

# A Permaculture Approach to Soil

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International  
Year of Soils

*healthy soils for a healthy life*

# Background

- In late 2012, the Permaculture Association Research Team began to focus on soil.
- In Sept 2013, we received funding from Slush to look at permaculture soil tests
- This funding ran until Christmas 2014
- We published *The Permaculture Soil Test Handbook* and *The Permaculture Soil Advice Booklet* online in May 2015.

# The core questions

- 'Permaculture is good for the soil, and using permaculture techniques will improve soil health'
- But how do we know that permaculture is good for the soil?
- And how can we improve our own soil using permaculture?

Let's get down and dirty with our wonderful soil!



# Criteria for permaculture soil tests

- Holistic approach to the soil as a system
- Needing no specialist equipment
- Needing no specialist knowledge
- Take no more than 2 hours
- Give really useful information about the soil
- Enable actions to improve the soil further
- Simple, right? Or maybe not...

# The problem

- Farming soil science dominated by lab testing
- Chemistry with very little biology
- Reductive, looking at the smallest parts of the soil but not the whole
- Characterised by NPK approach
- No nationally/internationally agreed tests

# Here's the problem...

- 'Soil testing is a special chemical analysis that provides a guideline for lime and fertilizer needs of soils when considered in conjunction with post-fertilizer management and cropping history.' (*SOIL TESTING: What It Is and What It Does* Thom, Wells, Murdock, and Sikora, Department of Agronomy, Kentucky State University, 2000)

# A Different Approach...

'The purpose of the tests is to measure the quality of your soil... the tests focus on healthy soil that is rich in microbial life and has a good structure.' (*The Permaculture Soil Test Handbook*, Warburton Brown and Kemeny, 2015)



# The Permaculture Approach

- Good soil has 3 characteristics; rich biological life, good structure & available nutrients.
- Our soil tests focus on biological life and structure, a 'bio-structural' approach.
- Well-fed soil, with cared for biological life, and a good structure, will generally feed plants very well.
- 'Feed the soil, not the plant' is a key principle of organic gardening.
- And 'a design for good soil' should be a key part of all permaculture growing projects.

# The Importance of Soil Biology

- Good soil has rich biology ranging from billions of bacteria and tiny fungi to worms and beetles.
- The biological life creates the soil through its digestive activities and binds the soil together.
- Much conventional farming practice ignores this biology or is actually destructive of it.
- A revolution in soil science has recently begun as the extraordinary role of fungi, worms and bacteria is just beginning to be realised.

# A Soil Science Revolution

- 'Recent research has revealed the true nature of soil organic matter (SOM). The prevailing thought was that most of it was comprised of decomposed plant material. This study shows clearly that it is actually bacterial and fungal remains that make up most SOM. The implications are that building SOM and sequestering carbon are absolutely dependant on the “living” fraction of the soil. Essentially, biology is everything when it comes to regenerating and sustaining healthy soil. Soil is indeed “living”.' (Soilhealth.net reviews work in *Biogeochemistry*, January 2013)

# Example 1) Wonderful worms!

'Earthworm services for cropping systems. A review' (Bertrand et al 2015, in *Agronomy for Sustainable Development* 35:2) reveals:

