



Grow Great Fruit

ESSENTIALS COURSE



[WEEK 2 – MID SPRING]



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SUPERCHARGE YOUR SOIL WITH COMPOST TEA....

The two main principles of building healthy soil are increasing the amount of organic matter in your soil (by adding compost, growing plants under your fruit trees, or mulching), and encouraging healthy soil microbes. The soil microbes perform many useful functions, including adding nutrients to the soil, changing nutrients into a form your plants can use, adding carbon to the soil, and helping your soil hold more water.

Microbes will naturally populate your soil over time, but this week we're bringing you a way of speeding up the process—by drenching the soil with compost tea that you've brewed yourself, at home. As the weather—and therefore the soil—warms up, now's the perfect time to be adding biologically rich compost tea to your soil.

WHAT IS COMPOST TEA?

It's really important to establish at this early stage just what compost tea is and isn't. Compost tea is not compost extract—which is compost that has been steeped in water. This in itself is a good product (which we highly recommend you use), but it is different to compost tea. Why? Because with an extract you end up with the same amount of microbes

that you started with, it's just they're sloshing around in water rather than hanging on to compost—nothing has been done to actually breed and increase the microbes, which is exactly what happens when you make compost tea.

Compost is wonderful stuff, but its biggest shortcoming is that it's difficult to get enough of it—finished compost typically has only 30% of the bulk of the raw materials that went into making it, and so it takes a lot of source material to make any quantity. Now, what if there was a way to multiply by many times all the goodness in a shovelful, making it go so much further? Well, guess what, this is exactly what compost tea does!

The process of making compost tea is really a massive biological breeding program—science in a bucket really. What you are doing is taking all the microbes—mainly bacteria, fungi, protozoa, nematodes—that are found on biologically active compost (or, even better, worm castings), providing an environment for them where they're happy (by providing oxygen and the right temperature), and then feeding them.

The result is a liquid that has huge quantities of all that is good in the compost, and can then be applied

AT A GLANCE...

Compost tea is a great way to build your soil, making a small amount of compost or worm castings go a long way by rapidly multiplying the number of available microbes—it's science in a bucket, but way more fun than you had in the school science lab!

to our garden beds, orchards, and even directly onto plants in whatever quantities we choose. The biology can then get to work. So, as can be seen, compost tea is not fertiliser with which to feed plants; it is soil life with which to populate our soil so it can do what it's meant to do—support an ecosystem of life that enables the cycling of nutrients, making them available to plants in the form and quantities required. Yet again, nature has got it sorted; we just have to work with it, not against it, and compost tea is another great way to do this.

Another huge bonus with compost tea is that it is extremely cheap to make. You can put together a 20-litre home brewer for a one-off cost of less than \$100. Each 20-litre brew will cost then just a couple of dollars (including the electricity to run the pump).



FEEDING YOUR COMPOST TEA

Yes, compost tea is alive with hungry microbes, and therefore for your brewing to be successful the microbes need feeding.

To some extent we can actually control what sort of microbes we are brewing by the types of foods we add. Compost tea tends to be either fungal or bacterial dominated. Why should we care? Well, perennial plants—such as fruit trees—prefer a tea that has a high fungal count; with annuals such as vegetables it's high bacteria that we want.

Fungal foods: Good fungal foods include liquid fish, oatmeal, liquid seaweed, and even apple pulp.

Bacterial foods: These tend to be simple sugars such as molasses, maple syrup, ordinary sugar, or fruit juice.

Because fungi are harder to grow than bacteria, it can help to activate the fungi before adding it to the brew. To do this, 3–4 days before starting your brew, thoroughly mix your source compost with some good fungal food (ground oatmeal) at the rate of about 3 parts compost to 1 part food. Make sure there's enough moisture that you can squeeze out a drop of water. Place this in a warm dark place and after a few days there should be a visible white web of mycelia (fungal strands) covering the compost.

Having sung its praises so highly, there's a couple of other things you should know about compost tea. Did we mention that it's not fertiliser? It's not junk food for plants, and you won't see the same rapid response you get when adding those things. It takes time to build healthy soil, and compost tea is a way of speeding up the process.

The other thing is that if it goes pear-shaped when you're brewing, it is possible to make something that will be bad for your plants and soil, but more on that in a minute.

HOW TO MAKE COMPOST TEA

Compost tea is more complicated than making extract because to grow these little microbes you need not only good source material (compost or worm castings), but you need to look after 'em—compost tea requires food and air to be successful. On the simplest level, a 20-litre bucket with a large aquarium air pump and some hose will get you started. The most important thing is that the water is highly aerated—it should be bubbling vigorously, like a pot of boiling water. If you're using chlorinated tap water, aerate it for about 30 minutes before adding anything so the chlorine can gas-off.

So, we've got our bucket and air pump set up, our water is tumbling nicely, and the chlorine has gone. The compost (or, better, worm castings) can then be added, and it can just go in loose if you don't mind straining the tea at the end, or are simply putting it out by the bucket. It's important that the compost is allowed to move and get tumbled by the water so that the microbes are knocked off into the water and can then breed easily.

Ok, microbe food next. Trees prefer tea that has high fungal levels, and vegetables and annuals prefer tea with high bacteria levels. In practice it doesn't matter too much. Good bacterial foods include molasses and other simple sugars; fungal foods are more complex, so oatmeal, bran, liquid fish (e.g., Charlie Carp), and liquid seaweed (e.g., Seasol).

For a 20-litre bucket, two cups of compost is enough (really!), and then about 100 ml each of any additives. We don't want too much food or source material as we run the risk of things happening too fast and the oxygen supply doesn't keep up. We then go into low-oxygen—

or anaerobic—conditions, and it's this that can lead to problems as these are the conditions under which bad bugs thrive. Use the best compost that you can get your hands on—the better the source material the better your brew will be, i.e., the greater the diversity of microbes will be in your finished product.

The tea is then brewed for 24–36 hours—if the air temperature is colder than about 20°C during the day then brew for longer; warmer air means faster brews. If the air is lower than about 12°C then probably don't bother until things get warmer—there simply won't be enough going on to make it worthwhile.

Don't be alarmed if your brew starts foaming at some stage during the process (usually after about 12–18 hours). This is simply a sign of microbial activity, and so is good in that way, but from the point of view of what you're brewing, it's neither good nor bad. A tablespoon of vegetable oil will dissipate the foam if it is a nuisance.

So, how do you know if what you've brewed is a plant and soil smorgasbord teeming with life, or is just brown water? Basically, if it smells bad it probably is, and so don't put it on your plants or soil. The most likely reason is that your brew has gone anaerobic, either because of too much food or compost, or too little oxygen. Having said that, properly brewed compost tea does have a distinctive smell; it's certainly not a bad smell, but it's not that good either (something like a cross between wet dog and horse poo!), so don't be too hasty in getting rid of it.

Compost tea doesn't store well—use it within 24 hours of making it. There's no reason that you can't keep a brew going beyond 48 hours if you need to, but it's a good idea to add another round of food in that case. What happens as the brew progresses is that microbe numbers build up, food sources get depleted, and then microbes start eating each other! This is what happens out in the big wide (soil) world so it's not a major problem, but obviously we are trying to put out as many microbes as possible, and having them feed on each other ain't helping.

Bear in mind that no two brews are the same as there are simply too many variables—temperature, source material, food sources. This is partly why compost tea is not used widely commercially—it is very difficult to get



Hailea V20 air pressure pump is a good size for a 20–50 litre compost tea brewer. They are very economical to run, at about 10 cents for 24 hours.

a consistent product. One tea may be very high in a certain fungi, the next may have none of them but high numbers of something else, yet they will both be good teas. This does not matter in the home situation, as long as we know that what we are brewing is not actually bad.

CLEAN-UP: It is very important that you clean all your equipment after each use. Scrub your bucket with a solution of household bleach and water at 1:10, and do the same with the PVC pipe parts, to remove any film that is coating things. These bio-films can be handy places for anaerobic bacteria to breed, and then they could pollute your next brew. We generally give things a good rinse and then leave them out in the sun for a few days to really make sure they're clean and dry.

