Grow Great Fruit

ESSENTIALS COURSE

[WEEK 1 – EARLY SPRING]

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WHAT IS ALLELOPATHY?

PRUNING APPLES AND PEARS...

Many apple and pear varieties are 'spur bearers', which means they produce fruit on 2 year old wood (and older), in the form of short fruit-bearing shoots known as spurs. Some varieties produce apples on the end of longer shoots, and they are known as 'tip-bearers'. Others will produce fruit on both spurs and the tips of longer shoots.

By far the greater majority are spur-bearing varieties, which tend to have slow-growing leafy shoots, and a mixed terminal bud (leaves and flowers). It's important to know whether your apple tree is spur bearing or tip bearing, and prune it accordingly.

PRUNING PRINCIPLES AND TECHNIQUE

Regardless of what type of apple tree you have, the essential pruning principles always remain the same:

1. Remove dead and diseased wood.
2. Prune as little as possible to maintain the correct shape.
3. Pruning cuts which remove the apical bud (i.e., the bud on the end of a shoot) create branching.
4. Horizontal wood produces more fruit than vertical wood.
5. Encourage fruit to grow close to the trunk and main limbs.

TECHNIQUE

Your technique should always be to establish and maintain the desired shape of your tree. We like vase-shaped trees and think they suit most backyards, so our guidelines are for maintaining a vase-shaped apple or pear tree.

- Always start your pruning by having a good look at the tree, and reminding yourself of the shape you're aiming for.
- Identify the main limbs. Select one limb and prune it from top to bottom, then move methodically around the tree pruning each limb in turn.
- Define the end of the limb by removing all but one of the laterals (i.e., the new shoots that grew last summer) at the end of the limb; this is called **defining the leader**.
- On a young tree you may also **head the leader** by cutting the lateral at the end of the limb in half. This helps to define and strengthen the permanent framework of the tree (it's not necessary in fully grown trees).
- Prune the rest of the limb as described below depending on which type of tree you have, spur or tip bearing.

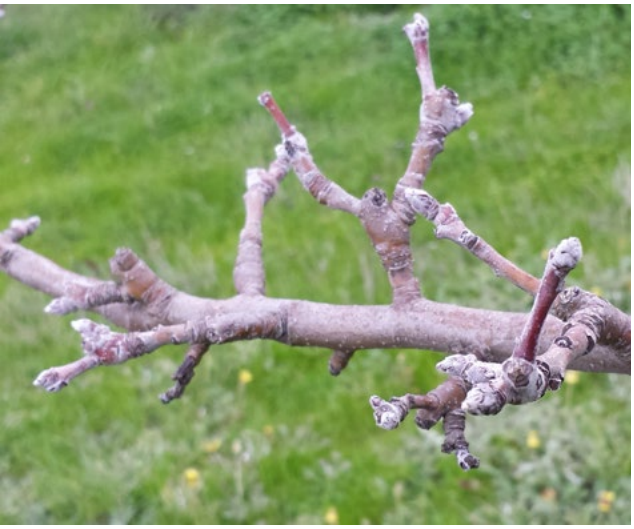
AT A GLANCE...

Until your apples and pears start producing leaves and then flowering, they can still be pruned (but you should have finished your pruning on anything that's started flowering).

Knowing whether your trees are spur bearing or tip bearing will help you decide how to prune them.

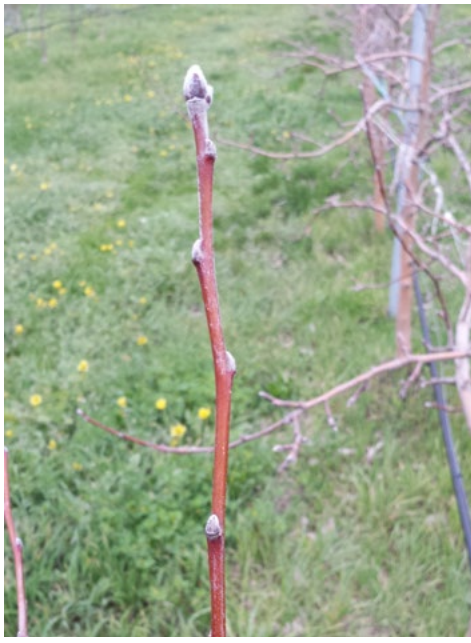
PRUNING SPUR-BEARING VARIETIES

- Shorten laterals on each main branch by about one-third, cutting back neatly to a bud. This will encourage the development of new side shoots and spurs.
- On a 2 year old spur (i.e., a lateral that was shortened by a one-third last year), it will most likely have branched into 2 or 3 new laterals—shorten each of them by one-third, as this will help to encourage the development of spurs.
- Old spurs have less fruit buds, so on older trees, thin any spurs that have become overcrowded, or remove them completely if there are replacement young shoots nearby.
- On really large, vigorous trees, it's impractical to shorten every single lateral, so make larger pruning cuts to remove part or all of some of the more crowded branches.



spur bearing

tip bearing



PRUNING TIP-BEARING VARIETIES

- Identify the new growth (laterals, or side shoots) on your tree, i.e., all the bits on the ends! They are usually a different colour to the older wood. The buds on the end of these new shoots are 'apical buds', and this is the main place fruit will grow on your tree in the coming season. It's important not to cut too many of these off when pruning, or your tree won't have any fruit.
- Fruit buds are fat and furry, leaf buds are slender and smooth.
- On mature trees that have been fruiting, cut back a proportion of older fruiting shoots to a new side shoot, or shorten them to one or two buds, or remove them completely if there are plenty of new replacement shoots.
- Leave all the other side shoots unpruned, as they will carry this year's fruit crop.

PEARS

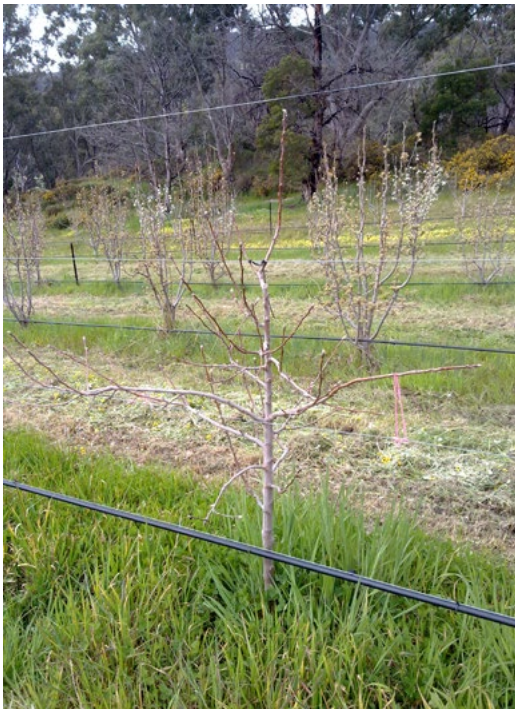
SPUR BEARING	TIP BEARING
Conference	Jargonelle
Doyenne du Commice	Josephine
Williams bon Cretian	
Crimson Gem	
Forelle	
Packham's Triumph	
Howell	
Beurre Bosc	
Moonglow	

APPLES

SPUR BEARING	SEMI-SPUR BEARING	TIP BEARING
Akane	Blenheim Orange	Abas
Cox's Orange Pippin	Braeburn	Bonza
Golden Delicious	Bramley's Seedling	Cornish Gilliflower
Dayton	Coromandel Red	Fuji
Earl Victoria	Discovery	Gala
Greensleeves	Empire	Golden Delicious
James Grieve	Epicure	Golden Russet
Jonathan	Golden Noble	Hi-Early
Liberty	Granny Smith	Irish Peach
Oregon Spur	Gravenstein	Redfree
Red Delicious	Imperial Gala	Yarlington Mill
Redchief	Jonagold	
Red Elstar	Northern Spy	
Rome Beauty	Pink Lady	
Snow	St Edmunds Pippin	
Sundowner	Worcester Pearmain	
Sunset		
Wagener		

While you're doing your pruning (or in fact, any time), remove any suckers that have grown from below the graft union. It's a good idea to remove them before spring growth starts, because they are often very vigorous and will hog the nutrients, stopping your tree growing properly.

central leader apple tree after pruning



BEES AND OTHER POLLINATERS

ABOUT

There are around 25,000 known species of bees known around the world, with the European honey bee being the most well-known by fruit growers. They are hugely variable, and range in size from tiny stingless bees less than 2 mm long, to large leafcutter bees that can be up to 39 mm.

They are found on every continent except Antarctica, in every habitat containing insect-pollinated flowering plants. Some estimates are that pollinating insects like bees are needed to pollinate about three quarters of all food plants, and that by weight about a third of the food we eat needed a pollinator—in other words, they're important!

The European honey bee (*Apis mellifera*) is the most common species of honey bee worldwide. They create colonies with a single fertile female (the queen bee), many sterile females (worker bees) and a small proportion of fertile males (drones). Colonies (or hives) can contain up to tens of thousands of individuals, and are organized by highly sophisticated communication between individuals, mainly using smell and dance.

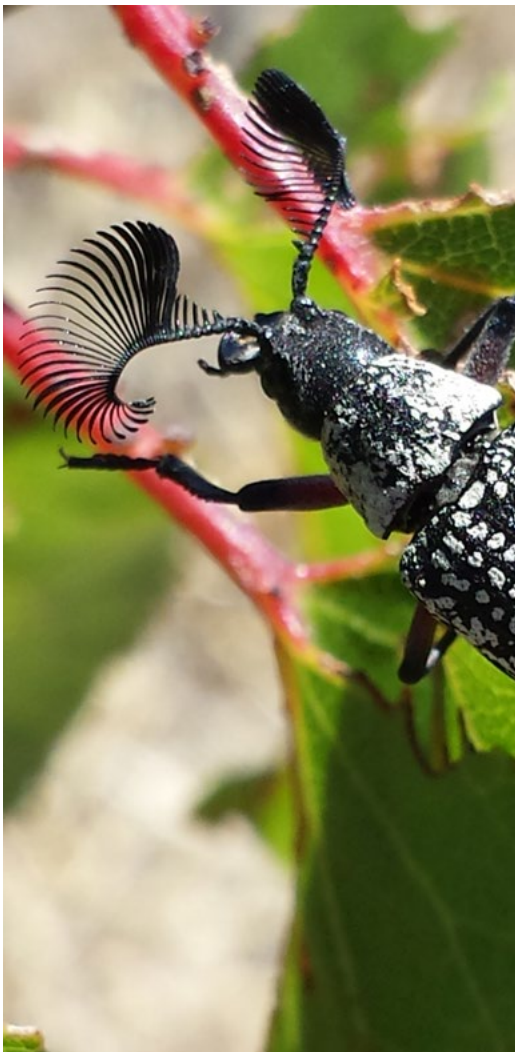
While European honey bees get most of the credit for pollination (because they're cultivated by humans for this purpose), there are many other species of wild bees (and other insects) that are just as important for pollinating crops.