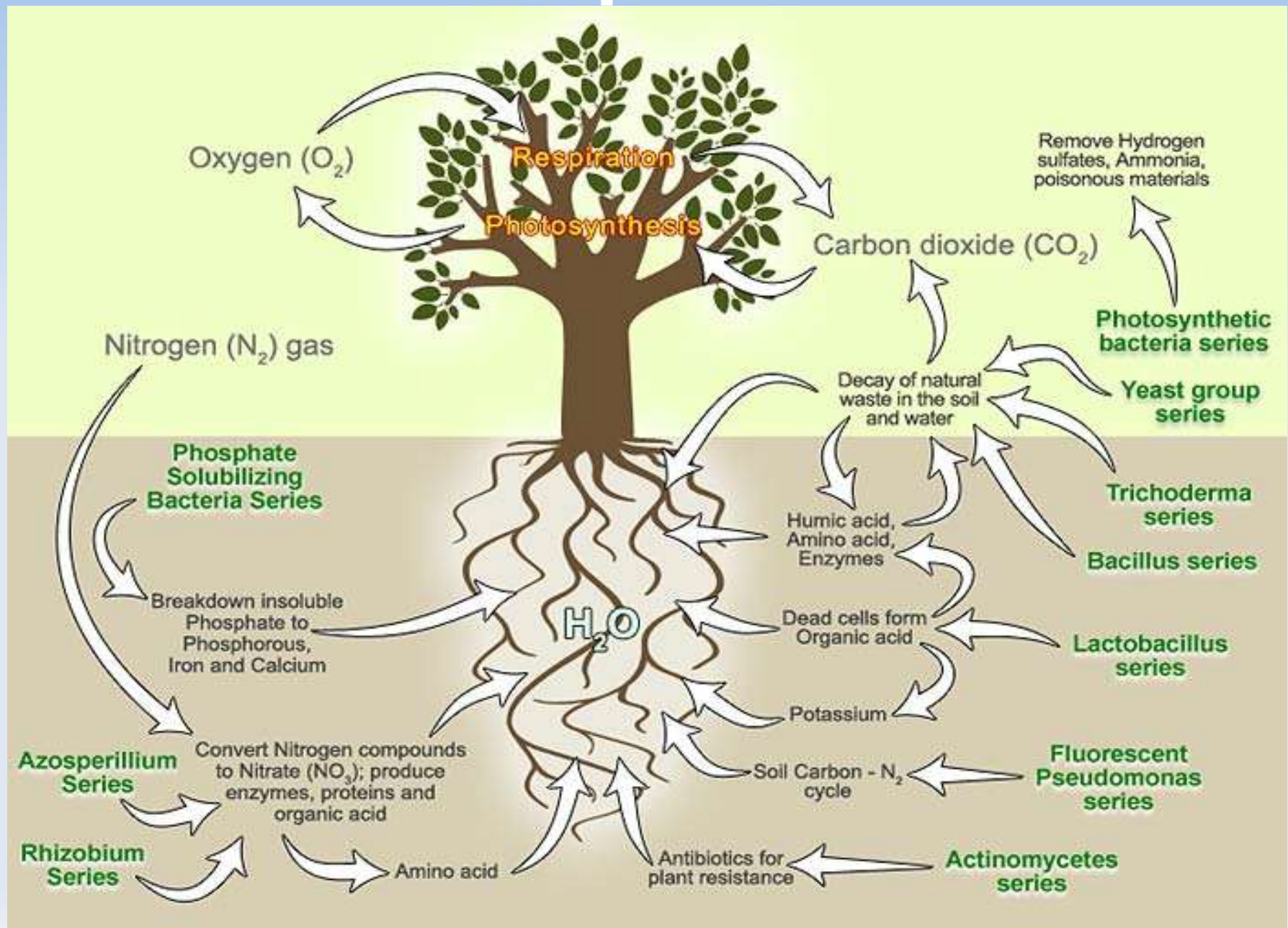
- (1) Worms improve soil structural stability
- (2) Worms modify SOM and nutrient cycling
- (3) Worms induce the production of hormone-like substances for plant growth and health
- (4) Direct drilling increases worm abundance
- (5) Organic amendments help worm abundance
- (6) Worms are vulnerable to pesticides.

# Example 2) Organic farming benefits soil biota

'14 years of evidence for positive effects of conservation... and organic farming on soil life' (Henneron et al, 2015, Ag. For Sust. Dev. 35:1)

- The long-term effects of conservation, organic and conventional farming on soil biota.
- Conservation and organic hugely boost soil life; macrofauna from 100 to 2,500 %, nematodes 100 to 700 %, microorganisms 30 to 70 %.
- Long-term, no-tillage and cover crops are better for soil biota than periodic legume green manures, pesticides, and mineral fertilizers.

# Soil biology is immensely complex...





# But we don't need to understand it!

- Once you start playing with soils, you quickly learn to recognise healthy ones by colour, smell, feel and look
- Our tests use very simple proxy measures of soil biology:
  - 1) Earthworm count, which acts as a proxy for all organic life in the soil
  - 2) The slaking and dispersal test, which tests how much organic matter is binding the soil