USING COMPOST TEA

Right, now that we've made our tea, how we do use it? The important thing to remember here is that compost tea is not a fertiliser—it is really a soil improver, and because it isn't a fertiliser, it's impossible to use too much of the stuff! We can either put it out neat, or dilute it which simply makes it weaker and therefore go further. Weaker is not a bad thing; it's just that you'll be putting fewer microbes out over a given area. It's best to put tea out in mild weather on soil that is not completely dry. Adding it towards the end of a watering is ideal.

If using as soil drench, a watering can works well, and tea does not need filtering. Simply pour it onto the soil around—and over—your plants.

Another great way to use compost tea is to inoculate your compost pile, particularly if you've bought a quantity of compost (rather than making your own), as the quality can

be a bit variable, and you have no guarantee that it will be full of lovely microbes, as good compost should be!

Compost tea can also be used as a foliar spray, the idea being that you are colonising your foliage with beneficial microbes, which, if they get established, will live on the leaf and make it harder for diseases to take hold. If using tea as a foliar spray, filter it through an old stocking or other very fine mesh as it goes into the sprayer, or you'll get blockages in spray equipment.

However you decide to use your tea, it's not a bad idea to add some more of the foods that were added at the start of the process just to give the microbes something to go on with while they get comfortable in the soil.

HOW TO BUILD A COMPOST TEA BREWER

Building a 20-litre brewer is pretty simple. The main expense is the pump (~\$75), the rest is just a few PVC pipe fittings, and a suitable bucket or other container.

CONTAINER: A 20-litre bucket is a good size for getting started, but you could use any container up to around 100 litres with the pump we've recommended. It's important that the container is nonporous so that it can be cleaned effectively and won't give any off 'flavours'—plastic, enamel, and stainless steel are all good; copper, aluminium, concrete, cast iron, and steel (that can rust) are not good. Round containers are better than square as you're less likely to get low-oxygen dead spots where the water doesn't get circulated, and which can become anaerobic. They're also easier to clean.

PUMP: Ok, remember here that we're pumping air, not water. Air pressure



A 20-litre plastic bucket makes an ideal brewer—as long as it hasn't had anything nasty in it.

pumps designed for large aquariums are perfect for what we want. For a container of 20–100 litres, the pump needs to be able to move 20 litres/minute. We have had good use out of our Hailea pump, and the current appropriate model is V20, the '20' standing for 20 litres/minute. There are a number of brands out there. These are very efficient pumps that are rated at only about 15 watts, so over a 24-hour period they cost only about 10 cents to run.

It's not a bad idea to plan to have the pump at the same height or higher than the top of the bucket. This way if the power goes off in the middle of a brew and a siphon forms, the pump will live to do another brew and not become a casualty. It's not a big risk but you may as well eliminate it if you can.



PVC pipe components needed to make a compost tea brewer. Note that no glue is required—simply push parts together

PIPING: The piping takes the air from our pump into the bottom of the bucket where it is released through small holes. PVC is the easiest to work with and is pretty cheap, and either 15 mm or 20 mm pipe is suitable. We want to make a frame of pipe that sits on the bottom of the bucket and distributes the air as widely as possible so that there is no risk of low-oxygen spots developing. While a round frame would be best in a bucket, in practice it's much easier to make a square/rectangular one as you can just use elbows and not have to attempt heating and bending PVC (we've tried it, and it ain't worth the effort!).

So, we'll need 4 elbows for the corners and then short lengths of pipe for the sides. In one side we need to place a T-piece to join the piece of pipe that delivers the air from the top of the bucket. It's a bit fiddly getting this thing fitted together, but as there's no need to use glue because of the low pressure, you can experiment as much as you like to get it right—or close to it.

Now we need holes in each side of our PVC square for the air. Smaller is better in this regard as small bubbles allow for better oxygen exchange with the water—1 mm holes are ideal, and it's surprising how few are needed. The important thing is to have enough holes so that your pump isn't being choked and then could overheat. Put 3 in each side and then see how that goes. It's best to have the holes facing in towards the centre of the bucket, and as the pipes

are not glued you can just rotate them to achieve this.

At the top of the bucket you'll need an elbow on the top of the pipe, and then it's just a matter of getting the air to it from the pump. You'll probably need to buy some clear vinyl hose for this. Take your pump along to the hardware store so you can check the best fit. It's not important how snug the fit is at the other (bucket) end, as you can step down the PVC fitting to something close, and then just insert your vinyl hose and secure it with a bit of duct tape. This is not a high-pressure system and it also doesn't need to be completely airtight.

Assemble everything and give it a test run. You may need to tweak things a bit to get the air bubbling evenly in the container. You may also need to secure the PVC setup so that it doesn't try to float, but there's any number of ways to do this—you could attach a weight to the frame itself, tape the PVC frame to the bucket handle, or clamp the vinyl pipe to the lip of the bucket.

FURTHER RESOURCES: What we've given here is a basic compost tea primer—it's possible to get very involved, and perhaps just a bit obsessive, in the quest for the best brew. There's even a Compost Tea Yahoo group dedicated to the topic, and a glance through the posts there shows just what lengths people will take things to!

When brewing tea on a large scale, the same principles apply—water must be vigorously aerated.

Foaming in brews is common—add a small amount of vegetable oil to settle if desired.



20-litre bucket, pump, and PVC pipe are all you need to make a compost tea brewer



LOOKING AFTER YOUNG TREES IN SPRING...

WHAT SHOULD MY NEWLY PLANTED TREES LOOK LIKE AT THE MOMENT?



The first sign of life you will notice on your new tree is that buds will swell, and then open up.



The leaf buds will open and the leaves will unfold. It's possible for a tree to get this far just on the nutrient it had stored in its tissues from last year. For the next stage of growth to occur, and the shoots to start lengthening, the roots have to start growing and functioning well.



The tree will often produce flowers in its first year. It will also grow leaves, but it's important to remove the flowers as soon as you see them, to save the tree putting its energy into producing fruit when it should be growing branches. It's safer to cut (or use your fingernails) to snip the flowers off rather than pulling them, to make sure you don't accidentally pull any leaf buds off, which the tree is depending on for its growth. It's a good idea to remove all the fruit until the tree is 2-3 yrs old, and has established its permanent branches.

AT A GLANCE...

Trees do a lot of their growing in spring and early summer, so it's important they get a good start. At first they use the energy they stored in their tissues last season, but as their roots develop and grow, they are soon relying on the nutrients and water they take up with their roots. Therefore, if your young trees are growing and looking healthy, you can be confident they have started to establish a good root system underground. Here's what they should look like...

Sometimes the tree will ambitiously produce flowers in its first year. It will also grow leaves a bit later, but it's important to gently remove the flowers as soon as you see them (without damaging any leaf buds), to save the tree putting its precious energy into trying to produce fruit, when it should be growing branches



The leaf buds will gradually extend into shoots, some of which are destined to become the tree's permanent branches.



By early October, this little plum tree already has some shoots that are about 20 cm long. It's not uncommon for a tree to grow a metre or more in its first year.



TROUBLESHOOTING PROBLEMS WITH YOUNG TREES

PROBLEM	IMPACT/POTENTIAL CAUSE	ACTION
Bark eaten or damaged	If the damage extends all the way around the tree (ringbarking), the tree will probably die.	If you notice the damage before the tree is ringbarked, put a tree guard around the trunk, or use some other method, to protect it from further damage.
Leaf curl on peaches and nectarines	Mature trees will grow out of all but the very worst cases of this disease, but it can set a young tree back so much that it can die.	Nothing until next season. If the tree survives, next spring use copper spray at budswell and 10 days later to prevent Leaf curl.
Good initial growth and shoot lengthening, but then failure to thrive	Too much competition for water and nutrient from invasive weeds.	Remove weeds (except helpful groundcover plants), add compost to the soil and mulch. If you already have good groundcover plants, keep them mowed regularly. Make sure the tree is getting enough water.
Buds swell and burst, but then tree dies	Poor soil or poor rootstock. Possible soil contamination.	Remove tree, plant green manure crop to remediate the soil, don't plant another tree in the same hole (nearby is OK). If you are not familiar with the soil, and a lot of trees are dying, get the soil tested for contamination.
Failure to thrive in apple trees	Could be caused by root-eating nematodes, if apple tree is planted in the same place as a previous apple tree.	Provide appropriate soil conditions to favour predators of root-eating nematodes, ie, lots of organic matter, inoculate with soil microbes, make sure there is no compaction and the soil is aerated.
Leaves eaten as they emerge	Could be grasshoppers or earwigs	Try to diagnose problem. Earwigs can be excluded from tree with double-sided sticky tape or horticultural glue. Keep groundcover plants very short around tree.
Leaves pale in colour, curled up and may have burnt margins	Possible nutrient deficiency	Add a dose of good compost. Organic fertiliser may also provide some short-term relief of the symptoms. If you are unfamiliar with the soil and are having numerous problems with plants in your garden, you may want to get the soil tested for nutritional status, but generally soil will improve if you follow our suggestions and regularly add organic matter and feed your soil microbes.

