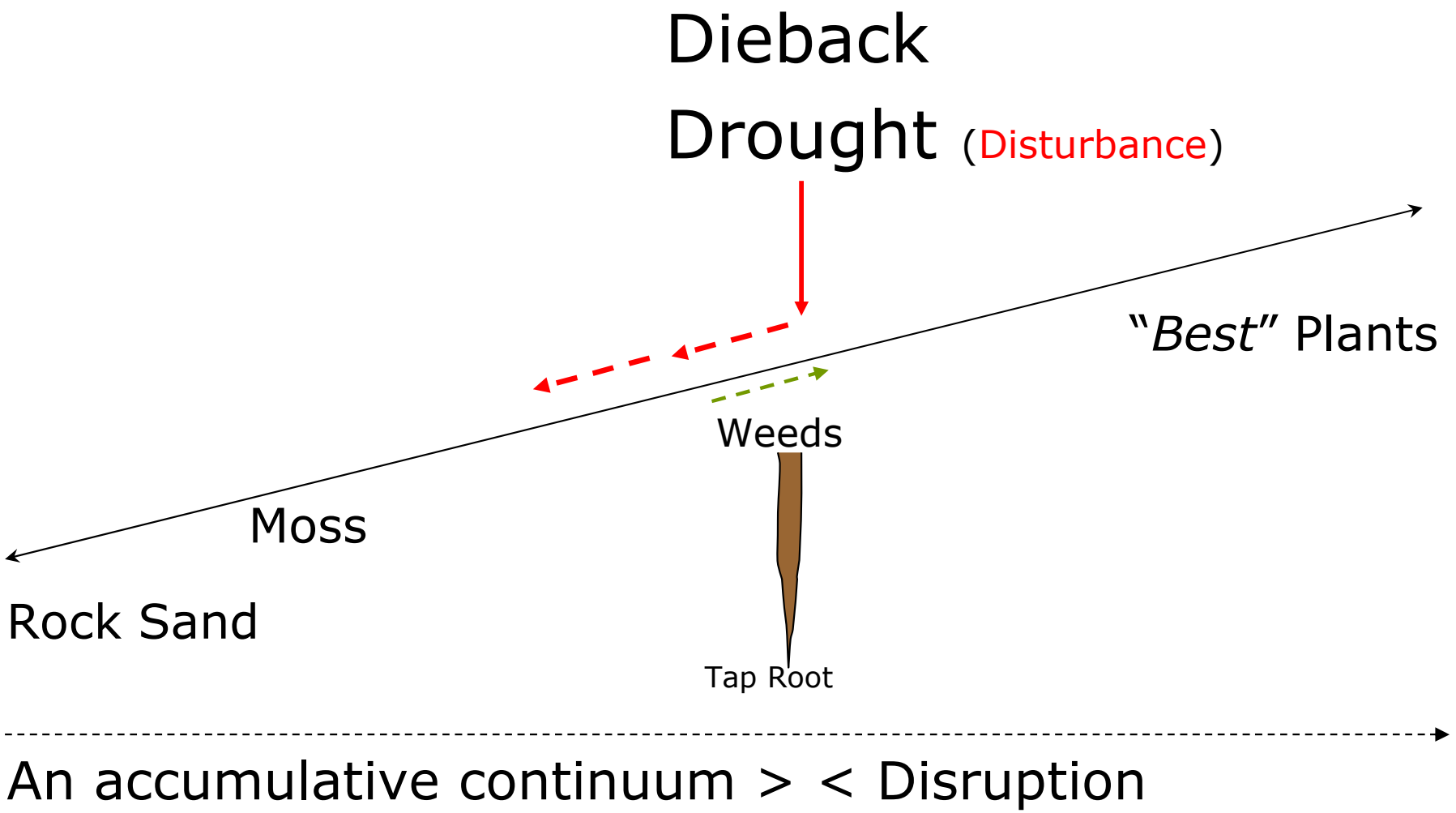
The moment your decide that it is!

Shoot to **Root** ratio

- When think about plant / weed succession, don't just think about what's on top.
- Many weeds do their repair work under ground being unseen or valued.
- Note: After dieback of grasses [fibrous roots] the **tap rooted** weed fills that niche.

  Why? To create new feedback loop?

After the Drought / Floods?



Elephant in the room

- Is dieback simply the ecological collapse [failure of a climax community] of an agro-ecosystem?
- Are weeds in time and space nature's repair tools? [Doing their best work underground]
- Is there good documentation of the restorative plant succession after dieback?

What is a weed?

Is a weed just an unwanted plant?

Is a weed a plant out of place or

Is it an opportunistic plant that has found and is making an improved home?

What is a weed?

A plant that has a [perceived] negative value to individuals, councils, states or the Nation*

*WONS: 32 Weeds of National Significance

Why WONS?

WONS Key criteria:

- ✓ Invasive tendencies
- ✓ Impacts
- ✓ Potential for spread
- ✓ Socioeconomic and environmental values.

- Ref: https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds/wons

What is a weed?

- Weeds have a tendency to be invasive and spread [or is the landscape degrading and other plants dying out and leaving new niches?]
- Why do some weeds rapidly “take off”, but times they don’t?
- Why are many weeds – Seasonal?

Why do we get weed?

- Historically we used to associate weed problems with having a lot of **seed reserve** in the soil.
- That is why often an aim is to kill the weed before it goes to seed.
- Logic is that the more weed seed you have the more weeds you are going to have.

The weed seed or the environment?

- Is a large weed seed bank the “problem” or the “symptom”?

- If 1,000,000 weed seeds were in the
- favourable environment – many would grow?

- If 1,000,000 weed seeds were in the
- unfavourable environment – few would grow.

Do weeds (plants) reflect their environment?