LIFE CYCLE

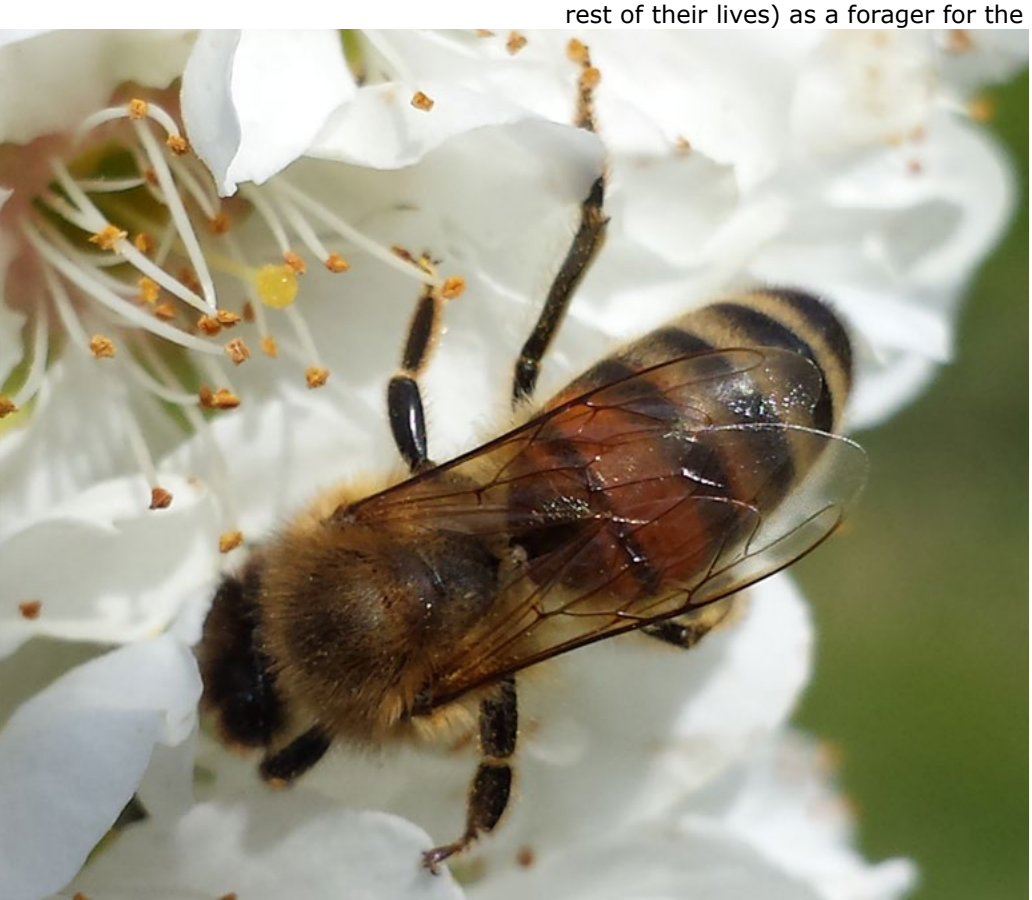
While a lot of wild bees don't live in hives but live as individuals, the European honey bee is absolutely fascinating in their social structure, and well worth a look. The hive is a highly organized and structured community with strict rules of behaviour and function imposed on the individuals that live in it.

Hives usually have just one fertile queen though it's now known that some hives can maintain two queens. The queen begins laying eggs in mid to late winter, probably triggered by day length. Except for a brief period when she may fly to mate with drones or leave her hive with a swarm to start a new colony, the queen hardly ever leaves home. She deposits each egg in a cell prepared by the worker bees. The egg hatches into a small larva which is fed by 'nurse' bees (worker bees who look after the hive). After about a week the larva is sealed into its cell by the nurse bees and begins its pupal stage, and after about another week it emerges as an adult bee.

For the first 10 days of their lives female worker bees clean the hive and feed the larvae. For the next week or so they graduate to building cells in the comb for the next generation. On days 16-20 workers are fed nectar and pollen, and store it. After the 20th day the worker bees are mature enough to leave the hive begin their role (which lasts for the rest of their lives) as a forager for the rest of the hive.



Queens usually live from 3 to 5 years. The life span of other members of the hive vary from weeks to months.



MONITORING–HOW MANY IS ENOUGH?

The common wisdom in commercial orchards is that you need one hive per hectare for maximum yield, and introducing a beehive into your garden will make sure you always have enough bees around when you need them.

However it's not at all necessary, as research has clearly shown that maintaining an understory of flowering plants under your fruit trees dramatically increases the number of species of pollinating insects in the garden.

A handy rule of thumb to check whether you have enough pollinators is to stand by your tree in full blossom on a calm sunny day and count the number of bees and other insects—if you can count at least 6 bees in the tree, pollination should be ok.

ENCOURAGING BEES AND OTHER POLLINATORS IN THE GARDEN

There are lots of threats to honey bees, wild bees and other pollinating insects. Data from around the world is showing that both honey bees and wild bees are in decline from climate change, chemicals, and disease.

A condition of honey bee hives called colony collapse disorder occurs when most of the worker bees disappear, leaving only the queen and a few nurse bees to care for the remaining immature bees and the queen. This phenomenon has been dramatically increasing worldwide and is possibly due to many causes including the Varroa mite and/or other predators, pathogens, loss of habitat either from land clearing or large areas of monoculture crops, and the use of pesticides such as neonicotinoids.

The good news is that non-bee insects play a much bigger role in pollination than has previously been understood. These wild insect pollinators occur naturally and don't need managing by us as gardeners or orchardists. They include flies, beetles, butterflies, moths, wasps, ants, birds and bats. Depending on the crop, the surrounding habitat and the insect populations that are present, these non-bees can be responsible for from 8-80% of the pollination.

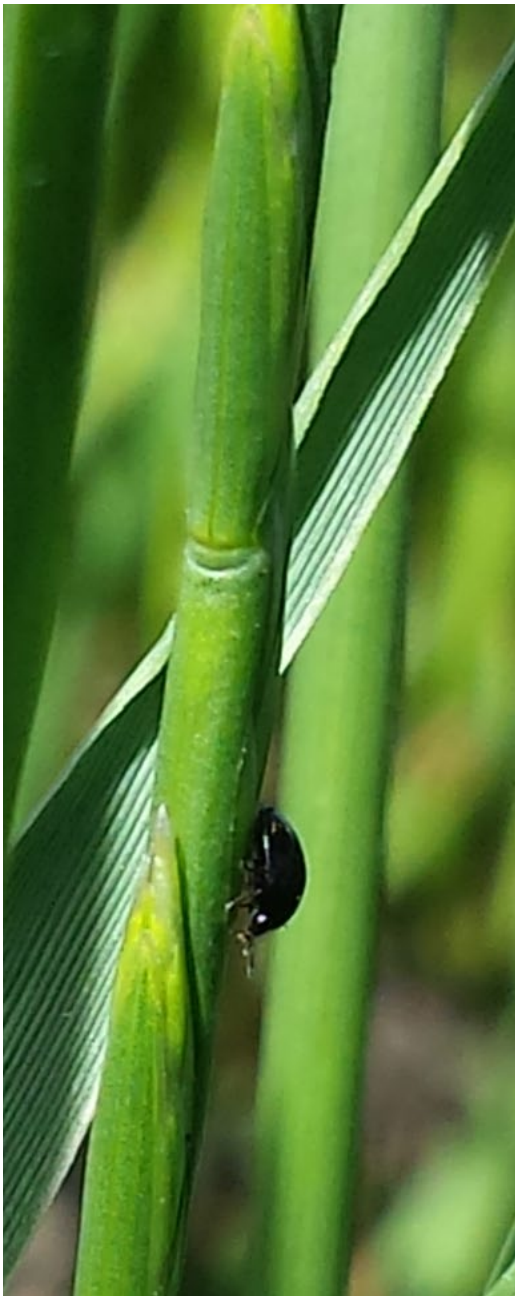
Not a lot is known at the moment about which species are most likely to pollinate different crops, so it's safest to stick to our basic principle of biodiversity.

What we know is that insect pollinators need somewhere to live (which might include trees, other woody vegetation, bushes, flowering plants and grasses), and they need a food source, or maybe more than one food source if their larvae and adult stages eat different things. They may be able to use flowers (nectar and pollen) at some stages of their life cycle, but feed on other insects or even decaying plant matter at other stages.

European honey bees are adapted for feeding on nectar as an energy source, and pollen for protein and other nutrients. Most pollen is used as food for larvae.

While all this matters a lot to them, it need not matter to us that we don't really know or understand exactly which insects are likely to be pollinating our fruit trees. Here's the things to aim for in your garden:

1. Complete ground cover (i.e. no bare ground at all, and living plants are better than mulch)
2. As many different types of plants as you can fit into the space, including different types of fruit trees (and other trees if you have plenty of space), different bushes, herbs, grasses and weeds
3. Flowering plants present for as much of the year as possible, particularly from late winter all the way through summer until the following autumn if possible
4. Different types of habitats if possible – tall plants, low plants, sunny spots, windy spots, sheltered spots
5. Insects need to drink, so provide an open water source if possible
6. Don't use any chemicals that may harm the beneficial insects, particularly be careful of pesticides (which are designed to kill insects)—even the organic or natural ones
7. If you have a large garden or a farm, create a wildflower strip along the edge of any cropped areas to provide insect habitat



SETTING UP A DRIP IRRIGATION SYSTEM

AT A GLANCE...