GROWING YOUR OWN FRUIT TREES: SPRING JOBS

Growing your own fruit trees is really easy and lots of fun. Even if you don't grow your own rootstocks, it's great fun trying to graft new varieties onto existing fruit trees in your garden, and can be a terrific way to revitalise a tree that is not pulling its weight, for example a cherry plum that is very vigorous, but produces fruit that is wasted each year because it's too sour to eat.

Don't get hung up on whether you're doing things the 'right' way, just give it a go. If you follow our guidelines, you'll be surprised how easy it is to grow your own functioning, productive tree!

GRAFTS DONE THIS YEAR - AFTERCARE

It's not too late to do some grafting this year if you still have scion wood in good condition, ie, it's still dormant and not shrivelled

If you've already done some grafting this spring, the following pictures tell you what you need to know:



Check grafts to see whether the buds on the graft have started to grow

Remove any competing shoots growing from the rootstock or the soil—you can see from the photo how quickly these suckers can get very strong and start to dominate the tree



If the graft is growing well, it might be time to remove the bandage, particularly if you notice it is starting to create a thinner 'waist' because it is restricting growth. If you take the bandage off and decide the union is not yet strong enough, tape it up again to hold it firm for a bit longer.

AT A GLANCE...

If you're growing your own fruit trees from scratch, lots happens in spring, and it's worth paying attention!

To help you keep track of all the different aspects of your rootstock and grafting care, we've summarised spring's jobs.



Remove all competing shoots that you don't want, ie from the rootstock, or coming up from underground

BUDDING - AFTERCARE

If you did some budding last summer, it's really past the time when you should have cut back to the bud, but it's still worth it, as there's still a chance the bud you implanted will grow.



If the graft has grown very vigorously and has become top-heavy, prune it to protect it from snapping off at the graft in a heavy wind.



BUDDING - GET READY FOR SUMMER

Budding (summer grafting) needs to be done on one or two year old growth, no bigger than about 25 cm diameter. If you're planning to bud a mature tree, remove all the branches bigger than 25 cm diameter now, and this should stimulate the tree to grow new shoots this summer, that can be budded in February. It's a good idea to leave at least one 'nurse' limb on the tree to make sure it doesn't die!

GROWING ROOTSTOCKS FROM CUTTING OR SEED - ONGOING CARE

If you haven't planted any seed yet, it's not too late to try planting apple and pear seed—unfortunately it's too late for peach seed. Use good quality Granny Smith or Packham pear fruit if you can get it, or any variety you have access to. As long as the seed is dark brown and looks plump and healthy, it's worth a try. You've got nothing to lose!

If you planted plum cuttings and they are growing, remove the shoots from bottom of cutting, just let one shoot grow on from the top of the cutting.

If you've already planted seed and it's grown, weed around seedlings, and thin them out if necessary

Don't let your rootstocks dry out.



[Click here to listen an audio article on growing your own fruit trees.](#)



If planting lots of seeds, mix them with damp sand to make them easier to spread along the row

PRACTICAL SPRING TIPS FOR PREVENTING PESTS AND DISEASES...

As organic gardeners, we don't use chemicals to kill pests and diseases, but instead rely on building a healthy, balanced ecosystem in our garden—it's better for our health, the health of the environment, and it also takes some pressure off our wallets!

Healthy fruit trees get less diseases and attract less pests, and having lots of variety of plants in your garden attracts all sorts of beneficial insects that help to keep the pests under control.

There are eight key principles for keeping your fruit trees healthy, so let's look at them in turn:

1. SOIL IS THE PLANT'S IMMUNE SYSTEM, SO BUILD HEALTHY SOIL

The recipe for healthy soil = organic matter + microbes. The easiest way to do this in spring is add a layer of compost to the soil under your fruit trees. You might also want to add compost tea or worm castings, to make sure there are plenty of soil microbes present in the soil. And lastly, add some microbe food such as seaweed or fish emulsion.

Spring is also a great time to pay attention to the groundcover plants under your fruit trees, and replace any you don't want with more useful plants.

2. PREVENTION IS EASIER THAN CURE

There are a few hazards that will predictably damage your fruit each year if the conditions favour them—particularly birds, earwigs, codling moth, rabbits and fungal diseases.

Be a clever fruitgrower by getting

Hygiene is an important part of preventing disease—remove mummies and prune out dead wood

in first with the right preventive action. Netting, organic fungicides, double-sided tape or horticultural glue around the trunk of your tree and tree guards will all repay you many-fold for the time and effort involved.

3. MANY PESTS HAVE PREDATORS—DON'T ACCIDENTALLY KILL THEM!

Most pests have a place in the food chain that dictates they are also prey for something else! If you see insects on your trees, try to identify them, or at least to identify what impact they are having on your fruit tree. It's important not to panic or act too soon, because the insects you notice may actually be the good guys, who have turned up to eat the baddies.

One of the benefits of not using any chemicals in your garden is that, over time, the predators will thrive and do much of the work for you! If you resort to an organic chemical (like pyrethrum) to combat a particular problem, use it very carefully and precisely to make sure you're not doing more harm than good.

4. ENCOURAGE ALL KINDS OF VARIETY IN YOUR GARDEN

As well as predator insects, there is a whole food chain in your garden of animals eating each other! Take advantage of this clever system provided by nature by encouraging and providing habitat for as many different species of both plants and animals as possible. Birds, lizards, arthropods, frogs and small mammals will all help to keep your fruit trees healthy. Encourage them by providing a huge variety of plants (including plants of different heights and many different flowering plants) and a reliable water source.



5. HYGIENE IS IMPORTANT

One of the best defences against common fruit tree diseases is to break their life cycle by removing the material in which they survive over winter. This is usually diseased fruit either in or under your tree, or diseased wood.

Thinning in spring is a great time to remove any diseased fruit or wood that you see left over from last season, or newly diseased wood that has become infected this spring, e.g. with blossom blight. Cut the dead wood back to where there is a healthy shoot, and remove and destroy it.

6. MAINTAIN YOUR TREES WELL

Give your fruit trees the best possible chance of producing a big crop of fruit every year by giving a small amount of attention, at the right time, to the basics of nutrition, pruning and water.

Use the list of jobs "To do this week outdoors" to keep it really simple and manageable.

7. MONITOR YOUR TREES REGULARLY

Trees grow fast, and things change quickly in spring, so it really is the time to be keeping a regular eye on things. Get to know what your trees look like at this time of year: Do they look healthy? Are they growing? What insects are on and around them, and what do they appear to be doing? How long does it take for the trees to dry, and what happens to the soil after rain? Did they flower, and what proportion of the flowers turned into fruit? Use your Fruit Tree Diary to record key dates and anything else of interest.

