

# FRIENDS OF HODDLES CREEK NEWSLETTER



Thanks to Yarra Ranges Council for their generous printing of the Newsletter.

## Our amazing 'talking forests'

**We all know the common expression 'Can't see the forest for the trees' – well this saying has now been taken to another dimension with the revelation that a forest is far more than a collection of trees, far more than what can be seen and, perhaps, far more than what we've always believed.**

### What lies beneath?

Below the forest floor is another world that scientists are just beginning to understand – a silent form of chemical communication where trees respond to their external environment. Within the soil, fungal roots known as **mycorrhiza**, grow around and inside the tree's roots, forming an expansive network, or **mycelium**, that is being referred to as the Wood Wide Web.

This web can be so dense there may be hundreds of kilometres of mycelium under a single footstep. The mycelium creates pathways that connect individual trees, not only of the same species, but between species. These pathways enable 'communication' between the trees, allowing the forest to behave as if it's a single organism.

Older trees, affectionately known as

mother trees, use the fungal network to 'nurture' their offspring by sending excess carbon down through their roots and into the network to shaded seedling trees. Similarly, sick and dying trees can dump their resources into the network which can then be used by healthier neighbours.

Trees can also use the network to send messages to one another when they are under threat (from insects and animals), by releasing chemical signals through their roots, warning neighbours to raise their defences. This underground network creates a thriving community that is effectively one huge superorganism.

### Sceptical?

Well, all of the above has been widely researched in Europe and Canada. Dr Suzanne Simard is a forest ecologist from the University of British Columbia and has widely studied these fungal networks between trees in North American forests. In 1997, her ground-breaking experiment was published in the journal, Nature, describing how radioisotopes were used to trace carbon, nitrogen and water moving between a Douglas fir and a paper birch tree.

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A cut 'mother tree' in Beenak Bushland reserve.



# How healthy soils make for a healthy life

**The next time you bite into an apple, spare a thought for the soils that helped to produce it. Soils play a vital role, not just in an apple's growth, but in our own health too.**

The formation of soil, known as **pedogenesis**, is a very slow process. Creating one millimetre of soil coverage can take anything from a few years to an entire millennium. But with soils around the world under threat, we're in danger of losing their health benefits faster than they are replaced.



## Healthy soils for healthy plants

A healthy soil is a living ecosystem in which dead organic matter forms the base of a food web consisting of microscopic and larger organisms. Together, these organisms sustain other biological activities, including plant, animal and human health. Soils supply nutrients and water, which are vital for plants, and are home to organisms that interact with plants, for better or worse.

In the natural environment, plants form relationships with soil microbes to obtain water, nutrients and protection against some pathogens. In return, the plants provide food.

The use of mineral fertilisers can make some of these relationships redundant and their breakdown can lead to the loss of other benefits such as micronutrients and disease protection.

Certain farming practices, such as tillage (or mechanical digging), are harmful to fungi in soils. These fungi play important roles in helping plants obtain crucial nutrients such as zinc. Zinc is an essential micronutrient for all living organisms. Zinc deficiency affects an estimated one-third of the world's population, particularly in regions with zinc-deficient soils. If food staples such as cereal grains are grown on zinc-deficient soils and further lack their fungi helpers, the plants become deficient in zinc.

## Farming practices and plant health

If the way food is grown affects the composition and health of plants, could farming practices that focus on soil health make food more nutritious? A recent review on fruits says yes. The researchers found that fruits produced under organic farming

practices generally contained more vitamins, more flavour compounds such as phenolics, and more antioxidants when compared with conventional farming.

Many factors are at play here, but pest and soil management strategies that benefit soil organisms and their relationship with plants are part of the equation.

The composition and function of animals and humans reflects, to some extent, what they eat. For example, the fish you eat is only rich in omega-3 fatty acids if the fish has eaten algae and microbes that manufacture these oils. The fish itself does not produce these compounds.

Increasing numbers of studies are demonstrating the link between nutrition and human health issues. We know, for example, that antioxidants, carbohydrates, saturated fat content and the ratio of omega-6 to omega-3 fatty acids contribute to immune system regulation.