Drip irrigation systems are easy to set up and take the drudgery out of ensuring your trees get enough water. These systems are also affordable and easy to automate.

Drip systems are also the most efficient way to water as there is no runoff—all the water soaks in and is available to the plant.

Now that you have your fruit trees planted, it's time to **build a watering system** that is going to make life easy for them—and you. If your system relies on you having to manually water your trees—either by hand-held hose or, perish the thought, bucket— there's a good chance your trees will not get the water they need to thrive.

Another excellent reason to set up a drip system is that drippers on individual trees are very **much more efficient** than hoses or sprinklers. Drippers deliver water slowly, so there is no runoff and the water goes exactly where you want it—into the root zone—and is delivered at a rate that the soil can easily absorb. Sprinklers and hoses tend to deliver water much faster—faster in fact than the soil can absorb it, and so not only is there water wasted in runoff, but less water is actually absorbed into the soil. Drippers are around 95% efficient; hoses and sprinklers as low as 50%.

If you needed more convincing, drip systems are also **easy to automate**, so you don't need to become a slave to your trees—you have to look after them, but carting buckets of water?

As we keep talking about, soil has structure, and this includes air pockets and passageways. When a high volume of water is delivered, the soil is flooded and the structure potentially damaged.

GETTING STARTED

The first thing to do is organise your **water source**. If you are on reticulated (town) water you'll probably have a tap in the back yard that you can connect to—lucky you! When you are relying on your own supply—e.g. dams, tanks or bore—you have to get your water to a tap as a starting point. This will usually involve pumping so that you have water under pressure—drip systems are easiest to set up as pressurised systems, although they can work on gravity feed but you'll be limited by the much lower water flow rates. The benefit of course is that gravity-fed systems cost nothing to operate once set up (see box).

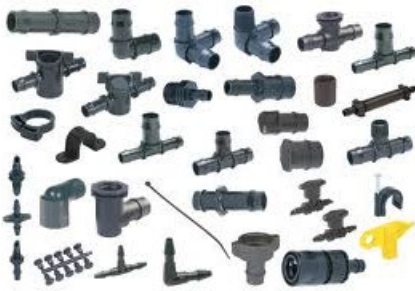
We also need to make sure our source is going to be able to supply the amount of water needed, especially at the height of summer—and you may be surprised how much this is. Allow at least 200 litres per tree per week for mature trees (4 m high) in hot weather; half that much for smaller trees and cooler weather.

OK, we have water to a tap somewhere reasonably close to our trees. Next we need to **check the water flow rate** to make sure there's enough water flow to do the job. If your flow rate is low, it may be necessary to run more than one line from your tap and split the watering. So, time how long it takes to fill a 10 litre bucket from your tap, then do the maths to find your rate in litres per hour: e.g., if it takes 20 seconds to fill the 10 litre bucket, this equals 3 buckets per minute (30 litres), which is 1,800 litres/hour. That's enough to run 225 drippers rated at 8 litres per hour (a common dripper rating). However, there will be some pressure loss due to friction in the pipe, so it's a good idea to scale back by about 25% the number of drippers to run from any one tap at once, so in this case we could run around 170 drippers on one or multiple pipes.

The next consideration is the **length of pipe**. Generally 13 mm (1/2") diameter pipe is all that's needed, but because of the friction, pipes shouldn't be more than around 70 meters long. Allow for a maximum delivery rate of around 1,800 litres/hour. If you need more than this, try to split the system into two or more individual pipes. If this is impractical (say if your trees are spaced out but in the same general area), consider using 19 mm (3/4") pipe, as the friction loss is much less and so not only will it deliver more but can do it over a longer distance. Bigger pipe is obviously more expensive, as are the fittings such as joiners and elbows, but it's not that much more and it's important to get this right. Using 19 mm pipe over the same distance, your maximum flow rate will be around 2,700 litres/hour (assuming of course your supply can deliver this volume).

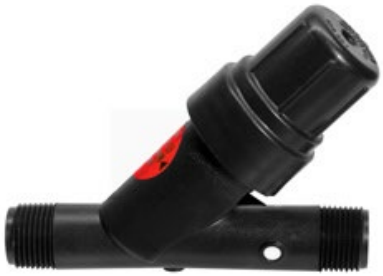
If your trees are a long way from the tap (more than 70 metres), it would be a good idea to use 25mm pipe for the feed out pipe from the tap to the first tree, and then scale down to 19 mm or 13 mm, and/or

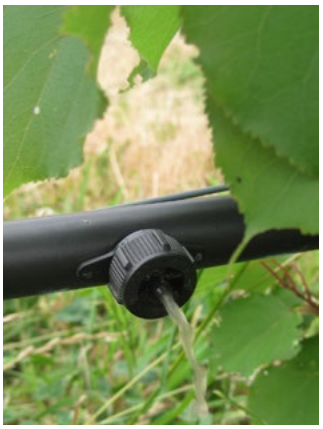
the range of fittings makes configuration easy...



low-density poly pipe comes on rolls up to 200 m

in-line filters are essential on tank or dam water systems...





drippers have different rates, and just push into the main pipe...

split the system into two at this point.

All pipes used for drip systems are low-density poly. These are low cost and are designed for relatively low pressure (fine for what we are doing). They generally come in rolls of 25 meters to 200 meters, and the longer rolls are more economical. As a price guide, 13 mm pipe costs around $18 for 25 meters, $35 for 50 meters, and $66 for 100 meters. The same prices for 19 mm pipe are $27, $50, and $80.

If you are using dam or tank water a **filter** is an absolute must; on town water it is still a good idea. In-line disc filters are the most effective, and these are threaded and so will screw straight into your tap, and then the irrigation line is attached to it. A 20 mm filter which will filter 120 micron particles (adequate for drip irrigation) will cost around $40—it's the most important $40 you'll spend in the whole system—blocked drippers are a nightmare and if your system is prone to blockages it means you'll be needing to check your drippers weekly to be sure each tree is getting a drink, and surely you have other things you'd rather be doing?

SKETCH A PLAN

Sketch out a rough plan of your fruit trees on paper (or use the Fruit Tree Garden Planner)—it will help if it's roughly to scale. Now you can work out the best way to supply water from the tap to each tree. Poly fittings such as tees, elbows and joiners make the job of configuring your system very easy. Use elbows on any sharp bends, as this will avoid kinking your pipe, bearing in mind that water flow through a kinked pipe is reduced by as much as 90%. Plastic or metal ratchet clips should be used to secure your pipe to any fittings used—there's nothing worse than a system that keeps blowing apart, and if you plan to bury your pipes it's essential. No specials tools are required to assemble these systems as the pipes and fittings just push together. You will need pliers to crimp up the plastic clips.

If you have single trees that are off to one side or are going to be tricky to reach with your main pipe, the easiest way to get water to these is via a 4 mm spur line off your main pipe. These should be no more than about 5 meters long as the pressure drop is too great beyond this. These spurs attach to your main pipe via a barbed spike, and so can just be attached to the pipe anywhere—there's no need for a special fitting on the main.

plastic ratchet clips are needed on all joints and fittings...

If practical, it's a good idea to make your system into a loop, as the pressures will be more even. On a sloping site it's best to have the main pipe running along the high ground, with spur lines running down the slope to lower areas.

Drippers come in a range of styles and delivery rates—in fact there's a staggering array available at garden centres. When buying drippers the most important thing is whether or not they are pressure-compensating drippers—often advertised as PC (nothing at all to do with being politically correct!). They are great in a pressurised system because, as long as your system has the required minimum pressure, each dripper will deliver the stated amount of water. If the area you are watering is sloping or hilly, it is important to use PC drippers because there will be more pressure in the lower parts of the system and watering rates will vary greatly. In a gravity-fed system, or on flat land, you can use non-PC drippers.

We use the Toro Turbo-Plus 8 litre/hour drippers. They are PC, and can be taken apart easily to clear blockages. If you are watering trees of varying size (and therefore water requirements), you may decide to use different-sized drippers on some trees—they come in 2, 4, and 8 litres/hour.

PRESSURE

How much is enough pressure? PC drippers need a minimum of about 10 pounds per square inch (PSI) (about 70 kPa for those who prefer metric) to work effectively. Any pumped system or town water system should easily deliver this much pressure. With less pressure than this, or on a gravity-fed system, non-PC drippers must be used, and you need to be aware that pressure will drop quite rapidly over pipe length, so keep an eye on drippers at the far end of the system as they may not be delivering the required amount of water.

You can also have too much pressure. Low-density poly pipe is not designed for high pressure. If your system consistently has more than about 40 PSI (300 kPa), you'll need a pressure regulator, which keeps the pressure constant but doesn't restrict the volume. Note that town water supplies are regulated at around 500 kPa (about 70 PSI), although you may not get this if you are at the end of a line or the system is old. However, it's too high for a low-density system and so a regulator is a good idea. Poly reducers that screw straight onto your tap are cheap and widely available, and there's also at least one brand (Rainbird) that combines filter and regulator, which is handy (flow rate is 1,100 litres per hour).

Another decision you'll have to make is whether or not to **bury the pipes**. It is generally most practical to bury your pipes, as then there is no risk of chopping them to bits with the mower, and squashing them by running over them. If you have a fence handy you could attach the pipe to it, but it usually makes most sense to bury them. Pipes only need to be a couple of cm below the surface—the trick is remembering where you have buried them so you don't stick a shovel through next time you go to plant a tree! If you are running a pipe under a vehicle track, it's best to bury it a bit deeper, or run the pipe through an old piece of steel water pipe or other pipe that won't get crushed or damaged by the vehicle weight.

Aim to have the main pipe run quite close to each tree, and then put the drippers on 4 mm spur lines so that they are above the ground level. You can bring your main pipe up above ground in a loop at each tree, but there is a risk that the pipe will kink, and it will be more vulnerable to mowers, slashers, and brushcutters.