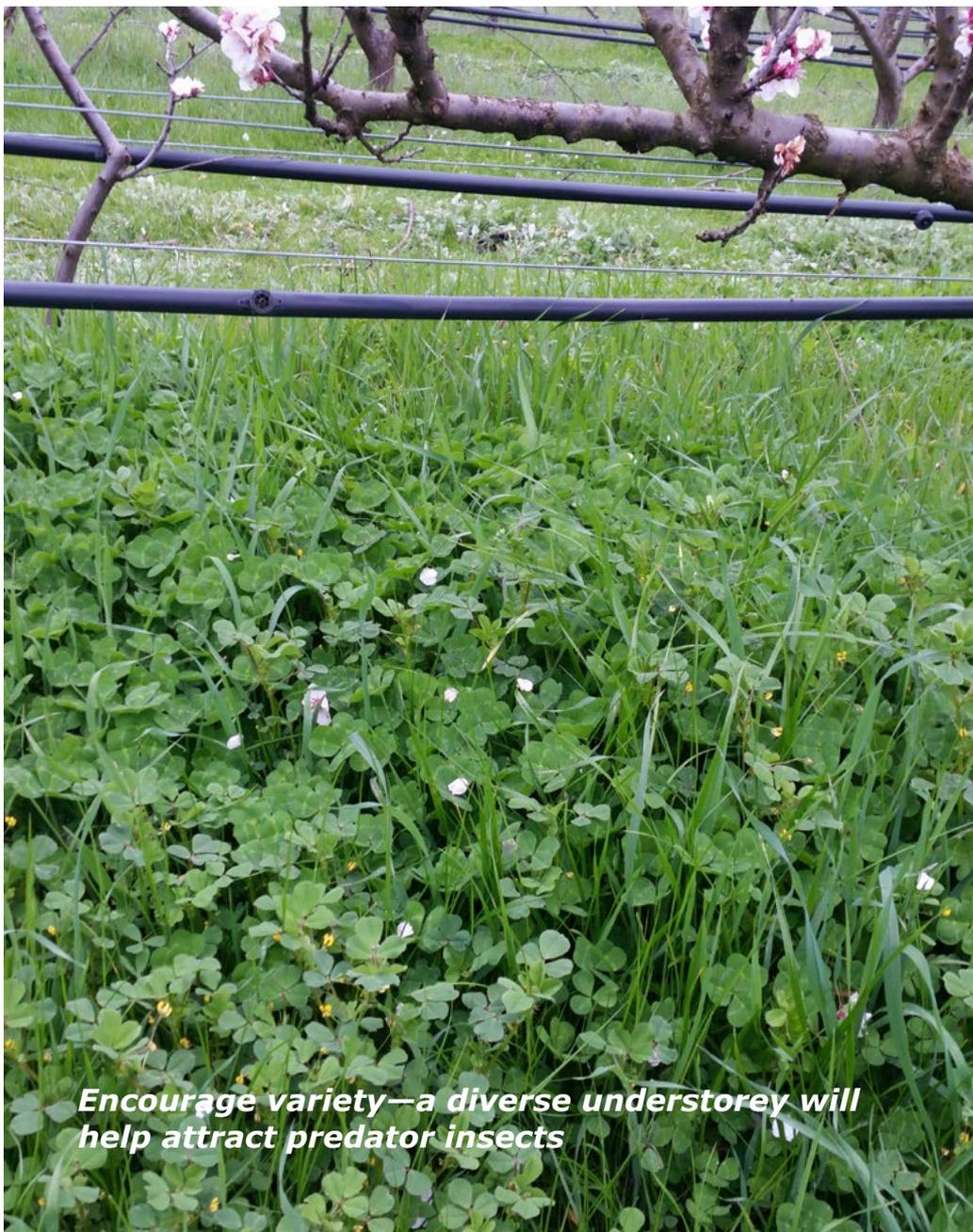
8. PLAN YOUR FRUIT TREE GARDEN

Assess how much fruit you think your trees will carry this year—will you be able to handle it all? If it looks like you're in for a bumper crop, you might want to thin harder than normal, which will slightly reduce the size of your harvest, but improve the quality.

In the long term, you'll have a healthier garden if you don't grow more fruit than you can manage. Fruit left in the tree or lying on the ground can create pest and disease issues, not just for you, but for other fruit growers around you, and can create a serious problem for any commercial growers nearby.



Build a compost pile—one of the best ways to build your soil



Encourage variety—a diverse understorey will help attract predator insects

FREE NUTRITION FROM WEEDS

MANY PLANTS THAT WE THINK OF AS WEEDS ARE ACTUALLY “DYNAMIC ACCUMULATORS”, OR PLANTS THAT EXTRACT AND GATHER NUTRIENTS—SPECIFICALLY INORGANIC MINERALS—FROM THE SOIL OR AIR, AND MAKE THEM AVAILABLE TO OTHER PLANTS, ANIMALS, AND EVEN TO US!

Dynamic accumulators are a group of plants with special characteristics:

- They tend to be tough and fast-growing plants
- They have an extensive root system, that draw nutrients from deep in the soil
- They thrive in a wide range of poor, unbalanced soils, and in areas where topsoil has been lost
- They spread easily

It's easy to see why many of them are also known as 'weeds'!

They are also sometimes called 'succession plants', because they are the plants that are the first to show up after some sort of disturbance to the soil—think flood, fire, overuse by animals, landslides, and also human activity like

EXAMPLES OF DYNAMIC ACCUMULATORS

The following table lists some dynamic accumulators, but it is an ever-growing list as more research is done on this fascinating aspect of plants. The table lists some of the minerals each plant is known to accumulate, but it's by no means an exhaustive list. You'll notice there are lots of plants in the table that are better known for other reasons:

- common garden herbs—e.g., camomile, fennel, parsley and peppermint
- common lawn or pasture weeds—e.g., dock.
- compost activators—e.g., borage, comfrey, and yarrow
- green manure favourites—e.g., clover
- medicinal plants—e.g., dandelion, nettles and plantain

chemical farming, land clearing, building sites and mining.

Given enough time, the earth always self-heals and restores the complex system of natural soil fertility that has supported life for millions of years. These early plants help to repair and improve the soil, effectively preparing it for use by larger, higher quality, and less resilient plants—hence the term 'succession'.

A special category of dynamic accumulator is the nitrogen fixer, or legume—plants like clover, vetch, and beans. These have a symbiotic relationship with a type of bacteria in the soil that allows them to capture atmospheric nitrogen and store it in the soil. Many dynamic accumulators that fix nitrogen from the air also access other minerals from the soil.

TABLE KEY

★ Accumulates these elements

COMMON NAME	BOTANICAL NAME	SODIUM	IODINE	BORON	SILICON	SULFUR	NITROGEN	MAGNESIUM	CALCIUM	POTASSIUM	PHOSPHORUS	MANGANESE	IRON	COPPER	COBALT
Alfalfa							★						★		
Arrowroot	<i>Borago officinalis</i>								★						
Bladder wrack	<i>Pteridium aquifolium</i>		★					★					★		
Borage					★					★					
Bracken, eastern	<i>Fagopyrum esculentums</i>									★	★	★	★	★	★
Bridal bower	<i>Arctium minus</i>										★				
Buckwheat										★					
Burdock												★			
Calamus	<i>Carum carvi</i>						★			★	★				
Carageen	<i>Daucus carota</i>	★					★		★						
Caraway	<i>Typha latifolia</i>										★				
Carrot leaves								★		★					
Cattail	<i>Chamomilla recutita</i>						★								
Chamomile, common	<i>Anthemis nobilis</i>								★	★					
Chamomile, German	<i>Matricaria chamomilla</i>								★	★	★				
Chickweed	<i>Stellaria media</i>									★	★	★			

COMMON NAME	BOTANICAL NAME	SODIUM	IODINE	BORON	SILICON	SULFUR	NITROGEN	MAGNESIUM	CALCIUM	POTASSIUM	PHOSPHORUS	MANGANESE	IRON	COPPER	COBALT
Chicory	<i>Cichorium intybus</i>								★	★					
Chives	<i>Allium sp.</i>	★							★						
Cleavers	<i>Galium aparine</i>	★							★						
Clovers	<i>Trifolium sp.</i>						★				★				
Clover, hop	<i>Medicago lupulina</i>						★				★				
Clover, rabbit foot							★				★				
Clover, red	<i>Trifolium pratense</i>						★				★				
Clover, white	<i>Trifolium repens</i>						★				★				
Coltsfoot						★		★	★	★			★	★	
Comfrey	<i>Symphytum officinale</i>				★		★	★	★	★			★		
Dandelion	<i>Taraxacum vulgare</i>	★			★			★	★	★	★		★	★	
Dock, broad leaved	<i>Rumex obtusifolias</i>								★	★	★				
Dulse		★	★					★	★				★		
Fat hen	<i>Atriplex hastata</i>									★			★		
Fennel	<i>Foeniculum vulgare</i>	★					★				★				
Flax, seed	<i>Linum usitatissimum</i>									★					
Garlic	<i>Allium sativum</i>					★						★			
Groundsel	<i>Senecio vulgaris</i>												★		
Horsetails	<i>Equisetum sp.</i>				★			★	★						
Kelp		★	★				★	★	★				★		
Lamb's quarters	<i>Chenopodium album</i>						★		★	★	★	★			
Lemon Balm	<i>Melissa officinalis</i>										★				
Lupine	<i>Lupinus sp.</i>						★				★				
Marigold, flowers	<i>Tagetes sp.</i>										★				
Meadow sweet	<i>Astilbe sp.</i>	★			★			★	★		★		★		
Mistletoe								★							
Mullein, common	<i>Verbascum sp.</i>					★		★		★			★		
Mustards	<i>Brassica sp.</i>					★					★				
Nettles, stinging	<i>Urtica urens</i>	★				★	★		★	★			★	★	
Oak, bark	<i>Quercus sp.</i>									★					
Oat straw					★										
Parsley								★	★	★			★		
Peppermint	<i>Mentha piperita</i>							★		★					
Pigweed, red root	<i>Amaranthus retroflexus</i>								★	★	★		★		
Plantains	<i>Plantago sp.</i>				★	★		★	★			★	★		
Primrose	<i>Oenothera biennis</i>						★								
Purslane	<i>Portulaca oleracea</i>							★		★		★			
Salad burnet	<i>Poterium sanguisorba</i>	★				★		★	★				★		
Savory	<i>Satureja sp.</i>									★					