- Many specific weeds can be turned “on” by creating a favourable [seasonal] environment for them.
- You can turn many specific weeds “off” by creating un-favourable environmental conditions
- As environmental conditions change, so will the weeds

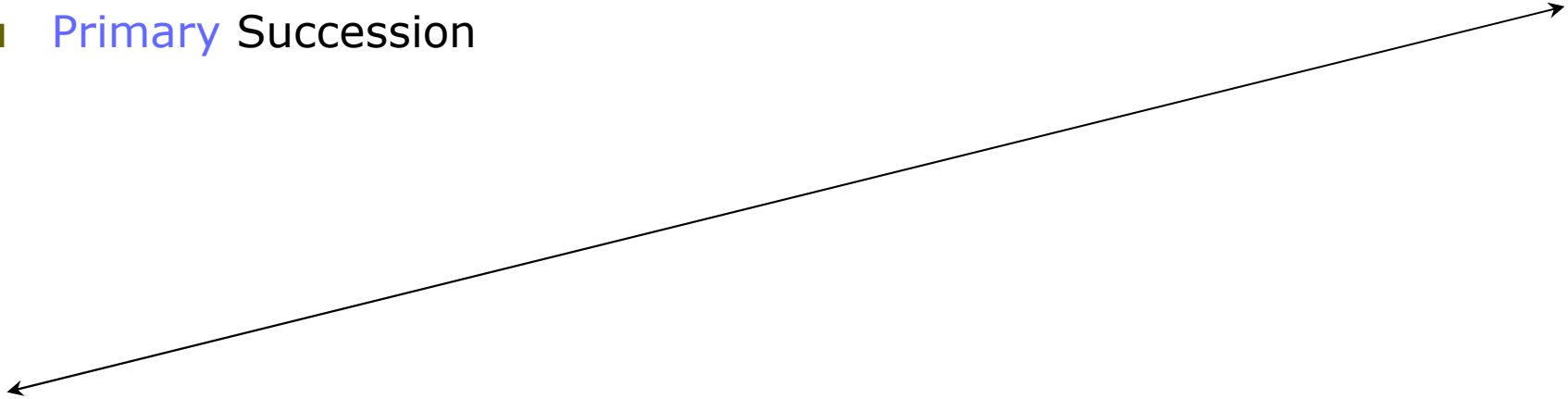
- Weeds as plants in disturbed environments take the opportunity to capitalise on new ecological niches.
- {Like putting in new links in a broken chain}

- As plants create an improved environment they produce conditions for their **own demise**.

- The successional order needs previous plants to create and accumulate improved conditions, so that “higher” order plants can live and reproduce.

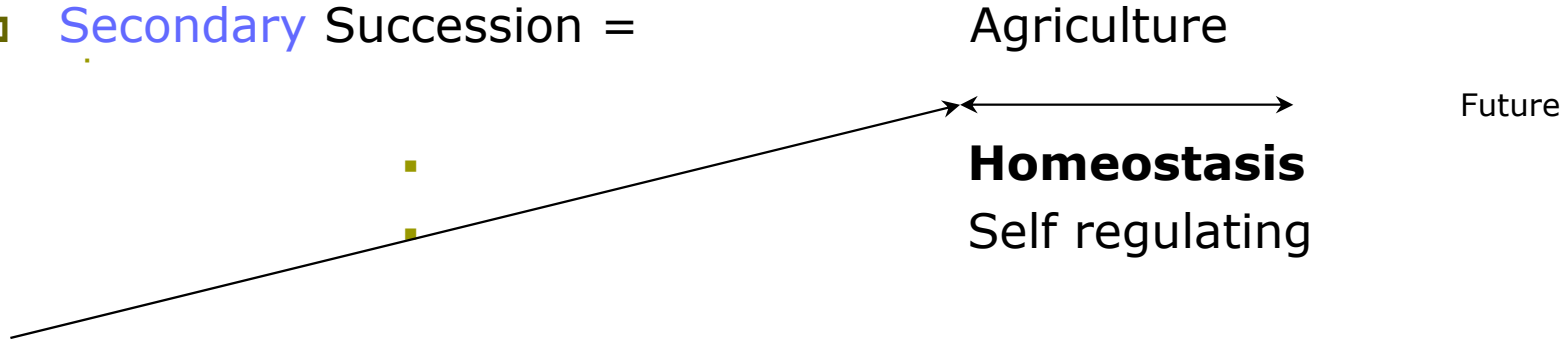
Plant Succession

- Rock (each plant improves the environment for the next) Forest
  - Primary Succession



  - Can be bi-directional

  - Secondary Succession =



Homeostasis

- Generally Agriculture aims for (self regulation) homeostasis, meaning a natural balance giving consistent economic returns.
- A “good” season is when everything goes well = homeostasis.
- Fertilisers are used to re-balance fertility.

Homeostasis

- Are herbicides used to re-balance the plant community that you are wanting?
- (Which changes the successional direction)

- Is it possible to re-balance the environment and create a new homeostasis; new micro-climates?

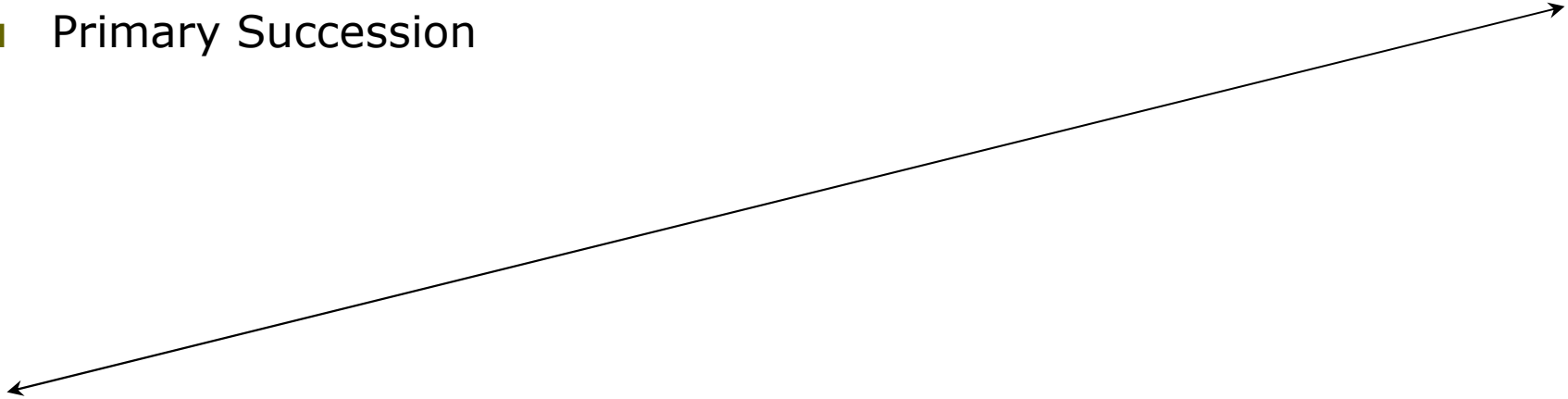
- Is weed invasion an indicator that the ecosystem has had a change in its homeostatic balance and is literally recalibrating?