With fruit trees it's not a bad idea to have a couple of

drippers on each tree (one each side), as it encourages more even root development, so you may have two 4 litre drippers on each tree rather than one 8 litre dripper. The drippers should be about 30 cm from the trunk, and this can be increased as the tree gets bigger.

TIMERS

It's good to have some degree of automation in your watering system, but just how much depends on what is going to suit you—and again there's a boggling array to choose from. At the most basic level is the 2-hour mechanical timer, where you have to turn the tap on, and the timer turns the water off after up to 2 hours. They are a pretty good solution, but obviously if you want to water for more than 2 hours you'll need to come back and turn it on again. **Mechanical timers** are cheap, and can often be found with two outlets, or some even have two timers to water two circuits separately or for different time periods. Timers like this start from as little as about $10.

Digital timers give much greater flexibility, and often are available with multiple outlets, each individually programmable. The beauty of these timers is that you can water as often as you like for as long as you like, and you can also water in the middle of the night when evaporation is lowest (although drip systems have low evaporation rates anyway because the water is not lying on the surface or spraying through the hot air). The trap with them is that it's easy to relax a bit too much, thinking that your trees are getting regular water, only for you to go out one day to check the trees and find that there has been some problem—the battery is flat, there's a blocked dripper, etc. Digital timers can cost anywhere from about $50 up to about $300.

SETTING UP THE SYSTEM

Hopefully now you've made all the tricky decisions, have got yourself a shopping list, and so can head off and make your purchases.

timers can be either mechanical or digital...

Once you get everything home, you can start building your system. If your planning has been thorough it should be plain sailing. One of the tricky bits can be getting the coils of poly pipe to behave and not try to curl up again. A couple of things can help: if possible let the pipe sit in the sun for an hour or two to warm up—it will be much more flexible. Also, when running the pipe out, find the loose end and weigh it down, then grab the coil of pipe and roll it along out like pushing a wheel—this will get the pipe laid out without the coils in it. You'll soon find out what a bad idea it is to take the loose end of the pipe and try walking out with it and leaving the bulk of the roll on the ground—you'll end up with a tangly mess that will not cooperate.

When your pipes are laid out, join them all up to the tap and flush the lines through with water before attaching any drippers, making sure the water runs clear and any bits of muck are gone. The simplest way to seal the end of the pipe is to simply bend it back over itself about 20 cm from the end, and then tie it firmly down—cable ties are handy here.

Now fix all your drippers in place—either by pushing the barb directly into the main pipe, or by adding a 4 mm spur line with the dripper at the end of it.

If you find it difficult to push the barbs into the line, you can buy spikes made for the job. And don't worry too much if you put a hole in the wrong place in the pipe, or change your mind—this is where 'goof plugs' come into their own! A pack of 20 costs just a couple of dollars and they add even greater flexibility.

All that remains is to light the blue touch paper and stand clear! Run the system, give it a few minutes to charge up, then walk around to each dripper to see if it's working OK. With any luck you can now kick back with a cooling ale in the shade, and watch your trees grow!

HOW MUCH WATER?

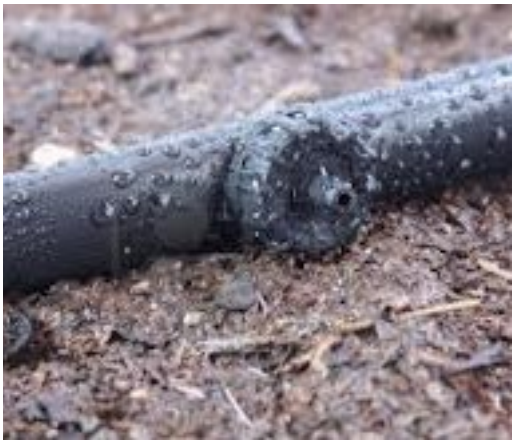
Watering requirements vary enormously depending on soil type, tree size and weather conditions. As a rough guide, for mature fruit trees (say, 4 m high) in hot dry weather (30–35°C) allow at least 200 litres per tree **per week**, and this should be split into at least two waterings. In cooler weather (20–25°C) you can halve the amount of water required.

Use this as a rough guide only, and take your cue from your trees. If your soil is very heavy or sandy the watering needs may be quite different.

It's also easy to over-water, so don't make the mistake of thinking that there's no such thing as too much. It's better to water for shorter periods (3–4 hours) more often than infrequent long periods Don't leave drippers on all night.

drippers are easily sited on the end of a 4 mm spur line

pipes can be on the ground, or buried for convenience...



GRAVITY-FED IRRIGATION SYSTEMS

It's possible to set up a system that doesn't rely on electricity or some other power source, but there are limitations. The most obvious is that your water source must be higher than your trees. They will also require more time input from you as it's not possible to water many trees at any one time, and so you may find yourself having to turn taps on and off a fair bit.

Here's a few things to consider:

- Use non-pressure-compensating drippers
- Keep the length of rows as short as possible
- If possible, position the water source on the high side of the orchard (or vice-versa) to maximise the use of gravity
- Elevate the water source as much as possible to increase pressure
- Use larger sizes on any long lengths of pipe to reduce friction losses
- experiment by setting up part of the system and test before adding more rows

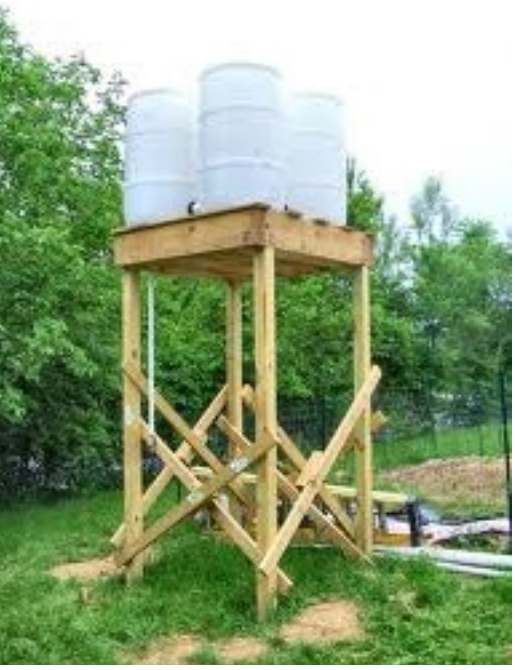
If you have less than 10 PSI of pressure, be sure to use non-pressure-compensating drippers such as the Toro Turbo-Key range. The lower the pressure, the greater the effect of friction losses in the pipe that will slow the flow of water. If the pressure is too low, the drippers at the far ends of the system may not flow at all.

Drippers also rely on turbulence in the water to stop silt and fine organic material from settling in the pipe. Low pressure results in low turbulence, and so silt may settle and eventually clog the small openings in drippers.

Elevating your water tank can make a surprising difference. It takes 70 cm of height (head) to produce 1 lb per square inch (PSI) of water pressure. In other words, your water tank must be 7 meters in the air to produce 10 PSI. You may be able to place the tank on a hill or high in a shed or other building, or build a stand. The higher the better until you reach 20 metres, above which height a gravity-fed system will produce more than 40 PSI and will require a pressure regulator to keep the pressure at 30 PSI or less.

To design your system, measure the flow rate at the source, and establish how many drippers can be run at any one time. This will determine how many pipes are needed and how many taps so individual pipes or spur lines can be turned on or off as needed.

Very low pressure drip irrigation is possible but be prepared to experiment to see what works in your garden or orchard.



an elevated water supply gives pressure in a gravity feed watering system...

KEEPING INSECT PESTS OUT OF YOUR TREES

In an organic garden, instead of using chemicals to kill problem insects, we use a whole toolbox of other ways of thwarting them, and one of the easiest and most effective is to provide a barrier that they just can't overcome!

Barriers are most effective for those insects that don't fly, but must crawl into the tree to take up residence and do damage, particularly earwigs and garden weevils, but they can also help prevent flying insects like codling moth, which will sometimes flutter up close to the trunk as the female moths emerge from their pupae in the soil in spring.

As providing physical barriers such as tape rely on preventing insects crawling into the tree, it is important to remove other ways for insects to get into the tree—long grass and tall plants around the trunk of the tree provide excellent insect highways, so keep these slashed or only encourage very low-growing plants such as clovers.

DOUBLE-SIDED TAPE

This is the most effective, and least damaging to the tree. It's sold simply as Sticky Tape and, as the name suggests, it is extremely sticky. Sometimes it's also sold in strips as monitoring tape, designed to be hung in the tree to monitor flying insects that are attracted to the yellow colour, and then stick to the tape.

Note this is special horticultural tape rather than the various double-sided tapes available for other purposes, the main difference being the enduring stickiness of the glue.

Applying the tape is an amazingly sticky job. You'll need rubber gloves, patience, and no-one around to hear you cursing! Try to find a smooth part of the trunk so that the tape forms a good seal and doesn't leave any little tunnels and gaps for insects to crawl under. If the trunk is too rough you can put it instead around each limb after it branches from the trunk. The tape needs to overlap by a good 50mm, as it sticks to itself rather than to the tree. The tape will last a full season, so this is a yearly job to do in spring before trees have leaves and insects start moving in.

The only thing we have found that is an effective solvent to clean up hands and scissors is citrus solvent or cleaner.