COMMON NAME	BOTANICAL NAME	SODIUM	IODINE	BORON	SILICON	SULFUR	NITROGEN	MAGNESIUM	CALCIUM	POTASSIUM	PHOSPHORUS	MANGANESE	IRON	COPPER	COBALT
Scarlet Pimpernel	<i>Anagallis arvensis</i>							★							
Shepherd's purse	<i>Capsella bursa-pastoris</i>	★				★			★						
Skunk cabbage	<i>Navarretia squanosa</i>							★							
Sorrel, sheep	<i>Rumex acetosella</i>	★							★		★				
Sow thistle	<i>Sonchus arvensis</i>							★		★				★	
Spurges	<i>Euphorbia sp.</i>			★											
Strawberry, leaves	<i>Fragaria sp.</i>												★		
Tansy	<i>Tanacetum vulgare</i>									★					
Thistle, Canada	<i>Cirsium arvense</i>												★		
Thistle, creeping	<i>Sonchus arvensis</i>									★	★		★		
Thistle, nodding	<i>Carduus nutans</i>												★		
Thistle, Russian	<i>Salsola pestifer</i>												★		
Toadflax	<i>Linaria vulgaris</i>							★	★				★		
Tobacco, stems/ stalk	<i>Nicotiana sp.</i>						★								
Valerian	<i>Valeriana officinalis</i>				★										
Vetches	<i>Vicia sp.</i>						★			★	★			★	★
Watercress	<i>Nasturtium ofpcinale</i>	★				★		★	★	★	★			★	
Willow, bark	<i>Salix sp.</i>							★							
Yarrow	<i>Achilea millefolium</i>						★	★			★			★	

THE 10 BEST THINGS ABOUT DYNAMIC ACCUMULATORS...

1. The best thing they do is to gather up soil nutrients (in mineral form) with their roots, and store them in their tissues, as well as absorbing carbon (in the form of CO₂) and nitrogen from the air. As they die back, they decompose and return their nutrient-rich organic matter to the soil in a form that is usable by other plants and soil microbes.
2. The roots leave tiny channels through the soil that help air and water enter the soil, and provide passages for worms and soil microbes to move around.
3. They shade the soil, helping to keep the temperature and moisture levels even.
4. They make the soil much more stable and prevent soil erosion.
5. They can be helpful in indicating soil deficiencies—naturally growing dynamic accumulators often give you a sign about what your soil might be lacking, as nature sends them in to remedy a deficiency. Alternatively, if a deficiency is identified through soil testing, dynamic accumulators can be encouraged or introduced to help address that specific deficiency.
6. Plants with long taproots, such as dandelion and dock, are very helpful to break up heavy clay soils and aid against compaction.
7. Their flowers can provide food for bees, particularly valuable in those that flower at times when other pollen and nectar sources are scarce, such as capeweed, dandelion and oxalis.
8. They attract or provide habitat for other pollinators, and good predator insects such as ladybugs.
9. There is a reasonably good chance that dynamic accumulators will be edible, because they have evolved to focus on creating new plants rather than defending themselves with protective toxins. Their ability to harness minerals can be particularly useful to supplement dietary mineral deficiencies, including providing iron-rich greens for people with low iron levels.
10. Lots have known medicinal uses.

HOW TO USE DYNAMIC ACCUMULATORS IN YOUR GARDEN

Dynamic accumulators can be used in a number of ways:

- as a cover crop, grown before or between other plantings
- as a green manure, turned into the soil where they have been growing
- as a mulch, pulled or cut back and used as a surface mulch around other plants
- as compost, pulled or cut back and added to a compost heap or other composting system
- as companion plants, interplanted with, or planted near, desired plants

A COUPLE OF WARNINGS...

Working your soil to turn in a green manure crop will bring seeds to the surface to germinate, so you need to follow promptly with seeding or transplanting of desired plants. A cover crop or green manure similar to the intended crop may harbour pests. So avoid, for example, a cover crop of mustards that can allow the cabbage root maggot .

Be aware of noxious weeds and weeds that might be controlled by law. In Australia, the Weeds Australia website (www.weeds.org.au) is very useful. Also be careful of letting weeds go wild, choose attractive dynamic accumulators to assuage neighbours, and keep them regularly mown.

Be aware of possible risk to or undesirable competition with native species. When planting non-native dynamic accumulators, always check to make sure they are not invasive in your area. Your local Landcare group is another great source of information. You can find your local group, and there are lots of useful resources on their website at www.landcareonline.com.au (but be aware they may have quite a different view of weeds, and may favour the mass-extermination method!).

Be careful about inadvertently encouraging unwanted proliferation. For example, oxalis corms will stay active in soil that is moved, and comfrey will regrow from disturbed roots or root fragments.

And lastly, some dynamic accumulators, such as dandelion and nettle, can produce allergic reactions.



THINNING: HOW MUCH FRUIT TO REMOVE FROM YOUR TREES

Let's just recap the four main reasons we thin:

1. To prevent biennial bearing and improve food security
2. To protect the structure of the tree
3. To grow fruit of a usable size
4. To improve fruit quality and help to prevent pest and disease damage

HOW MUCH FRUIT SHOULD I REMOVE?

The aim is to leave the tree with as much fruit as it can comfortably bear and bring to a reasonable size, without sacrificing either growth of new wood in the tree, or next year's crop. Plus, the fruit should be spread evenly across the tree—this is called "optimum crop load".

CROP LOAD: First, assess the crop load, ie, how much fruit is on the tree after flowering (and shedding out) has finished—is it heavy, medium, or light? The more fruit on the tree to begin with, the more you will need to remove, but even medium- and light-crop trees need to be checked in case there are bunches that need to be broken up for all the other reasons mentioned above. Most fruit trees, in most years, will carry a medium to heavy crop load, and you can expect to have to remove 60%–70% of the fruit.

ULTIMATE FRUIT SIZE: Does the variety usually produce small (e.g. most apricots, some plums such as Greengage and Angelina), medium (most plums and nectarines, some pears) or large fruit (most peaches, apples, and pears)? If you're not sure, or your tree has always produced small fruit, look for the same variety in the shops, on a neighbour's tree or in a fruit book.

HEALTH AND VIGOUR OF TREE: Has the tree had a hard time with disease or damage this season or last, in which case you might let it recover by removing more fruit than usual. Is it growing strongly, or having trouble getting established?

OUTLOOK FOR

SEASON: What are the forecasts—enough water, drought, very hot? If the tree is likely to be stressed by drought, you might reduce the crop load more than usual as a way to help the tree conserve its energy for staying alive!

During the recent long drought in Harcourt, many orchardists removed their entire crop of apples to use the small amount of water available to keep the trees alive, rather than supporting a crop of fruit. If the forecast is for a really wet season, with a much greater risk of fungal disease, it's more important than usual to give individual pieces of fruit a bit more room to grow without touching each other.