Ecosystem recalibration

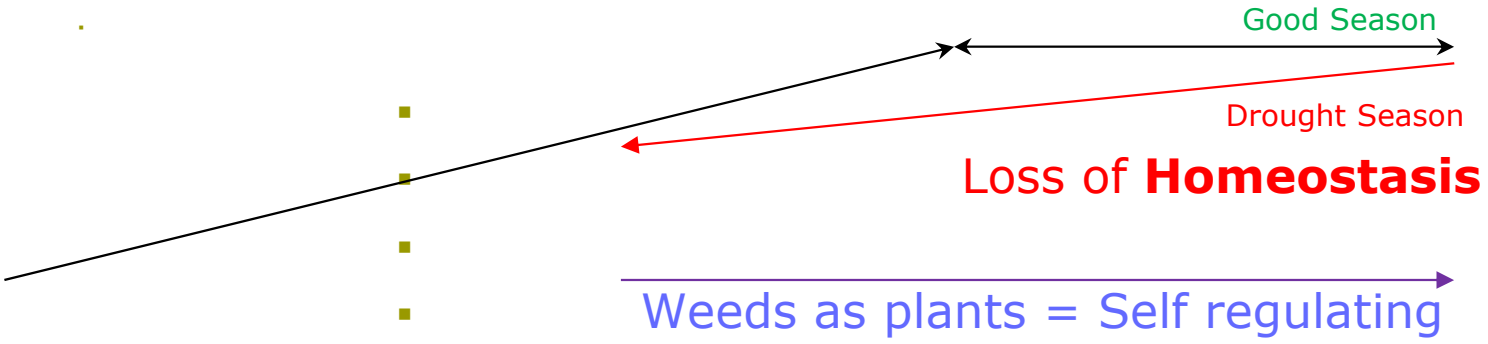
- Seeing changes in the landscape reflects "nature's self repair" system.
- Are plants called weeds, indicating a changing or recalibrating landscape to a new ecological homeostasis?
- BIG QUESTION – Are plants as weeds simply raising the successional order, but in a way that we do not always want?
- (No one weed has taken over the earth)

Plant Succession

- Rock (each plant improves the environment for the next) Forest
- Primary Succession



- Can be bi-directional
- Secondary Succession = Agriculture



Weeds are a reflection of their environment?

- In general weeds can be divided into 2 groups:

- **Protective** traits = thorns, toxins, high Si etc
- Compensatory growth / Increased resistance

- **Productive** traits = broad leaf weeds and especially Nitrate weeds [around stock camps]

Weeds are a reflection of their environment?

Protective weeds

As an environment degrades, it becomes harsher and or with greater extremes. Plant characteristics adapt with greater protective traits and adaptations: succulents and spines in deserts.

As a landscape degrades black spear grass gives way to white spear grass as the plant succession declines.

Weeds are a reflection of their environment?

- Q What type of environment does **G**iant **R**ats **T**ail prefer to grow in?
- Q An aggrading or degrading landscape and or environment?
- Q Focus on the GRT or improving the environment not to suit it?

Weeds are a reflection of their environment?

- Is GRT the "*problem*" or is it the "*symptom*"?
- Did the drought encourage or discourage GRT?
- What can we learn from this to better manage it?
- Did GRT invade or did it replace the more productive plants that have declined?

Weeds are a reflection of their environment?

- With Climate Change is GRT going to get worse and are more productive plants going to be successionally replaced by more protective plants?

- Have you heard of the "Great Southern Migration" of weeds [as the land dries out]?

- Do we have a growing weed "*problem*" or are they the "*symptom*" of the ongoing effect of Climate Change?

Where to focus?

- Should the focus be in [herbicide] killing weeds in the short term (only to see them return)?
- How much has herbicides gone up in the last 12 months?
- Should more “eco”-logical approaches be considered?

Where to focus?

- "Eco"-logical approaches:
- - Learning to work with Nature and ecologic patterns.
- - Learn about **your local plant succession** and ask yourself is it progressing or declining [more protective].
- - Learn to: Read the Weed and treat each plant as an ecological indicator.

Are you in the Low, Med, High Class

- Native: Original Species [Need RRP? + S?]
- Soil fertility Class: LOW

  Pioneer Volunteer Species – 1st RRP or 2nd Ca/Mg
- Soil fertility Class: MEDIUM

  Opportunist Species Need Ca: Lime? or Ca & Mg: Dolomitic Lime, Dolomite?
- Soil Fertility Class: HIGH

  Advanced Species Need Ca/Mg? & Biology?
- Soil Fertility Class: EXCESS [Nitrogen ⇧]

  Need Carbohydrates/Sugar &or Biology or Silica


How many plant species
can you count?

Remember

- “You don’t know, what you don’t know”
- “A little knowledge is a dangerous thing
  It is not the knowledge, but the little”
- “Study nature, not just books”

Reviewing

- Weeds (plants) are ecological indicators
- Weeds reflect soil fertility: Low Med High
- Are herbicides [*price rises* ⇑] a short term solution for longer term symptom?
- Is GRT a problem or the symptom?

What is the purpose of weeds?