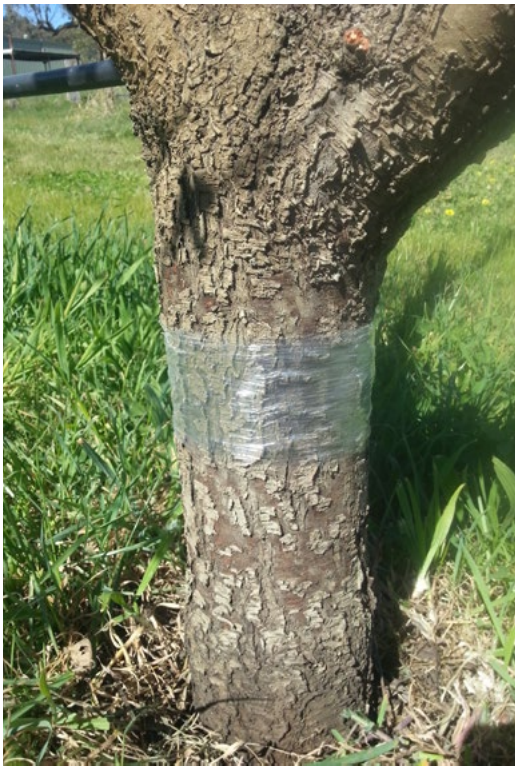
The main drawback of this tape is that it is difficult to source in small quantities suitable for the backyard. Greenharvest (*greenharvest.com.au*) sells wide rolls which can be cut in half; this is an incredibly fiddly sticky job. *Gemplers* in the US sells convenient 50mm x ~50m rolls, which are about US$60 each, but then there is the cost of shipping. This is what we use (photo).

HORTICULTURAL GLUE

There are several different types on the market—again, Greenharvest is a good place to look. This is a non-drying, waterproof, non-toxic glue that forms a sticky barrier that insects hate.

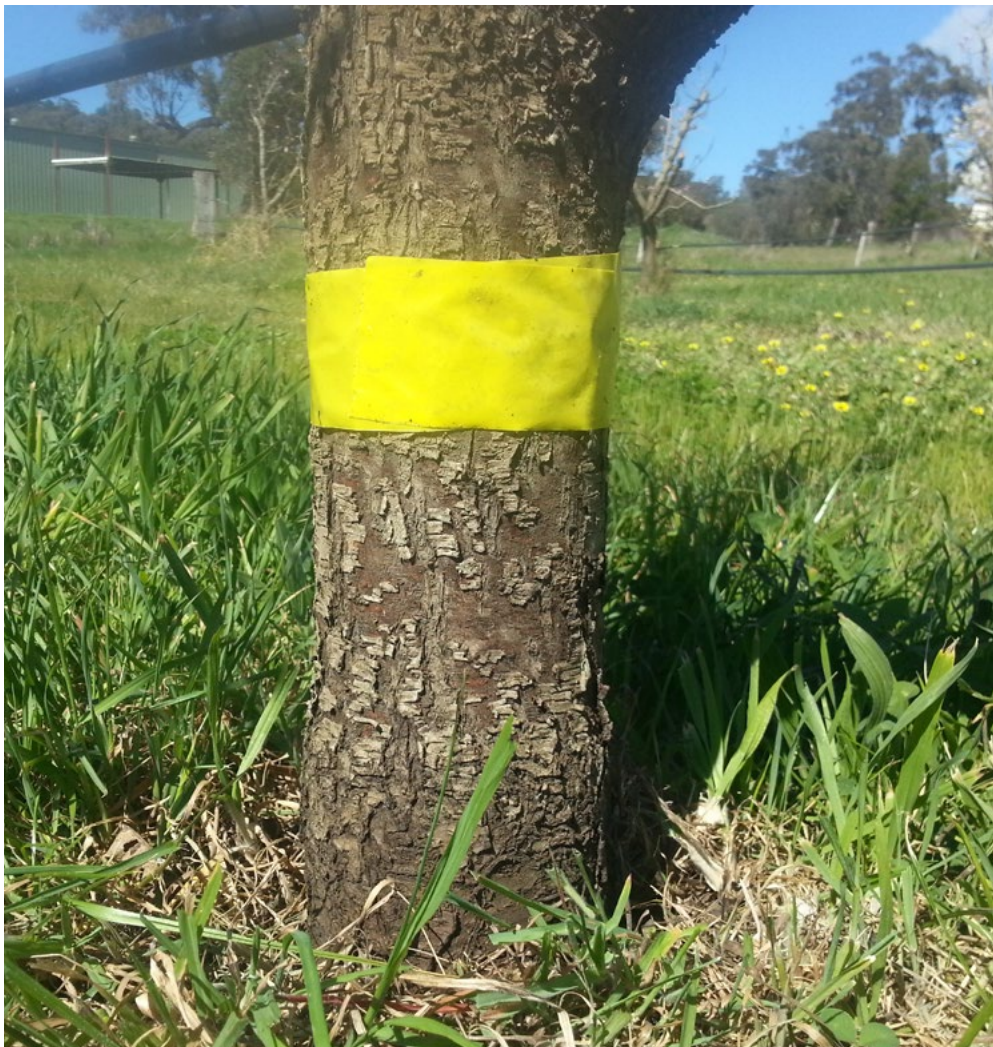
Basically you first wrap a waterproof barrier around the trunk—a 50mm wide strip of cling wrap works well, then apply a band of hort glue.

You could also use something like Vaseline, but be careful with stronger stuff such as automotive grease as this could kill the tree if it comes in contact with the bark.



A strip of cling wrap makes an effective base band for horticultural glue

Double-sided tape is very effective against insects that crawl up the trunk



SPOTLIGHT ON BLOSSOM BLIGHT

AT A GLANCE...

Blossom blight is one of the main reasons (other than frost) that you may never have picked any apricots from your tree.

It's a fungal disease, and most seasons is preventable by using the right organic fungicide, at the right time.

ABOUT:

Caused by various strains of the *Monilinia* fungus, especially *M. fructicola* and *M. laxa*. The same fungal strains cause Brown rot if they infect fruit (particularly peaches and nectarines) later in the season.

LIFE CYCLE:

Blossom blight reduces fruit set by infecting and killing blossom, and can occur anytime while the trees are in flower, from budburst to after full bloom. It can also lead to dieback of new shoots. Where shoots are infected there is usually a sunken area of dead or dying bark. These cankers often ooze honey-coloured gum, which is the tree's very effective method of containing the infection and preventing it spreading further. The tree will often put out a healthy shoot very close to where it has contained the infection with gum. The main source of spores is infected fruit or twigs from last season that have been left in the tree.

MONITORING:

From budswell to full blossom, monitor both the trees and the weather. Take action if flowers stay wet from rain or dew for more than 5 hours, when the temperature is more than 20°C, or if the temperature has been 20–25°C with showery conditions and cool nights.

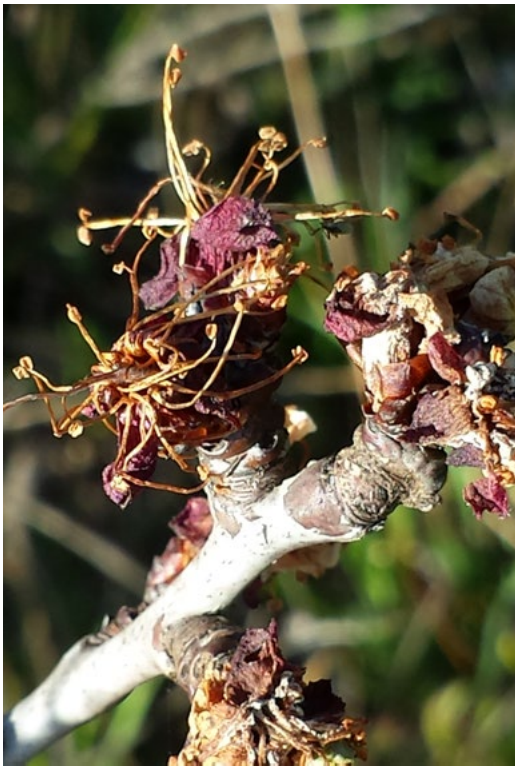
NOTE: Bacterial canker can look similar to blossom blight and twig canker symptoms, but is actually caused by the *Pseudomonas syringae* bacterium, and will not be prevented by the treatment you have applied for Blossom blight. However, if you applied a later winter/pre-budswell copper spray to your apricots, peaches and nectarines, this will hopefully have helped to control Bacterial canker if you have it in your trees.

PREVENTION AND TREATMENT:

PREVENTION: Once your trees are infected (and most trees are), you can expect some infection every year if the weather conditions are right (or wrong, depending on how you look at it!). Dry conditions prevent outbreaks, so it's quite common not to see much of this disease during a drought. There are lots of things you can do to prevent the disease:

- Because blossom blight is caused by the same fungus as brown rot, it's very important to clean up and remove any 'mummies' or dried up rotten fruit that were left in or under the tree after last season—in fact this is the single most important thing you can do to prevent the disease!
- It's also important to remove any infected twigs when pruning your apricots, as spores from old fruit or infected twigs can infect next year's blossoms. Apricots are the most vulnerable to blossom blight, but peaches and nectarines can also become infected.
- Apply a copper spray at budswell and again 7–10 days later as a good preventive measure for blossom blight.
- It's very important that trees dry quickly after rainfall in spring, so prune them to an open shape to allow good air flow and designing your orchard to allow good air flow can both help. Growing open-shaped trees will also help your organic fungicides to penetrate the tree canopy and get good coverage of all flowers and twigs.
- If you notice some infected flowers during your weekly monitoring, remove them completely from the tree, to help prevent the disease spreading to healthy flowers.
- Towards the end of flowering, also remove and burn any diseased shoots, and check again when thinning.
- Netting can create slightly more humid conditions, and can favour the disease, so don't put your drape netting over the trees until after the danger period has passed (ie, after flowering has finished).

TREATMENT: In wet conditions (for example if you've had more than about 25mm of rain, which is considered to be enough to wash off a spray application), or if you see signs of Blossom blight developing in the flowers, it's also OK to apply another half-strength copper spray at mid- to full-bloom to stop the disease spreading further.



Blossom blight causes young shoots to die back..

GETTING DRAINAGE RIGHT!

Drainage is an important issue for fruit trees, and periods of heavy rain provide the perfect opportunity to see how good your drainage is. After it stops raining, well-drained soil will usually look dry on top within a few hours. If there are still puddles sitting on the ground, or in the holes you've dug for your fruit trees, a day or so after the end of the rain, your soil is not draining very well.

One of the ironies of growing fruit in our rapidly changing environment is that in the dry years we're desperately trying to hold onto every drop of rain that falls, and in the excessively wet years we need the landscape to be able to cope with draining away megalitres of water in a short space of time.