EARLY OR LATE CROPPING VARIETY: Earlier cropping varieties have less time between full bloom and harvest to reach optimal size, so need to be thinned harder if you don't want end up with tiny fruit.

INTENDED PURPOSE OF FRUIT: Is the fruit destined to be entered in a competition at the local agricultural show, or in gift bags for Christmas? Or is it going to be made into jam or cider? (Of course even if you aim to grow perfect fruit it's inevitable you will always get some second-grade fruit suitable for processing.)

AGE OF TREE:

Young trees should be kept free of fruit for the first couple of years, at least until the structural branches are all in place and the tree is large and vigorous enough to bear fruit without sacrificing growth.

AT A GLANCE...

Fruit thinning is the practice of pulling a proportion of fruit from a tree while the fruit is very small, and there are lots of benefits for your fruit trees in doing it. But the trick is knowing how much fruit to remove and how much to leave.



Thinning peaches

—before

—after



THE RULE OF THUMB...

Now if that's all too complicated, then..."Leave no two pieces of fruit closer than a handspan (the width of your 4 fingers if you hold your fingers together), or approximately 80 mm apart." Bunches should usually be reduced to single pieces of fruit, or two at a stretch if the tree has a very light crop. Fruits that ripen early in the fruit season should be thinned harder than those that ripen later in the season, as the fruit has less time to make good size.

This tight bunch of apricots is too much for this small lateral, so keep the big one, and remove all the others!



WHEN TO START...AND WHEN TO FINISH

To get the best advantage for the tree in terms of good blossom next year, you need to thin as early as possible after the flowers have died away and fallen off, which is called 'shuck fall'. In their wake the flowers leave tiny swelling embryonic fruit behind; witnessing this annual miracle never ceases to amaze, and is one of the most exciting times in the orchard.

But wait!! After shuck fall there is usually a 'shedding out' process over the next couple of weeks, where the fruit that has not been pollinated shrivels up and falls off. Wait until the shedding out has finished before you start thinning, because only then can you accurately assess crop load, and you'll be wasting your time pulling off fruit that would have fallen off anyway!

If you've been keeping an eye on your tree and watching the flowers fall off to reveal the tiny fruit, you may be startled to notice one day that out of a bunch of 10–20 tiny fruit there might be one or two (or five) that are much bigger than the others—these are the fruit that have been pollinated; the others will soon fall off.

The development of new (next year's) flower buds starts around 5 weeks after bloom, and keeps going until the tree stops growing in late summer. It's really important to finish the thinning as close to flowering as possible (after shedding out) so that

competition between developing fruit and flower buds is minimised—left too late, the tree will already have responded to having had a heavy crop and you may not be able to prevent it having a light crop next year. We aim to have all the thinning finished by Christmas, but if you only have a few trees at home, you should be able to finish much earlier.

The other benefit of thinning early is making the most of the tree's capacity to grow fruit in that season. Let's consider an apple tree; assume that it's healthy, will get enough water and nutrition, and is able to comfortably grow 20 kg of apples this summer.

- **WITH NO THINNING** The tree may have 1,000 pieces of fruit weighing an average of 20 gm each – pretty useless!
- **EARLY THINNING** will divert the tree's growth potential into say 130 pieces of fruit weighing 150 gm each (an average-sized apple), and the total yield has only been reduced to 19.5 kg.
- **LATE THINNING** A lot of the tree's energy has already gone into the fruit that is being thrown away, and the fruit that remains on the tree can't make up the difference. The 130 pieces of fruit may now only weigh 120 gm each (or less) which means you've reduced the yield to 15.6 kg (though it may still provide benefits in terms of fruit size and quality).



And this is what happens when you get it right!



Apple thinning:

Before (above)

After (below)



WHICH FRUIT SHOULD I REMOVE?

Your aim is to produce the best possible fruit, and in some cases, that might mean leaving an imperfect piece of fruit where it is, because it's the best option available. It's better to grow a deformed piece of fruit than no fruit at all, especially when we're growing for our own use, and are happy to love our produce no matter what it looks like!

Here's a hierarchy to help you decide which pieces of fruit to remove from each bunch.

1. First remove any fruit that is growing in a small space where it won't have enough room to expand, e.g., in a tight angle or where it rubs against another limb
2. Next, diseased fruit should go—removing these fruit can really make a difference to the health of the whole crop (and future crops). If the tree has a light crop, you might choose to leave fruit that is affected by Freckle or Leaf curl, but any fruit with Brown rot, Codling moth and Fruit fly should always be removed and destroyed to prevent it spreading.
3. If you still need to take off more to satisfy your thinning requirements, take the misshapen ones next—look for Apple Dimpling bug scars, limb rub or Black spot.
4. Remove small fruit in preference to larger ones—it's safe to assume that the fruit that is already bigger when you are doing the thinning, will be the larger fruit at the end of the season.
5. Spaced out nicely along the limb—you'll often have hard decisions to make if the only two perfect pieces of fruit in a bunch (or the two biggest) are the two that are right next to each other! You'll have to sacrifice one of them, and choose instead a slightly less perfect piece that is an appropriate distance away.
6. Fruit under the limb will get less sunlight, and not colour as well.
7. In summary, leave the largest, healthiest looking fruit with as much space around them as possible.

NOW JUST DO IT...

Thinning the first tree for the season is always difficult, because it seems so wasteful! Even when you understand how important it is, it's hard to make yourself pull off as much fruit as you know needs to come off the tree. When the main aim of growing fruit trees at home is to provide your family with fruit, pulling tiny fruit off your tree seems counterintuitive and can be very difficult to do, especially on a tree with a heavy load, when an awful lot of fruit ends up on the ground. But be bold and press on—you certainly won't do the tree any harm, and you will probably produce a much better crop, both this year and next!

Steel yourself...try to visualise how big the fruit will become and then create enough space for it to grow into. Despite how uncomfortable it might feel to be pulling off all those tiny fruit, take our word for it—it's really hard to over-thin! In fact the reverse is true and you are very likely to have to do it again in a couple of weeks when you have another look at the tree and realise you haven't pulled enough off. You'll be surprised to find that in some cases, it will look like you've hardly thinned at all, and the job needs doing again!

Fruit is removed by pulling it off by hand, and if clean and free of disease it can just be left on the ground under the tree to return to the soil, which happens quite quickly if your soil is healthy. If fruit is showing any signs of disease, it's best to remove it from under the tree. Learn to thin with two hands—sometimes you need to hold one piece of fruit while you gently pull off its close neighbour, and it's much faster to use both hands at once.

A big tree with a heavy load may take up to half an hour to thin. This small investment in time is well worth it in terms of maximising the return you will get from your trees. It's a great job to do with a friend, as it always seems to take less than half the time with an extra pair of hands!

Thinning season is also a great time to teach yourself how to juggle, as the little fruit are the perfect size to practise the throwing and catching rhythms, without having to manage catching something as large as a tennis ball.

Thinning is not rocket science, but it can make a big difference to the ongoing productivity of your fruit trees, and is well worth the effort involved.

SPOTLIGHT ON ...ANTS

Ants are a great example of the type of soil arthropods we featured a few weeks ago—the shredders—but they are so common, and generate so many questions, that they deserve their own article.

Ants have chewing mouth parts, and have a wide variety of diets. Some species are omnivorous, eating plants, live insects, and dead animal matter. Some, however, forage for nectar and honeydew from aphids, lerps, and scale insects, and these are usually the ones we will see in our fruit trees.

There are at least 1,300 described ant species in Australia, so don't worry if you're not sure what type you have in your garden—there are a lot to choose from! You'll see a lot less ants in winter because they survive in a state of dormancy or inactivity in cool climates, with either adults, larvae or both slowing down dramatically until the weather improves.

Ants are incredible insects, with a

highly evolved social structure. Most species have one or more queens, various sizes of worker ants (which are all sterile females), males, and a brood of eggs, larvae and pupae. Colonies may contain from a few dozen individuals, up to millions. They all have highly specialised jobs (and will change jobs as required), they communicate very effectively with one another, and they are capable of learning new skills.

Ant nests are almost always in the soil, though some live in trees where they make nests from twigs and leaves, or live in rotten wood. Forager ants (this group includes any ants you will see in your fruit trees) will have travelled no more than 200 meters from their nests, so the nest won't be too far away. In fact, if you have a look, there are probably multiple ant nests in the soil throughout your garden. We have many nests in the orchards, though we don't often see ants in the trees.