We do not produce some of these nutrients; we must obtain them through our food. Therefore, how food is grown is a matter of public health.

## Beyond nutrition

Soil is the greatest reservoir of biodiversity. A handful of soil can contain millions of individuals from thousands of species of bacteria and fungi, not to mention the isopods, rotifers, nematodes, worms and many other identified and yet-to-be-identified organisms that call the soil home.

Soil microbes produce an arsenal of compounds in their chemical warfare for dominance and survival. Many widely used antibiotics and other drugs were isolated from soil. It may hold the answers to our battle with antibiotic resistance and other diseases including cancer.

It has also been suggested that exposure to diverse microbes in the natural environment can help prevent allergies and other immune-related disorders.

## The road to healthy soils

Unfortunately, we are doing a poor job of looking after our soils. About two-thirds of agricultural land in Australia is suffering from acidification, contamination, depletion of nutrients and organic matter, and/or salinisation. And in case anyone forgets, soil is every bit as non-renewable as oil because soil formation is such a slow process.

On the other hand, soil erosion can happen very quickly. For a taste of what happens when soils are destroyed, nothing beats sitting through a dust storm and watching day turn into night. Dust storms inspired George Miller's film 'Mad Max: Fury Road'.

In the 2009 Red Dawn in Sydney, some 2.5 million tonnes of soil were lost within hours to the ocean in a 3,000km-long, 2.5km-high dust plume.

Australia's major cities began on fertile land. Melbourne's

food bowl can supply 41% of the city's fresh food needs. Such secure access to fresh and whole food needs our protection.

Healthy soils are part of the solution to some of our dilemmas – poverty, malnutrition and climate change – as they underpin processes that gives us food, energy and water. If we want to meet the 2030 Sustainable Development Goals, soil health is a linchpin we cannot ignore. From this perspective, agricultural practices to maintain healthy soil are clearly an important target for policymakers. Looking after our soils ultimately means looking after ourselves.

By Ee Ling Ng & Deli Chen - The Conversation  
March 21, 2017 2.45pm AEDT

## Talking Forests

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In a later study, Dr Simard showed that every tree in a 30 by 30 metre forest stand was connected to every other tree, with an estimated 250 to 300 trees being connected together in this single forest stand.

Scientists have also known for many years that plants communicate by giving off chemicals above the ground. An example of this is the release of volatile chemicals by plants when they are attacked by pests. These chemicals are detected by neighbouring plants which can then set up defence mechanisms like accumulating chemicals that can deter the pests. Chemicals can also be used by plants to attract predators that eat the pests.

### Australian research needed

Little research has been done here in Australia on this topic, although eucalypt forests are known to have mycorrhizal fungal networks. So, it is reasonable to assume that, if this communication between trees happens in Europe and America, it is also happening here.

These insights must surely give us reason to reflect on the wisdom of current Central Highlands timber harvesting practices, where the forest is subjected to the double whammy of a clear fell followed by a so-called regeneration burn. One can only imagine that the impact of these practices on below ground networks must be equally extensive and possibly long-lasting.

We need to develop a better understanding of our plant neighbours and take better care of them, because life on earth could not exist without them.

For further reading here are some links and references:

<https://www.youtube.com/watch?v=oVK9TCXZz6I>

<https://www.youtube.com/watch?v=yWOgevPIVRo>

[https://www.ted.com/talks/suzanne\\_simard\\_how\\_trees\\_talk\\_to\\_each\\_other](https://www.ted.com/talks/suzanne_simard_how_trees_talk_to_each_other)

<http://www.abc.net.au/science/articles/2015/05/20/4236600.htm>

Peter Wohlleben: The Hidden Life of Trees (2016).

## Bravo, Pamela

**Friends of Hoddles Creek member Pamela Wiencke has received a Certificate of Recognition for her contribution to volunteering in the local community. The award was presented by Tony Smith MP, for the federal electorate of Casey, with Pamela being one of the 46 individuals recognised in the annual Casey Volunteer Awards. Fellow Friends attended the ceremony with Pamela which took place in Chirnside Park on Saturday 1st December.**

Pamela has worked with wildlife, with a special interest in wombats for the past 30 years. She was a registered wildlife carer, specialising in the rehabilitation of wombats, for over six years and worked with many orphaned wombats. While now retired from regular wildlife care, she is a volunteer for the Mange Management group, working with landowners to treat wombats suffering from mange, as well as educating the public on how to live with and protect wombats. She has been a member of Friends of Hoddles Creek for over five years and her efforts in protecting wildlife of all types is tireless.