- a] To annoy and frustrate horticulturists and farmers?
- b] To wear out your slasher / mulcher?
- c] To increase herbicide usage?
- d] To take advantage of a new ecological niche?
- e] To become a “Naturalised” plant
- f] All of the above?

Things to think about

Purpose, Form and Function [PFF] of Weeds

1] What weed are you targeting the most?

2] Name the most common weed [not including the above]

3] Name the weed most difficult to manage [not including the above]

4] Name the newest weed on your farm and what "ecological niche" allowed it to literally – take root?

Activity

- Write down a list of weeds that grow throughout the year.
  Please start in 1st major rain event for simplicity.
- Is there a natural weed succession on your property?
- [including perennial / full time weeds]

Clues:

- Think of the development of a new area or block.
- Think of any new bare areas that have been created.
- Think of a problem weed in the past and why it has gone.
- What weeds are increasing, what are decreasing, is there a pattern?
- Can you put your weed list into a natural order = weed succession

Hard Questions

- Of the 2000+ major weeds -
- Why do you not have them all?
- Why do you have to repeatedly spray as new plants come back?
- Have you got rid of weed “A” only for a worse weed “B” to replace it?
- Herbicide resistance, then what?

Turning Plant / Weeds On or Off

- Dr William Albrecht learn to "turn" plant productivity "on" by understanding a soil test. Focusing on:

- Calcium to Magnesium ratio

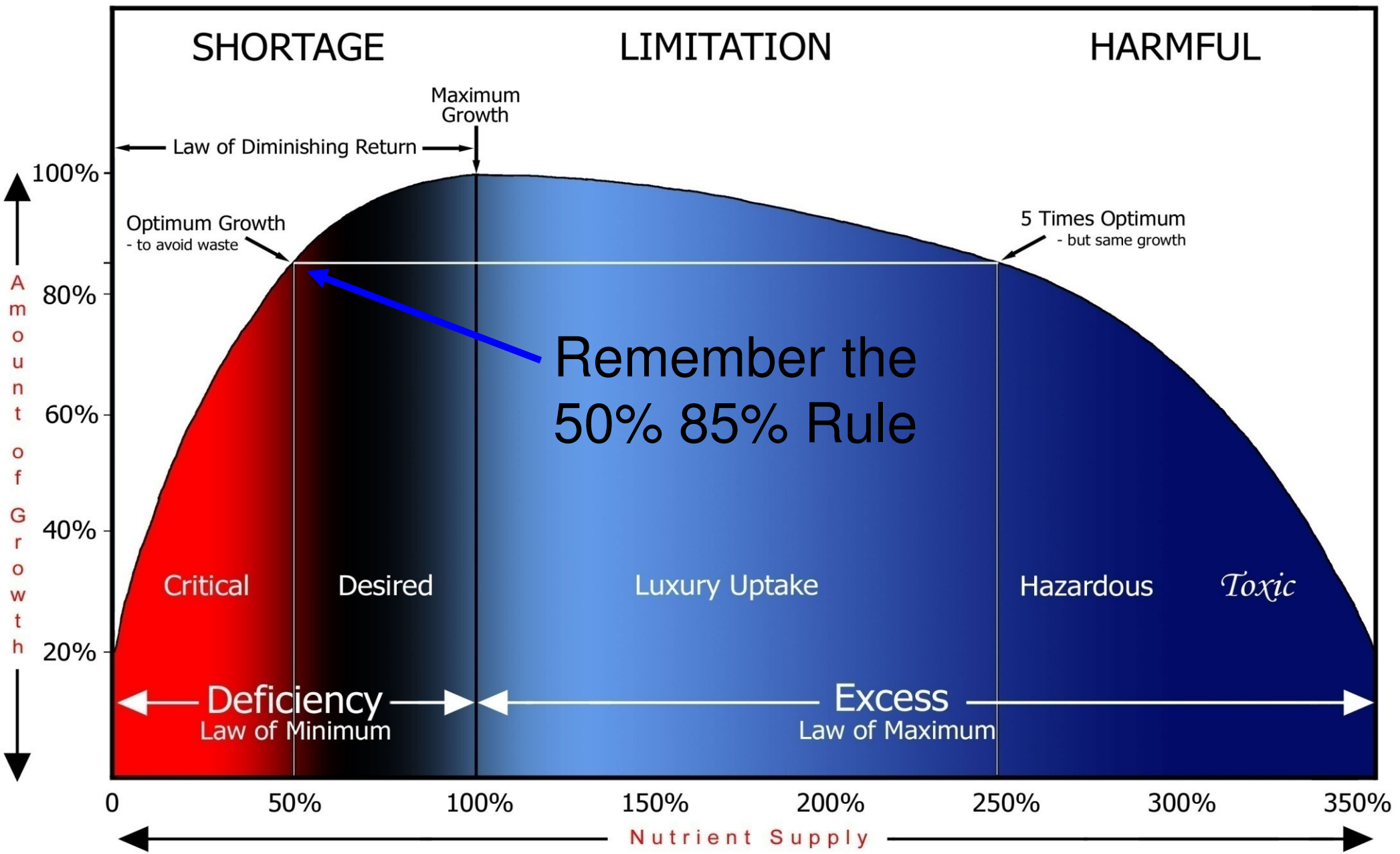
  and

- Potassium to Sodium ratio

  [and corresponding soil pH]

  [Not individual elements]

Nutrient [Plant] Response Model



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- Adjusting soil chemistry can [will if done in a major way] change plant composition.

- In low phosphorous soils the historical use of Superphosphate in agriculture
  – turned "on" plant productivity.

- But excesses of [for example] boron was used as a herbicide in the past.