AT A GLANCE...

Ants can be both friend and foe in the garden, and it's important to understand when to ignore them, and when to interfere, to protect your fruit.

FRIEND OR FOE?

The reason ants have a bad reputation among fruit growers is because they often form associations with other insects that damage our fruit trees. In particular, ants like aphids, lerps, mealybugs and scale—all insects which produce a sweet liquid, called honeydew, when they feed on plant sap. The sugars in honeydew are a high-energy food source for the ants. In some cases, the aphids secrete the honeydew in response to ants tapping them with their antennae—food on tap!

The ants keep predators away from the aphids and will even move them from one feeding location to another (known as 'farming' the aphids). When migrating to a new area, many colonies will take the aphids with them, to ensure a continued supply of honeydew.

Some caterpillars are also herded by ants, led to feeding areas in the daytime, and brought inside the ants' nest at night. The caterpillars have a gland which secretes honeydew when the ants massage them. Some caterpillars produce vibrations and sounds that are perceived by the ants.

Ants can also be a pest if they've invaded your tree and bite you while you're trying to pick your fruit!

However, in the course of going about their lives, ants also do many things that are useful in your garden, for example eating pests, distributing seed of some native plant species, cleaning up plant material and taking it into the soil, and creating channels that let air and water into the soil. They are also an important food source for lizards, spiders, echidnas, birds, and other ants. Some beetles and bugs also eat ant larvae.

Considering how easy it is to keep the ants out of your fruit trees, on balance, we think of them as beneficial insects.



MONITORING AND SOLUTIONS

Ants are a great indicator insect. If you see them in your fruit tree, it's a sure sign they are either looking for food, or cultivating a food source by shifting aphids or other honeydew-producing insects into your tree. Have a good look in the tree to see if you can spot their food source.

Because most ants have their nest in the soil, and move by walking around (rather than flying), double-sided sticky tape or horticultural glue around the trunk of your fruit tree is an extremely effective way of keeping ants out of your fruit tree. Once you separate the ants from their food source, the natural predators of the honeydew-producing insects will quickly move in and clean up the problem.

“ Considering how easy it is to keep the ants out of your fruit trees, on balance, we think of them as beneficial insects.

”

Ants lay chemical trails for each other between their nest and the closest food source, so it's also possible to confuse them by disrupting their walking paths with a strong smelling oil (e.g. eucalyptus, peppermint, clove or tea-tree), or with garlic or lemon juice.

You can bait and kill ants with a teaspoon of borax mixed with a tablespoon of jam or honey. This will kill individuals, and they will also pass it onto others in the nest. (But use and store borax with extreme caution, boron is toxic to humans if eaten, and will also kill any other insect it contacts.)

If you decide you really need to kill a nest, pour boiling water down it. You can add detergent or pyrethrum to the water to help kill the insects, but it's preferable not to put strong chemicals into the soil if you can help it.

A few species of introduced ants have really horrible bites, and are a significant pest in agriculture. For that reason, they are a notifiable pest, which means if you identify them at your place, you should let the local Department of Environment and Primary Industries know about it.

*This includes Argentine ant (*Linepithema humile*), big headed ant (*Pheidole megacephala*) and fire ant (*Solenopsis invicta*).*



PRUNE OUT DISEASED WOOD WHILE YOU'RE THINNING...

Spring is not really the time for pruning (though we will be talking about summer pruning very soon...) but it's a good idea to keep your secateurs in your pocket while you're thinning your fruit, and nip off any bits of diseased wood you come across.

Just to remind you about thinning, it's the practice of pulling a proportion of fruit from the tree while the fruit is very small. The four main reasons we thin every fruit tree (except cherries) are (1) to prevent biennial bearing, (2) to protect the structure of the tree from breaking by carrying too much fruit, (3) to grow fruit of a usable size, and (4) to improve fruit quality and help to prevent pest and disease damage.

Use the chart on the next page to help you figure out exactly how much fruit to remove to make sure each tree is carrying as much fruit as it can, while still achieving all 4 aims.

Doing a spot of pruning while we're thinning is part of how we achieve the fourth aim of preventing the spread of diseases (if not this season, then next), and it's especially a good idea for new infections that have occurred in spring. Blossom blight in apricots is a case in point—if your apricot trees had this disease, you may be able to see the infected flowers, brown and shrivelled, still on the tree, and usually the shoot bearing the flowers will also have died back as a result of the disease.

When removing the diseased wood, make sure you're cutting back into healthy wood wherever possible, so cut back either to a healthy piece of fruit, or to a new shoot, which will indicate where the disease stops and the healthy wood starts.



Removing diseased wood—before

And after—note how the cut goes back into healthy wood



FRUIT THINNING CHART

The following table will help you to decide how much fruit to remove from individual trees, but if you're missing some crucial information (such as the length of growing period), either make your best guess, or fall back on the rule of thumb of leaving no two pieces of fruit closer than a handspan (4 fingers held together) apart and reducing bunches to singles.

		Crop load	Ultimate size of fruit		
			Small apricots, small plums	Medium most plums, nectarines, some apricots, apples, and pears	Large most peaches, apples, and pears
Length of growing period	Short (ie early season fruit, harvested Nov-Dec)	Heavy	★★★★	★★★★	★★★★★
		Medium	★★★	★★★★	★★★★★
		Light	★	★★	★★
	Medium (ie mid-season fruit, harvested Jan-Feb)	Heavy	★★★	★★★	★★★★★
		Medium	★★	★★★	★★★★
		Light	★	★★	★★
	Long (ie late season fruit, harvested Mar-May)	Heavy	★★	★★★	★★★★★
		Medium	★★	★★★	★★★★
		Light	★	★	★

KEY

- ★★★★★ Thin very hard
Leave only single pieces of fruit, really spaced out, ie no closer than 150-200 mm apart
- ★★★★ Thin hard
Leave only single pieces of fruit, no closer than 100 mm apart
- ★★★ Medium thinning
Leave only single pieces of fruit, no closer than 50-80 mm apart
- ★★ Light thinning
Mostly singles, about 50 mm apart, some doubles ok if on opposite sides of the limb
- ★ Barely thinning
Break up bunches, maximum three pieces of fruit left, spaced out as much as possible (but still remove seriously diseased fruit)



—before

—after
(for a large peach like Fragar, leaving more than one peach on this small lateral might cause it to snap)



DEFINITIONS

CROP LOAD

HEAVY: Lots of fruit over whole tree or on all or most limbs, leaves should be normal size and darkish green

MEDIUM: About ½ normal crop, or crop just on part of tree (only on some limbs, or just the top of the tree), leaves look normal and darkish green

LIGHT: Hardly any fruit, maybe just the odd piece or bunch. Leaves tend to be lighter in colour and larger (you can often pick a light-crop tree in an orchard from a distance, its leaves will be noticeably lighter in colour than its heavy-crop neighbours)

FRUIT SIZE (REFERS TO OPTIMAL SIZE OF FRUIT INHERENT TO THE VARIETY IF CONDITIONS ARE GOOD)

SMALL: Small apricots (eg Bebeco, Castlebrite, Earlicot, Katy, Trevatt, Moorpark) small plums (eg Angelina, Greengage), crabapples, some nectarines (eg Goldmine)

MEDIUM: Most nectarines, large apricots (eg Rival, Goldrich), most plums, some pears (eg Winter Nelis, Winter Cole), some apples (eg Jonathan, Snow), some peaches (eg Anzac)

LARGE: Most pears, most apples, most peaches

LENGTH OF GROWING PERIOD

SHORT: < 16 weeks from full bloom to harvest (eg Castlebrite flower late August, pick late November, so growing season of approx 12 weeks, Anzacs flower mid-Aug, pick late Dec, about 16 weeks)

MEDIUM: 16–22 weeks from full bloom to harvest

LONG: > 22 weeks from full bloom to harvest

SETTING UP A GREY WATER SYSTEM...

Between 2000 and 2010, in southeastern Australia we lived through one of the worst droughts in Australia's recorded history, and along with the rest of the community, learnt a lot about water conservation and re-use.