This means our design solutions need to cater to both those situations but, more importantly, it means we need really excellent soil. Soil with a high level of organic matter has a high water storage capacity—so in dry years, any water that falls on it will be held in the soil (and made available for use by your fruit trees) for longer than it would be in poor soil. In wet years, soil with a high level of organic matter drains better than poor soil, and is also more likely to provide habitat for microbes to survive even when the soil is wet.

There are some fantastic systems to draw on when coming up with a good design for water capture and storage on your property:

KEYLINE

P. A. Yeomans invented the keyline system in the 1950s, and it's still much in use on farms in Australia now to harvest and control water in a way that makes the most of rainfall, and improves soil. The main application of keyline for small farms and gardens is the idea of identifying the contours of the land to understand how water flows, and using the contours to slow and trap the water.

SWALES

Swales are a common **permaculture technique**, and are basically wide ditches built on the contour of the land, to catch the runoff on sloping land as it flows downhill. They are an excellent way of slowing down runoff and allowing it to soak into the soil in dry years, and in wet years the runoff is drained off the slope without causing erosion. One of the easiest ways to retrofit swales when you have existing trees on a slope is to create obstructions along the contour lines, using soil, branches or other organic matter, which gradually build up and start functioning like swales as they trap silt and other debris when water flows down the slope.

CAN POOR DRAINAGE KILL FRUIT TREES?

Unfortunately for most fruit trees, the answer is yes, though pears, plums and to a lesser extent apples will all tolerate 'wet feet' for a much longer period than stone fruit trees. Cherries are usually least tolerant, followed by apricots, peaches and nectarines. If the site is wet only in winter while the trees are dormant, it's not so much of an issue because the tree's roots are not active, but from spring onwards, when the root hairs start to grow and the roots start interacting with the soil, right through until autumn, if the soil is too wet, the tree may drown.

WHAT CAUSES POOR DRAINAGE?

Drainage problems are caused by a combination of factors—the natural lay of the land, the way water flows through your landscape, localised features of your soil such as underground clay banks, and the quality of the soil itself. A high level of organic matter in your soil will help it to retain the right amount of water after rainfall, whereas a heavy clay soil will often drain too slowly, and a very sandy soil will drain too quickly.

Most level sites will have water lying on them during a wet winter, and this is not too much of a problem as long as the water does drain away when the weather starts to dry out. Problems arise when there are patches that simply take ages to drain, and if this is where you're planning to plant fruit trees (or already have), some site work will be needed.

AT A GLANCE...

Drainage is an important issue for fruit trees, and periods of heavy rain provide the perfect opportunity to see how good your drainage is.

Although some trees tolerate it better than others, they will never thrive on a site where the water doesn't drain away readily.

GOOD DESIGN

Site selection is important when planting a new orchard, although your choices may be limited on a small block or flat land. Choose sloping areas or areas that seem to drain best, if you have any, and avoid low-lying boggy areas.

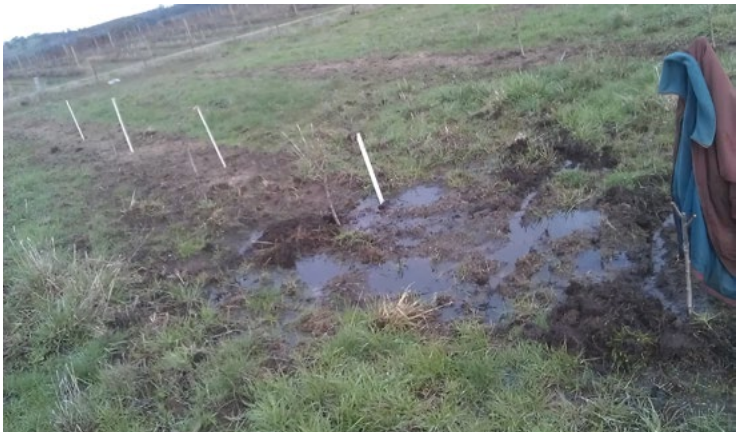
Ideally any drainage work or earthworks that are needed should happen before your fruit trees go in, and so some advance planning is required.

It's really worth observing your land (even if it's just a backyard) closely in both wet and dry times, to really see where and how the water sits and flows in wet times, and in dry times to notice which areas or plants dry out first. This will help you design a good water capture and drainage system. If you've had a chance to observe what happens in winter and identified where any problem drainage areas are, mark them (e.g., with pegs in the ground) so that once things dry out, you can put in a drain if necessary.

FIXING DRAINAGE PROBLEMS AROUND EXISTING TREES

INSTALLING AN AGRICULTURAL DRAIN

Essentially a subsurface drain is a



most trees can't tolerate poor drainage

flexible slotted poly pipe

slotted pipe (called agricultural pipe) laid in a trench and surrounded by gravel to prevent plant roots growing in and blocking the pipe. The drain needs to be on a slope, and have an exit point well away from the plants you are trying to protect. Water will drain from the surrounding soil through the gravel and into the pipe, and then drain downhill to the exit point.

Depending on the water plan for your property, the exit point may be into an external or surface drain joining the storm water drainage system, a waterway, or a dam or wetland on your property.

DIGGING DRAINS

If you're putting a subsurface drain in around existing trees, or only have a short length to do, the practical thing to do is break out the shovel and start digging (checking first of course that there are no pipes or cables in the area!). Of course, if you can get a bit of mechanical assistance this will save your back. The process is the same either way.

A full shovel blade width and depth is the minimum you'll need, but deeper would be better (30–50 cm), and try to even out the bottom of the trench so that water will flow easily and not puddle anywhere.

It's a good idea to line the trench with hessian or shade cloth to stop silt seeping back into the trench over time and blocking the pipe.

In the bottom of the trench place a 50–75 mm layer of 20 mm rock screenings or washed gravel (not crushed rock, which contains clay and solids which will clog any drain). Next comes slotted pipe. This can be either slotted 90 mm PVC storm water pipe, or 50 mm flexible black poly pipe. PVC comes in 6 meter lengths and is quite rigid, so if your trench has bends it's not the best solution. Poly pipe is easier to work with and doesn't need joining. Once your pipe is laid, block the uphill end of the pipe with a brick or piece of stone so that dirt cannot enter, and then cover the pipe with more screenings to a depth of at least 100 mm.

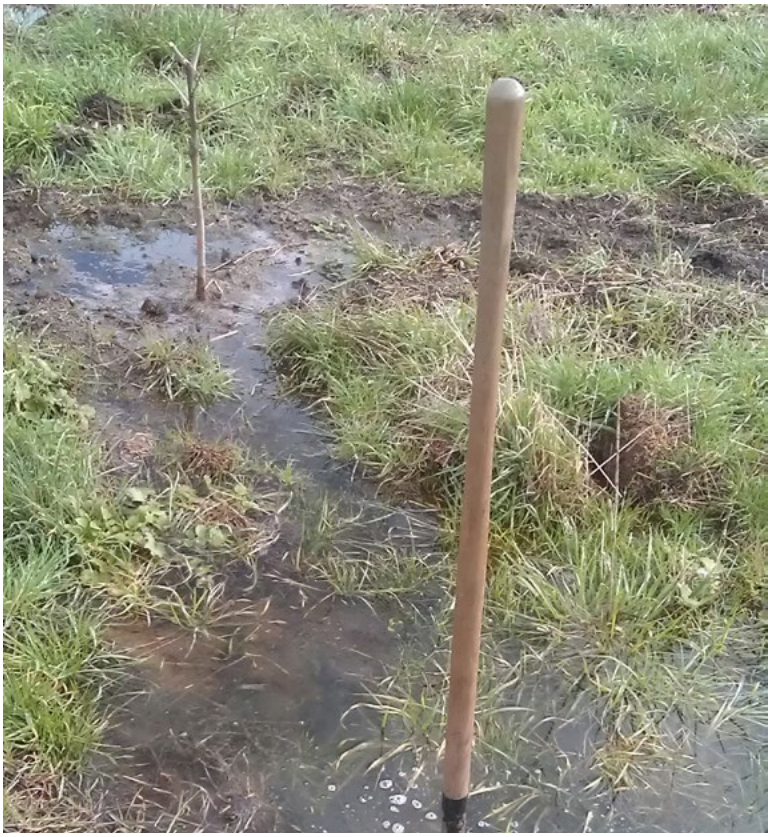
Now it's just a matter of backfilling your trench with soil—leaving the outlet end of the pipe unobstructed of course!

HOW DO I PREVENT LOSS OF PRECIOUS WATER INTO THE DRAIN IN DRY TIMES?

The key to this is soil improvement (which is pretty much the answer to everything!). In drought conditions, the higher the organic matter levels in your soil, the more moisture your soil will be able to absorb and hold. Water will only be lost to the installed drainage once the soil becomes saturated, and the presence of organic matter allows the soil to absorb much more water than soil with low organic matter levels. As always, we return to our mantra "add organic matter and microbes to build healthy soil".

hiring a trenching machine for a day is money well spent if there's any amount to do

no point planting here without dealing with this...

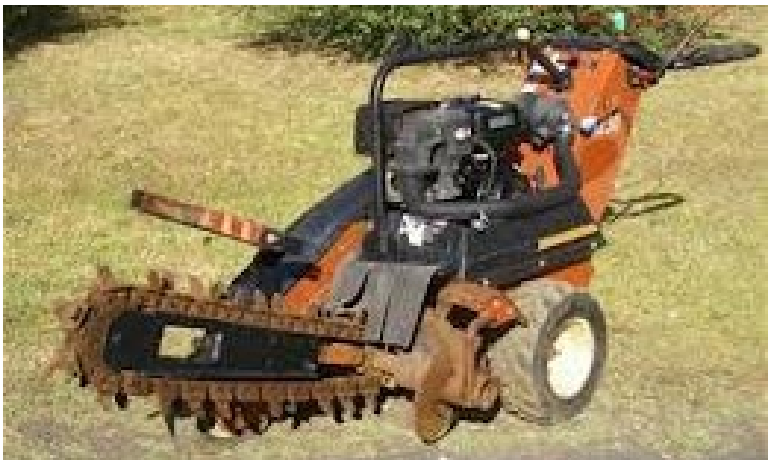


In addition to soil improvement, having above-ground water diversion structures (e.g., swales and drains), to direct rainfall runoff where you want it, slow the rate of runoff on a slope, and allow it to soak into the soil, will allow the soil to become fully saturated before any runoff enters the drain. Keyline ploughing will achieve the same result.