From cropping

- Recommended Reading, but US
- Correlation of specific weeds to soil chemistry
- McCaman, J.L., 1994
  Weeds and Why They Grow
  Sand Lake, MI.
- Acres USA [was over $ 200 now a lot cheaper]

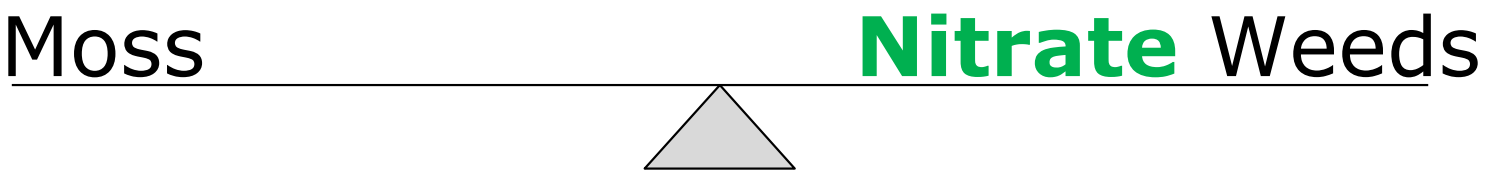
General Reading - Australian

- Recommended Reading

- **The Wonderous World of Weeds**
  Understanding Nature's Little Workers
  By Pat Collins
  New Holland Publishers

Form and Function of Weeds [as plants]

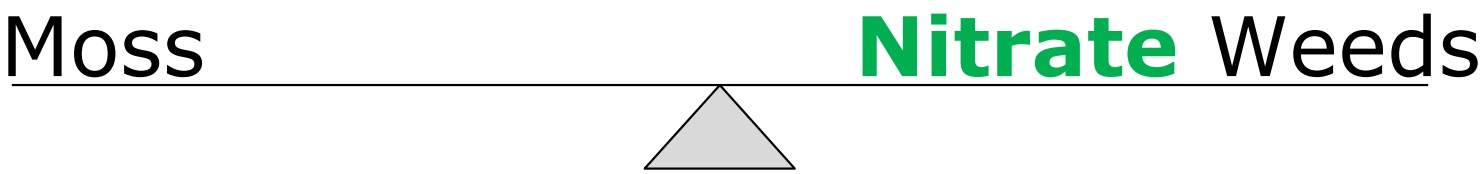
- 2 Extremes:



Moss	Nitrate Weeds
Short	Often tall soft
No roots	Often fibrous roots
Slow growth	Rapid growth

16 Forms of Weeds

- 2 Extremes:



Short	Often tall soft
No roots	Often fibres roots
Slow growth	Rapid growth
Low productivity	Highly productive

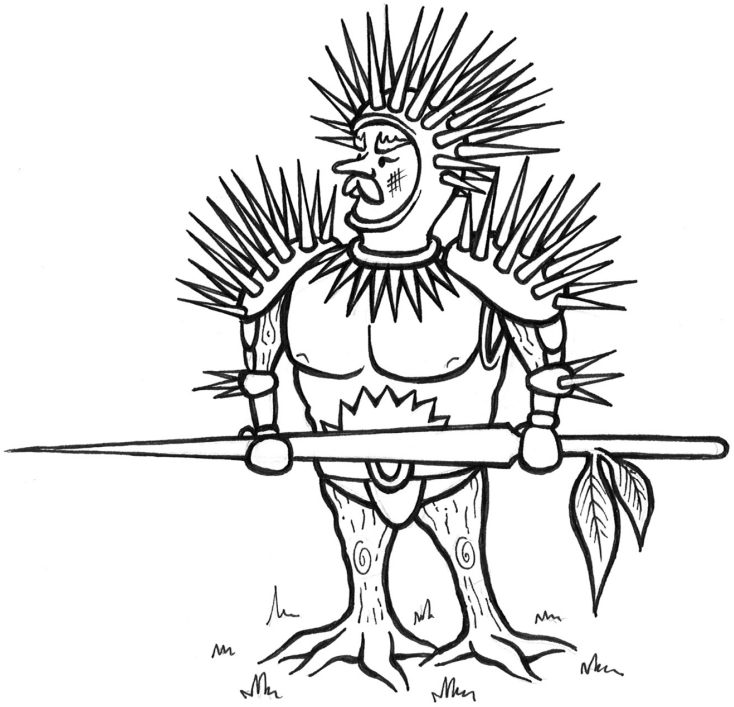
Jones Weed Index (JWI)

- Weed Behaviour Management through interpretation of the form and function of the weed in 16 categories of the Jones Weed Index (JWI)

- This list was originally designed to teach children, hence the simple pictural names

- **Simple pioneer** weeds
- **Highrise** weeds
- **Fortress** weeds
- **Rusty wire** weeds
- **Armed sword** weeds
- **Jack Hammer** weeds
- **Drilling rig** weeds
- **Gold nugget** weeds
- **Soil tiller** weeds
- **Bio Lump (N)** weeds
- **Balloon** weeds
- **Spider** weeds
- **Umbrella** weeds
- **Tube** weeds
- **Tent bush** weeds
- **Bowl of soup (wet)** weeds

Spiketon



5 Main Groupings {of the 16}

- Covers of the soil
- Defenders of the soil
- Topsoil Builders
- **N**itrogen Regulators [**+** or **-**]
- Ecosystem Renovators

  Often "*Environmental*" Weeds

Low succession order weeds

- Covers of the soil
- **Simple pioneer** weeds
- **Highrise** weeds

- Defenders of the soil
- **Fortress** weeds
- **Rusty wire** weeds
- **Armed sword** weeds

Soil builder with root system focus

Topsoil Builders		Root System
Jack Hammer	weeds	Tap root
Drilling rig	weeds	Deep tap root
Gold nugget	weeds	Rhizomes, corms
Soil tiller	weeds	[Fine feeder roots]

- Often associated with constant plant top removal or over grazing.