In times of adequate water supply (like now), it's great to be able to consider how we can set up systems to make better use of this precious resource, without any pressure to put a system in place yesterday!

We also think it's an important part of any risk management system to have multiple sources of all inputs, and that goes for water too. It's important for your food security that your fruit trees are not dependent on only one water source, because if it is interrupted or becomes unusable for any reason—drought, expense, water restrictions—it's good to know you'll still be able to keep your trees alive.

Before you use any water that's already been used, you need to ask yourself a few questions, and of course the answers will be very different for everyone:

- What is it?
- What's in it?
- What's the final use?

WHAT IS IT?

For example your water might be town water, dam water or bore water. This might mean it has different levels of minerals, which if it is suitable for household use is unlikely to be a problem for your fruit trees, or possibly have chlorine or fluoride

added, neither of which are a problem for your fruit trees.

WHAT'S IN IT?

The answer to this has two parts.

Firstly, it depends on what the water was used for, for example washing dishes, clothes or showering.

Whatever it was used for in the house, it will most likely have ended up with a high level of organic matter in it (which means lots of nutrients), as well as potential pathogens, and that's what poses a potential risk, particularly if it's stored for any length of time. It's essentially a lovely breeding 'soup' for whatever microbes are in it, and if they are the 'wrong' sort (for example *e. coli*), it can be hazardous to use on food plants.

The second part to this answer is to do with the products you use in your house, like detergents, shampoos etc. Unfortunately, many 'off the shelf' cleaning products are a toxic mix of chemicals that can damage the environment, including marine animals and some soil microbes, if released into your garden.

If you want to use your grey water on your garden, it's well worth investigating 'soft' cleaning products that won't damage the environment when they are used on the soil. The main things to avoid are salts like sodium and phosphorus, but other ingredients such as fragrances, brighteners and softeners are also often toxic chemicals (which when you think about it has quite an 'ick' factor, and makes you question

AT A GLANCE..

It makes sense to re-use water as many times as possible, particularly if you're trying to grow fruit in a dry climate.

Water that has been used in the house ('grey water') is perfectly good to water your fruit trees with, if you can just figure out how to get it there!

If you have 1 litre of water and you use it once, you have 1 litre of water. If you have 1 litre of water and you use it 10 times, you have 10 litres of water.

Geoff Lawton, Permaculturalist



Biolytix is one of a number of systems where the waste tank is (mostly) buried, and the treated grey water is automatically pumped out onto the garden via subsurface pipes.



whether you should be using them at all...). Plastic microbeads are another common ingredient that cause havoc in the environment and should be avoided at all costs.

If you stick to 'biodegradable' detergents you'll be pretty safe. It's also a good idea to use as little as possible of any cleaning product, which also has the added bonus of saving you money! (See box on right and this week's 'Nanna Technology' for some other suggestions).

WHAT'S THE FINAL USE?

Using grey water for fruit trees is a different proposition to using it for growing vegetables, for example, because the product you eat (the fruit) is never in contact with the water itself, which adds an extra margin of safety.

In fact, if there are no chemical 'nasties' in your grey water, fruit trees are a fantastic way to use it, because they will appreciate the nutrients, and turn this wonderful 'waste' product into delicious fruit for you!

HOW DO I DO IT?

There are many products marketed to solve this problem for you, for example worm-based septic systems such as Biolytix that deliver clean water to your garden. The "Choice" consumer website has a great comparison of different systems: www.choice.com.au/reviews-and-tests/household/energy-and-water/saving-water/greywater-systems.aspx

There are also many systems you can set up yourself to clean the grey water output from your house before it's used to water your food plants, including a series of ponds, aquatic

plants, reed beds, or biological systems that use micro-organisms. Permaculture (which stands for 'permanent agriculture') is a set of principles for growing food that offers many clever solutions to this problem. If you want to know more, check out the resources page at the end of the this week's program.

In the drought, many people resorted to things like diverting the output from their washing machine into the bath, then using a bucket to water their plants. While it may have been successful, it is also time consuming, heavy, and potentially dangerous work, and if you want a system that is going to work in the long term, it's well worth investing the thought and energy into setting up something sustainable. Many hardware shops offer DIY diversion systems that can be retrofitted to most existing plumbing set-ups.

Whatever system you set up, you also need to consider that the needs of your fruit trees vary throughout the year and use very little water in winter, but your household use probably stays quite even all year. To make sure you don't drown your fruit trees in winter, you'll need to be able to either divert water away from them, provide good drainage, or grow winter-active plants to use the water when the fruit trees don't need it.

IS IT LEGAL?

The short answer is yes, as long as you are aware of the risks, and stay within the guidelines in your area.

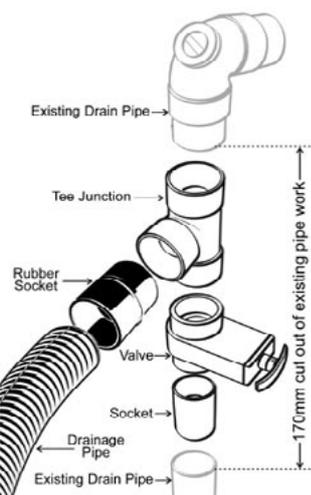
Different governments deal with this issue in different ways, but for example the EPA in Victoria has a 68 page book of regulations! Your local council will probably also have regulations, and you should investigate these before you go ahead with installing a system.

A great website to find out more about which detergents are OK for the environment is guide.ethical.org.au.

Authors like Jackie French and Shannon Lush also have many tips for cleaning with less chemicals.



Reed beds require more setting up, but can be used to clean and filter your grey water so you can re-use it somewhere else in the garden.



Diversion valves can be fitted to existing drain pipes to allow for fitting of an external flexible hose. Valve can be opened when diversion is no longer required.

ABOUT US

We—Katie and Hugh Finlay—run Grow Great Fruit from our farm in central Victoria, Australia. Teaching organic fruit growing was a natural progression from growing fruit commercially for years, and being asked thousands of fruit tree questions as we were selling fruit at markets.

We've always used organic, biological and regenerative farming methods, relying on building healthy soil to grow healthy trees and fruit—so that's what we teach. The trees get their nutrients from a diversity of microbes in the soil and plant tissues and from their relationships with other plants, rather than from artificial fertilisers.

We've been orchardists since 1998, both coming to it from non-farming careers, though Katie grew up on the orchard and Hugh worked on farms in Western Australia and the Middle East before roaming the globe for many years as a travel writer for Lonely Planet.

Training in organic farming, permaculture, soil biology, compost and holistic farming (as well as years of practical, hands-on experience) has all been important in developing our growing practices, the sustainable development of the farm, the establishment of the Harcourt Organic Farming Co-op, and the ethics of what we bring to you in Grow Great Fruit.

Diverse plantings rather than monoculture, spreading risk with biodiversity, and learning how to grow your own food successfully all contribute to food security—and we're on a mission to help build a secure food future for all!



DISCLAIMER: We make every effort to ensure the information given in this program is accurate. However, as conditions and methods vary, we cannot guarantee the results, and take no responsibility for any damage or injury that may occur, no matter how caused. But relax—you'll probably grow twice as much fruit as we predict...without incident!

Staying in touch

Part of what we love about the Grow Great Fruit Program is that we're building a community of like-minded fruit growers—something we wish we'd had when we were learning how to grow fruit.

There's lots of ways to join in, ask questions, share information, swap stories, make connections, and get to know us, and other GGF members.

On the socials...

See daily photos and updates from the farm, post comments, and share your own news on our social platforms:

Visit our [Facebook](#) page.



Instagram: [GrowGreatFruit](#)



For our exclusive community...

Grow Great Fruit Forum: Post your photos and questions online to get answers and feedback about fruit growing issues. Also a great place to brag about your success! Click [here](#).

Monthly Q&A Sessions: Join the community for a face-to-face friendly group chat once a month. Bring your questions and send photos in beforehand for us to share with the group. Register from the Members Home Page [here](#).

Blog. Our blog is another way we share what's happening on the farm, and go into more detail about various aspects of organic fruit-growing. Click [here](#) to view the blog.

All the material in the Grow Great Fruit program is the property of Hugh and Katie Finlay. It is provided to you as a member of the Grow Great Fruit program, and is not to be shared or distributed in any form without written permission.

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