PLANTS THAT PREFER MOIST CONDITIONS

The following list is just some of the plants that prefer growing in damp or moist places, so their presence can be a bit of a heads-up (though not sufficient evidence by themselves) that you might have a problem spot where you need to improve the drainage:

Moss, joe-pye weed, spotted spurge, knotweed, chickweed, crabgrass, ground ivy, violets, sedges, onion grass, bindweed, cattail, coltsfoot, buttercups and daisies, docks, foxtail, goldenrods, groundnut, poison hemlock, horsetail, jewelweed, marshmallow, may apple, meadow pink, meadow sweet, stinging nettles, ragwort, tansy, sheep sorrel, silvery cinquefoil, sweet flag thyme-leafed speedwell, black willow.



SPOTLIGHT ON ARTHROPODS – SHREDDERS

Healthy, diverse soil can contain thousands of species of arthropod... as well as the thousands of species of micro-organisms—it's a zoo down there! Whenever we talk about numbers of species and individuals in soil, they always seem impossibly large, but arthropods constitute around three-quarters of all living organisms (though they still have a smaller biomass than nematodes and protozoa!).

Soil arthropods are invertebrates, which means their skeleton is on the outside of their body, instead of a spinal column. They can range in size from microscopic (micro-arthropods) up to those that are easily visible. They usually have three body segments: head, thorax and abdomen, but some only have two.

They start as eggs, hatch and live as larvae, then metamorphose into a different form as adults, e.g., butterfly or insect. They may only live in the soil during one of their life stages.

Subcategories of arthropods include

Insects	Springtails, beetles, ants, silverfish, termites, dragonflies, damselflies, earwigs, mantids, cockroaches, grasshoppers, crickets, fleas, thrips, lacewing, moths, butterflies, flies, sawflies, bees and wasps
Crustaceans	Slaters
Arachnids	Spiders, mites, ticks, scorpions
Myriapods	Centipedes, millipedes

For the purposes of the fruitgrower, it's easiest to think of the different types of arthropods in terms of their function in the soil, e.g., shredders, predators, herbivores and fungal feeders.

Arthropods are important in healthy soil, because as they feed (and eat each other), they

- aerate and mix the soil
- control the size of the population of other types of soil organisms (helping to keep the soil in balance and control disease-causing organisms, called pathogens)
- shred organic material, helping it to break down
- spread beneficial microorganisms through the soil
- provide food for larger predators like birds & lizards
- improve soil structure.

Like their tiny microscopic cousins the soil microbes, they are really important in releasing nutrients into the soil in a plant-available form, making them a really important part of the natural fertility system that provides free nutrients for your fruit trees.

> "Whenever we talk about numbers of species and individuals in relation to soil biology, they always seem impossibly big, but arthropods constitute around 75% of all living organisms..."

SHREDDERS

One of the biggest categories of soil arthropods, a lot of the species that you're likely to see on the surface of the soil—like millipedes, slaters, termites, some mites and cockroaches—are shredders. They chew up dead plant matter, though at times they're actually after the bacteria and fungi on its surface. In the process of shredding, they in turn provide a lot more surface area for the bacteria and fungi to live on, and taxi the microbes about in the soil.

A word of warning: if there isn't enough dead plant matter to keep them satisfied, shredders can become a pest by eating live roots instead, which is yet another really good reason to make sure there is lots of organic matter in your soil. (Unfortunately a few species, such as cicadas, eat live roots even if there is plenty of dead material available, so sometimes you just can't win!)

MILLIPEDES are called diplopods because they have two pairs of legs on each body segment. They are usually harmless, but are great at protecting themselves from predators by spraying a really stinky substance from their aptly named skunk glands. Most of them eat decaying leaves and other bits of dead plants.

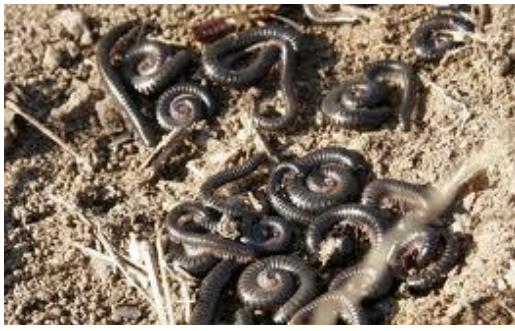
SLATERS: At large enough magnification, it's easy to see the similarities between these tiny bugs and their much larger relatives of crabs and lobsters. Slaters have massively strong mouths that they use to crunch up plant residue and dead leaves.

AT A GLANCE...

In addition to the all important micro-organisms (bacteria, fungi, nematodes and protozoa), and our master soil-building friends the worms, soil also contains many types of larger bugs, called arthropods.

There are thousands of different species, and they all play an important part in the soil food web. This month we look at one of the most important (and often most visible) groups – the shredders.

SPRINGTAILS: Also called 'soil fleas', they can range from 0.2 to 2.0 mm long, and may be seen jumping into the air when the top layer of soil debris is disturbed (though some species live deeper in the soil). Instead of wings they have a forked tail that allows them to jump. As well as eating decaying organic matter, springtails also eat bacteria, fungi, nematodes and dead animal matter. In turn, they are often eaten by mites.



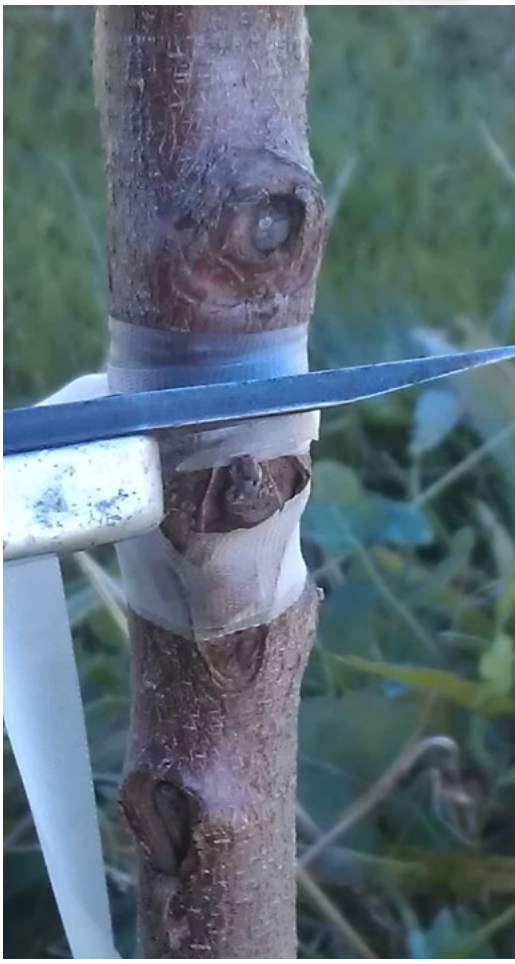
TERMITES AND ANTS: these groups of arthropods are similar in that both build tunnels and burrows, in the process taking organic matter from the surface of the soil underground, and mixing surface and sub-surface soil. The tunnels allow air and water into the soil, and help other animals move about. They may also make it easier for roots to grow in the soil. They differ in that termites eat mostly things containing cellulose, which they can do because their guts contain anaerobic bacteria. Unfortunately these bacteria emit methane, which is a major contributor to global warming.

CALENDAR OF GRAFTING JOBS

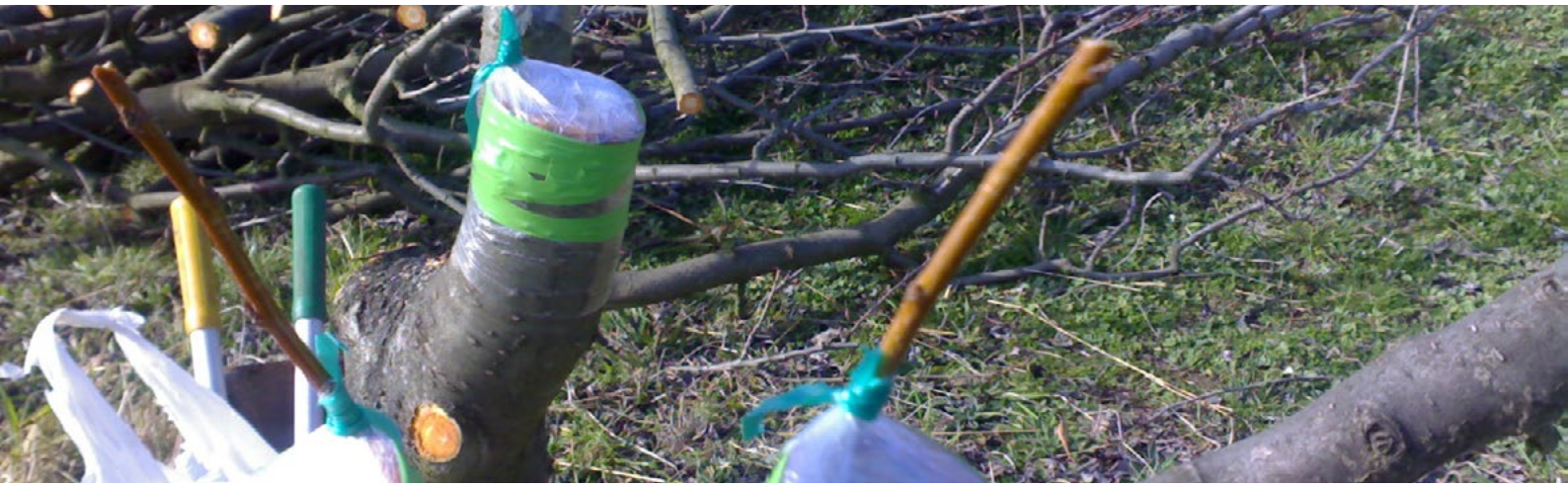
MONTH	JOB	COMMENT
February-March	Budding	As long as bark lifts
March	Collect seed to grow seedlings and store in sand	Best varieties: Granny Smith apple, clingstone peach, Packham pear
April	Start soil preparation for planting young trees	After autumn break, until trees planted in winter
May	Order fruit trees or stocks from nursery	
June	Collect scion wood for grafting	Needs to be dormant (no leaves)
	Take plum and pear cuttings and plant into wet sand	Winter, lateral wood, from known rootstocks
	Plant trees	Until late winter
	Keep seeds and cuttings moist	Until early spring
June-September	Cut back buds grafted in February	Late winter (ideally before spring, but it's better to do them late than not at all, even in spring or summer)
July	Cut back limbs of mature trees to stimulate lateral growth in spring for budding later	
	Transplant rootstocks in garden	
	Set up irrigation for new trees	
	Plant seeds and cuttings in ground	Early spring, cuttings should be swelling
July-September	Grafting (start mid-July, finish by mid-September)	When parent stock is showing early signs of spring movement
October-November	Remove tying and sealing material from grafts	Only remove if graft has securely taken. Remove before it restricts growth of the scion
September-March	Look after buds/grafts – remove competing buds and suckers	
	Choose laterals that are to be budded in February and remove others, especially in mature trees that were cut back in winter	
	Prune back new growth on grafts and buds if necessary to prevent wind damage	