- Note root to shoot ratio

Higher Fertility

- Nitrogen Regulators

- **Bio Lump** weeds Building N
- **Balloon** weeds Using Excess N
- **Spider** weeds Using Excess N
- **Umbrella** weeds Using Excess N

- Ecosystem Renovators

- **Tube** weeds
- **Tent bush** weeds
- **Bowl of soup "wet"** weeds

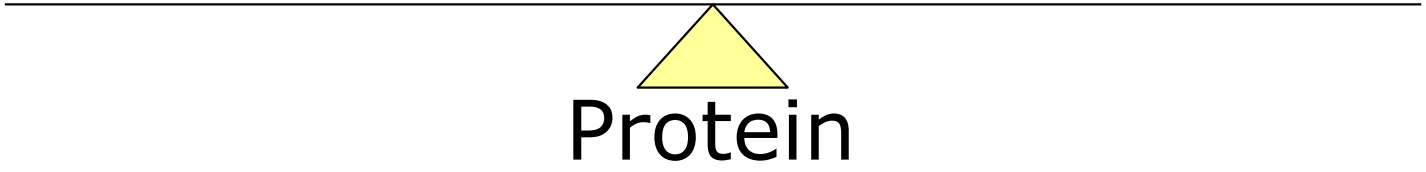
Nitrate Weed Characteristics

Case study: Nitrate Weeds

- Background:
- Carbohydrate = Carbon / oxygen / hydrogen
- Carbohydrate + Nitrogen = Protein

Case study: Nitrate Weeds

- Carbohydrate Nitrogen



Stock: Loss of condition = Nitrogen ⇧

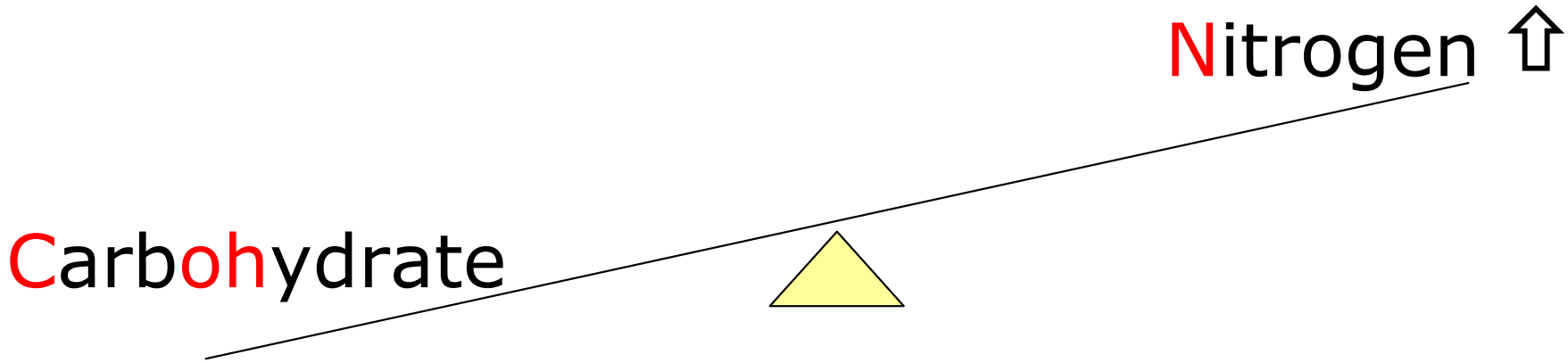
Crop: Hollow stem = Nitrogen ⇧

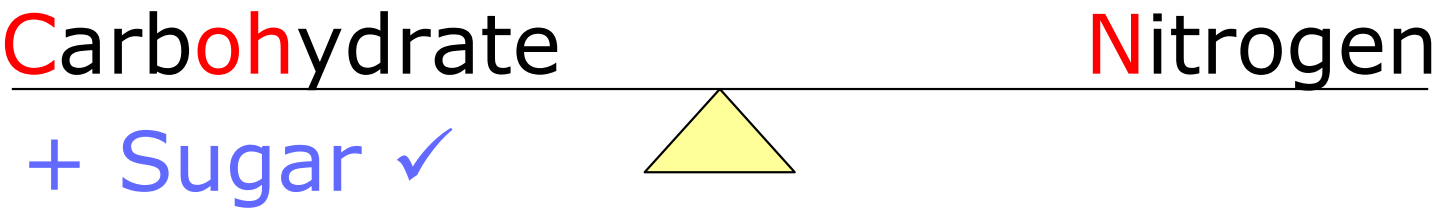
Nitrate weeds act as the soil's safety valves

Reduction of Nitrogen usage

- If nitrate weeds are the symptom of high nitrate levels and traditional management practices still suggest nitrogen usage.
- How can we use Judo Weed Management?
- How can we use the weed against itself?

A different way of thinking?





For example urea + sugar

A different way of thinking?

Why urea + sugar ?

Microbes eat at the first table;

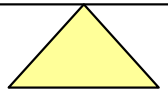
Meaning that if urea only is added, soil microbes will utilise the Carbohydrate in the form of organic matter to re-balance their intake (C : N ratio).

Sugar to suppress nitrate weeds

- Trials have been done on the use of sugar to suppress nitrate weeds.
- Dairy farmers have used raw sugar.
- For discussion Point:
- What trials have been done here?
- Did they work and at what rates?

Another option?

- Carbohydrate Nitrogen



- Protein

The use of [fish] protein = Carbohydrate and Nitrogen

Has anyone tried fish and kelp (+ B and V) mix on dieback? - Discussion Point

Break of drought and Nitrate weeds

- One of the functions of nitrate is to increase plant growth.
- Rapid growth [jet fueled] nitrate weeds as plants. Quickly put a green scab over the soil surface.
- During a drought or extended dry, organic matter will still break down but soil microbes are generally dormant. Therefore nitrate / nitrite builds up.

Break of drought and Nitrate weeds

- When rain comes and plants germinate. Those plants that grow best in the environment quickly grow to form a green scab to protect the soil surface.

- Healthy soil will often have few nitrate weeds as plants and soil biology share this limited resource.

Break of drought and Nitrate weeds

- Often if the "symptom" of nitrate weeds are killed off, more grow until the nitrate "problem" is overcome.