Pamela with a very cute and grateful youngster.



Friends of Hoddles Creek would like to wish all of our readers a very Happy and Healthy New Year, with a quote from the German-Australian physician, geographer, and most notably, botanist, Ferdinand von Mueller: "Let us regard the forest as an inheritance, not to be destroyed or devastated, but to be wisely used, reverently honoured and carefully maintained. Let us regard the forest as a gift, entrusted to any of us only for transient care, to be surrendered to posterity as an unimpaired property, increased in riches and augmented in blessings, to pass as a sacred patrimony from generation to generation."

## Facts about wombats and their scats

**Australia is home to three types of wombat – the northern hairy-nosed, southern hairy-nosed and the bare-nosed, formerly known as the common wombat. Wombats are thought to have evolved from other marsupials around 40 million years ago and their closest living relative is the koala.**

Wombats are herbivores, having a diet of grasses, bark and roots. They differ from all other marsupials by having a single pair of upper and lower incisor teeth which are never ground away as they are both rootless and never stop growing – well adapted for gnawing tough vegetation.

Wombats have a very slow metabolism, taking up to 14 days to complete digestion. This time allows them to get every bit of moisture and goodness out of their food, which is why their scats are usually firm and dry.

The hairy-nosed wombat is thought to be one of the most arid adapted mammals on earth. A wombat can produce between 80 and 100, two-centimetre pieces of faeces (scats) in a single night, with four to eight pieces each bowel movement. The distinctive cube shaped dung of the wombat has been a curiosity as to both how and why it is formed.

### Square peg from a round hole

In a recent study, Patricia Yang, a postdoctoral fellow in mechanical engineering at Georgia Institute of Technology in Atlanta, together with a group of colleagues set about to solve the mystery of the cubic wombat poo. They studied the digestive tracts of common wombats that had been euthanised after being struck by cars and trucks on roads in Tasmania.

Their research revealed that "the wombat's excrement solidified in the last 8% of the intestine, where the faeces built up as blocks the size of long and chunky sugar cubes. By emptying the intestines and inflating them with long modelling balloons, of the sort used to make balloon animals at children's parties, the researchers measured how the tissue stretched in different places."

They found that the last section of the wombat intestine

does not stretch evenly, unlike the rest of the intestine. When measured around the circumference, some parts give more than others. This allows the intestine to deform in such a way that packs faeces into 2 cm-wide cubes, rather than the usual sausage shapes. Their research is not yet complete and you may be wondering why someone with a degree in mechanical engineering would be interested in cuboidal excrement. Today, engineers have only two methods for making cubes: either moulding them or cutting them, according to Yang. The wombat's intestines suggest a third route is possible and this could have amazing implications if it were able to be applied to the manufacturing process.



Back here at home, any Hoddles Creek local would be well familiar with wombats marking their territory at night (being territorial animals) with neat little piles of their cuboidal poo deposited on anything new (fallen trees, fresh mushrooms, garden tools etc). And while the How question is close to being answered, the Why is most likely that having a cube shape the dung is less likely to roll off such objects, thus keeping their territory marked. Clever wombats!

<https://www.theguardian.com/science/2018/nov/18/scientists-unravel-secret-of-cube-shaped-wombat-faeces>

**Like to join FOHC?** The Friends of Hoddles Creek are always on the lookout for new members to add new ideas, new helpers and new friends to our group. If you'd like to join, simply contact us with your name, address and phone or email details. You can mail these to FOHC, PO Box 298, Yarra Junction, Vic 3797, or email us at [friendsofhoddlescreek@gmail.com](mailto:friendsofhoddlescreek@gmail.com).

See more at our website ([www.friendsofhoddlescreek.com](http://www.friendsofhoddlescreek.com)) or on Facebook – just search 'Friends of Hoddles Creek' or 'FOHC'.