# A tireless worker for humanity

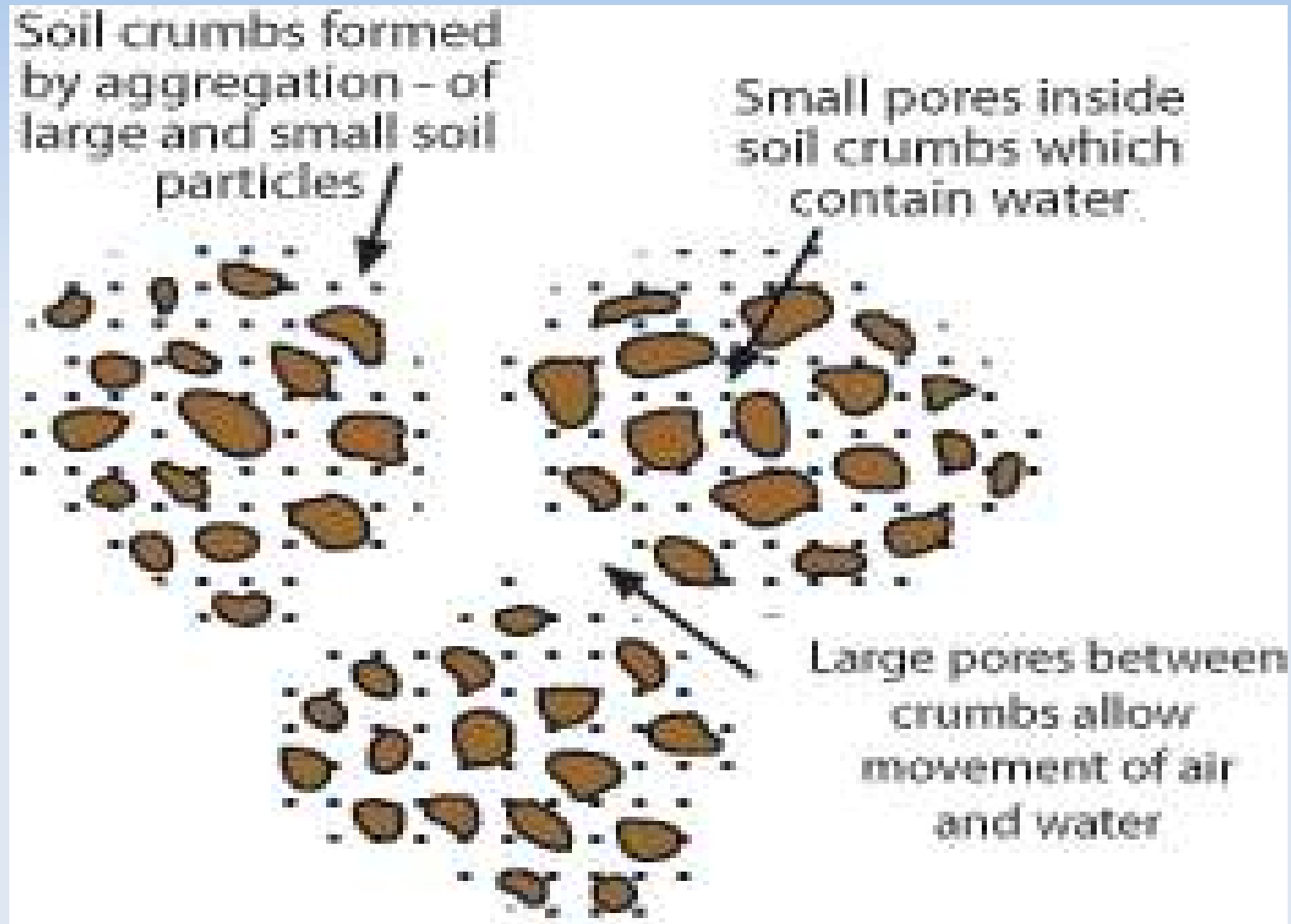




# Structural tests

- Healthy soil needs to have a good pore structure, to hold air and water and allow roots and soil fauna to pass through
- It also needs a good crumb structure, balls of soil that hold together but can be easily crumbled apart in the hand (friable)
- It shouldn't be compacted or squashed

# Friable soil



# Tests for soil structure

- Infiltration (soil drainage)
- Soil texture
- Bulk density
- Visual inspection
- Slaking and dispersal

# Additional tests

- Soil pH
- Soil depth
- Waterlogging and dryness
- Anaerobic conditions and pollution

# Soil chemistry and nutrients

- Using a lab to measure the geochemistry and nutritional content of your soil *is* useful
- This can be done alongside our tests to identify any nutrient shortages or pollutants
- However, a holistic approach to soil means that detailed soil chemistry/nutrient analysis should take second place to an integrated, rounded approach to soil health and feeding.

# Soil Advice

- *The Permaculture Soil Advice Booklet* contains much advice for improvements after undertaking the tests.
- The tests should be repeated yearly to show improvements over time.
- Time invested in understanding your soil and all that lives in it is time well spent.
- We hope that we can create a database of soil test results showing the benefits of permaculture management of soil.

**Spend some quality time getting  
to know your soil!**