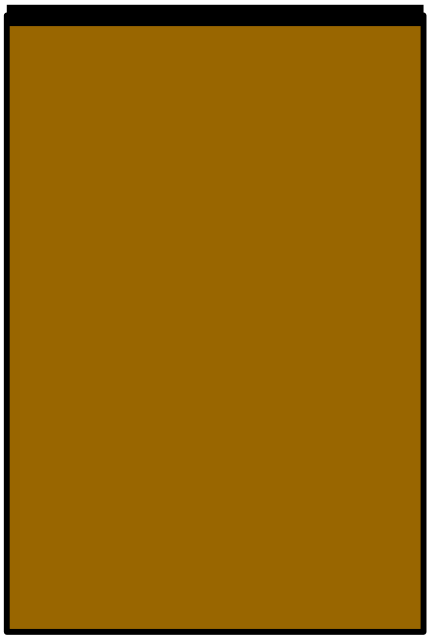
- Cash the problem -
- Pasture cropping was used in areas that had periods of dry weather and nitrate build up. Putting a (cereal) crop, utilized the excess N.
- Remember that in wetter years often nitrate weeds can be a symptom of surface sealing and associated poor soil structure.

15 years to work this out!!!!!!!!

- The challenge, 2 extremes:
- Why can a normally deep healthy, soil suddenly grow nitrate weeds?
- On poor [rocky] soil with very low fertility, can still grow nitrate weeds – Why?

Nitrate weeds grow on “good” and “bad” soil

Surface sealing



Thick Organic Matter
Could also be on rock

Key Point: Prevention 1st

- Aim to prevent your problem symptom ☑ weed.
- Ask yourself – When do my management decisions or environmental / climatic changes, cause it to thrive?
- If my weed is seasonal, what can I do to use "Judo" weed management against the weed itself?

Cause and effect

- If a new weed arrives, ask around if others have it – could it be due to changing conditions / climate?

- Ask individuals that have been around the district a while if they have had this weed before and what happened [eg will it come and go or stay and naturalise]

Take home message

- Pastures tell you where you are,
  but **weeds tell you where you are going**.

- It pays to read the weed.

- Are you progressing {Productive] or degrading {Protective} in your plant succession?

Using the 16 Jones Weed Index Groups

- Know the different groups and their associated roles and environmental niches.
- The behavioural weed management can now be integrated into the Judo weed management model.
- Learn to use the weed against itself.

?

- Weed management is also

about of state of mind.

When is a weed an “indicator” plant.

The moment your decide that it is!

An indicator plant can not be a weed as it has a beneficial value.

Take home messages

- Use **weeds as indicator plants**

- Thinking of weeds as the symptom
  [that can give you answers to the problem]

- Letting the form and function of the indicator plant [*weed*] tell you what is needed.
- [Book: Weeds and What they Tell]

New idea

- Make a local plant succession list
- [Collect as many plants as you can find]

- Place in order from:
  least to most productive / profitable

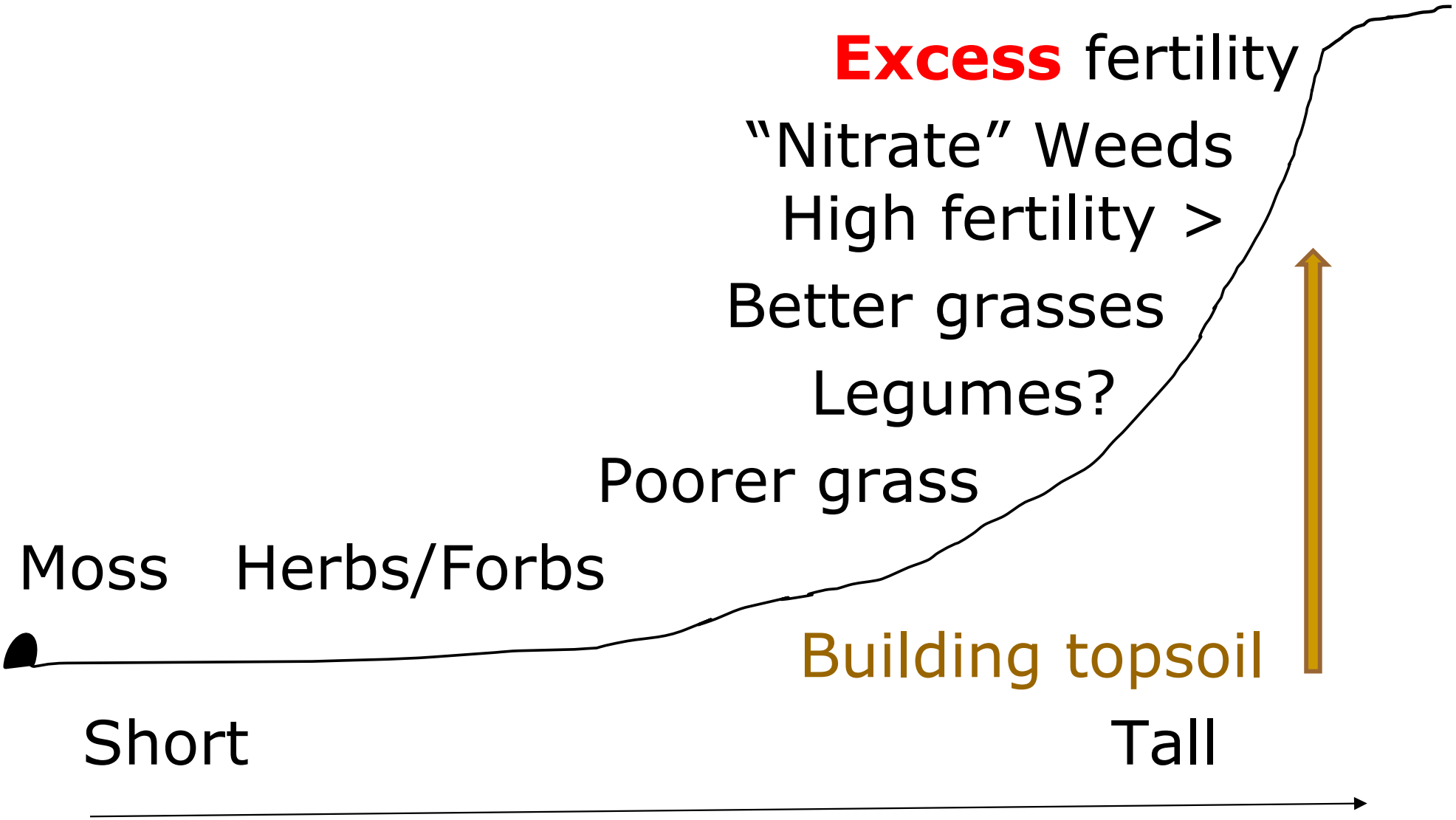
- From short to tall, weakest to strongest

- From mosses, forbs, weeds {tap root}, grasses
  Remember where legumes {N} fit in

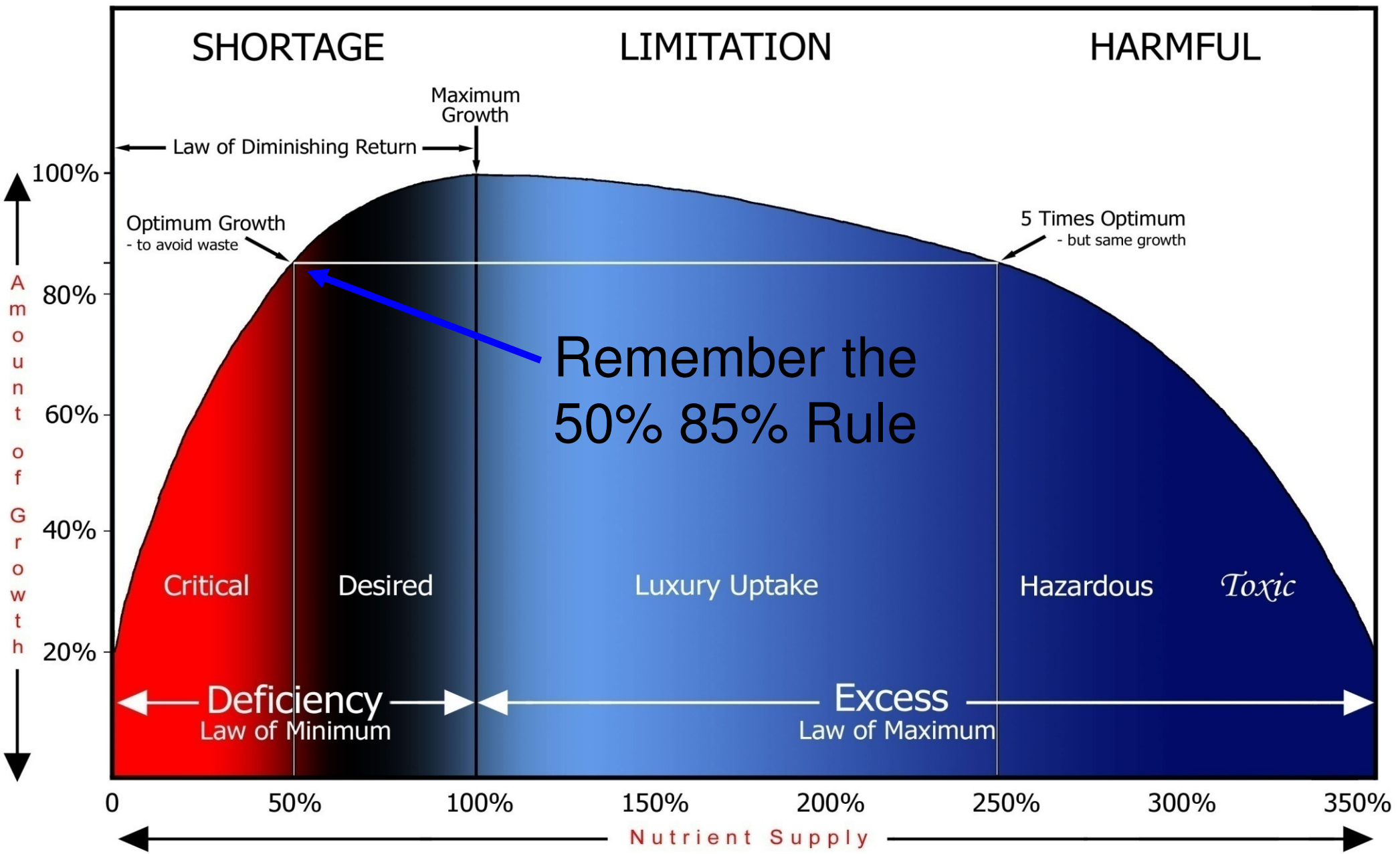
New idea

- Make a local plant (25+)succession list
- Think of where the highest fertility place is on the landscape [Septic? Stock yards].
- Think of where the wettest places are.
- Remember the legumes {N} and where they fit in.
- Look for edges where 2 plant communities join together.

What should it look like



Nutrient [Plant] Response Model



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Weeds and Civilisation

Weeds follow the footprints of human civilisation.

Are weeds going to be the plants that will initially repair those degraded global footprints?

If humanity wins the war on killing off weeds could we lose our civilisation?

Q

- Try asking yourself a simple question:

- What is the weed's form and function telling me?

- **Learn to Read the Weed**

  and how to prevent it.

Your management is like a steering wheel.

So avoid driving into problem weed situations!

This small plant that you did not know.

One day a plant was starting to grow. > In a garden, starting out very low.

Then its flowers felt the warn sunlight. > Its flowers were oh so bright.

As it grew with seed on high. > It matured and began to die.

This small plant helped many to grow. > This small plant that you did not know.

Was this a weed of just a plant? > Its seed feed many a hungry ant!

A lacewing ate many a pest. > A ladybird used it for a rest.

The bee enjoyed its nectar too. > Weed or plant, depends on your point of view.

Gwyn Jones 02 03 2019 8.32 pm

Overall reminders

- Use weeds as indicator plants
- Know your soil limitations and mitigate
- Know and understand underground relationships to increase yields
- Remember your underground livestock
- Never be frightened of change


THANK YOU