AT A GLANCE...

Growing your own fruit trees is a seasonal process involving lots of patience, and made up of many small jobs at different times of the year. Each month we let you know what they are (and how to do them), but we thought it might also be useful to give you an overview of the year's calendar of grafting jobs.



cut back to the bud now so it can grow



SPRING GRAFTING JOBS

GRAFTING JOBS THIS MONTH

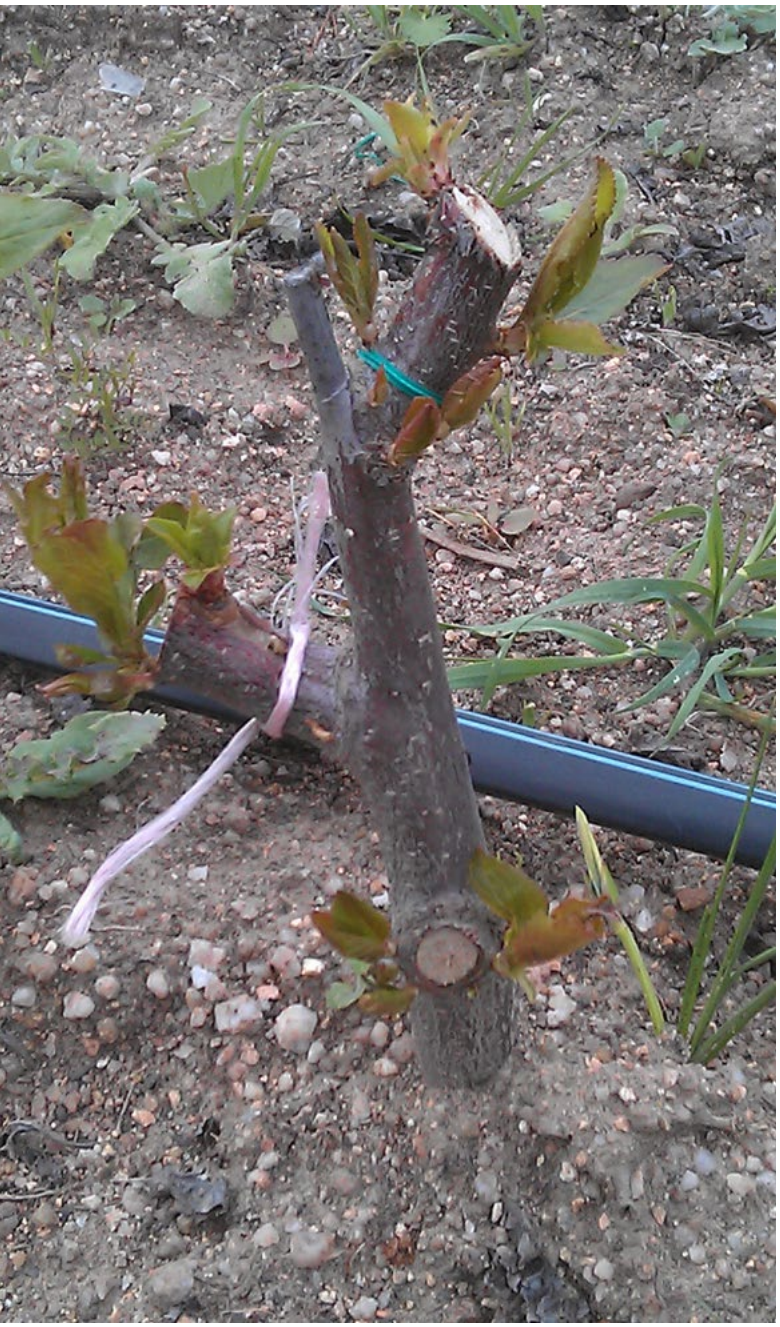
1. If you did any budding (summer grafting) in February, now is the time to make sure you have cut back to the bud so it can grow.

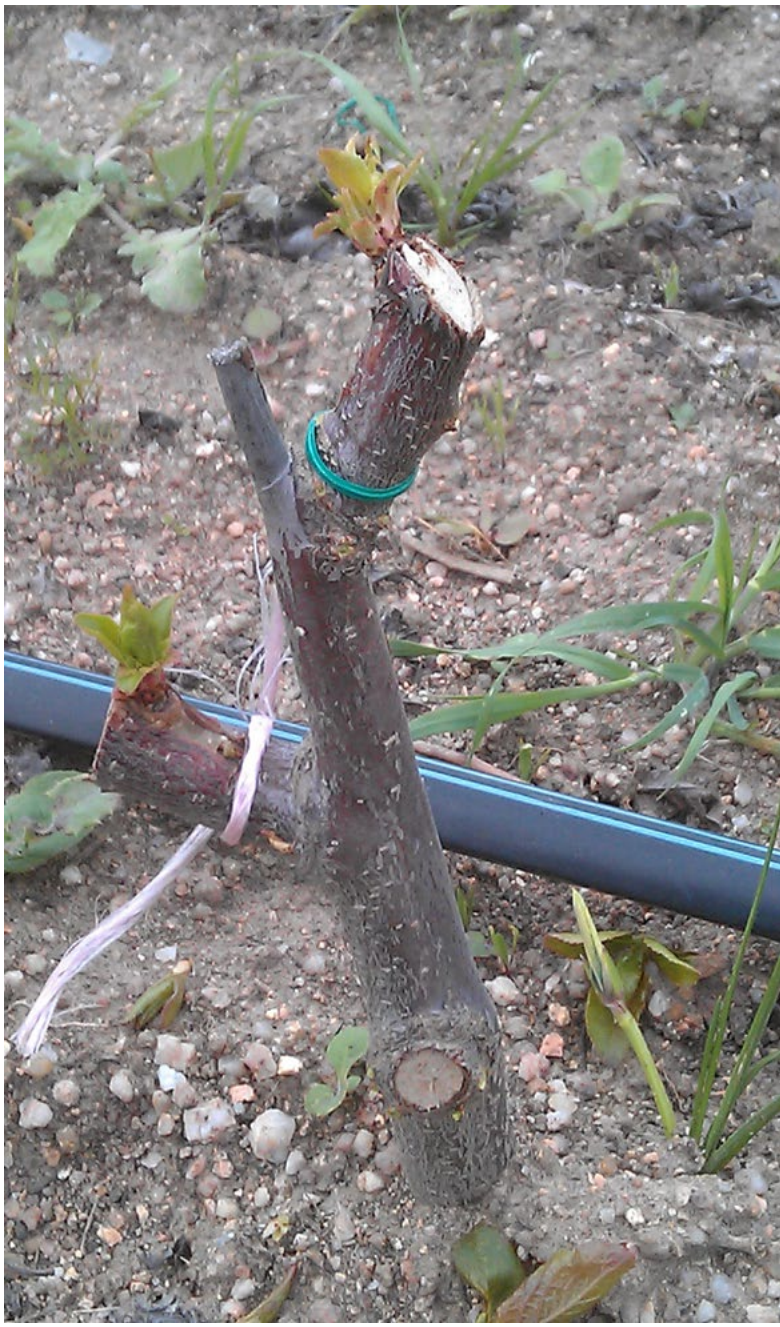
2. Look after buds done last February, and any grafts you've already completed this year by removing competing buds and suckers, to make sure the tree is putting all its energy into the new graft. If other buds (or suckers) are allowed to grow from the rootstock, they will quickly take over the tree and stop the graft growing successfully.

3. If you have scion wood stored (that you collected when it was dormant and put in the fridge), now is the time to start grafting your rootstocks, or grafting new varieties onto existing trees, using any of the grafting methods we've covered in the last few months (but not budding, that's a summer grafting technique we'll be using in February). Grafting can start when the parent tree or stock you will be grafting onto is showing definite signs of growth. For small stock trees in the nursery, this will often be later than for mature trees already established in your garden.

4. If you've already completed some grafts this year:
   a. If they've started to grow vigorously and are bushy, you may need to prune back the new growth as required to prevent it becoming 'top-heavy' and vulnerable to wind damage.
   b. If they've just started growing, don't remove the bandage that was holding the graft in place yet, wait until the union is really strong. There's no need to remove the bandage until there's a risk of it constricting the growth of your tree.

5. If you've planted plum cuttings, or seed from apples, pears or peaches, it's very important to keep them well watered, and to control the weeds around them to give them a good chance of growing.





SPRING NUTRITION...

Spring is the time when we really need to be on the ball, especially with nutrition. We need to make sure the trees have enough of what they need to produce fantastic fruit.

Flowering and fruit set uses the energy and nutrients your trees stored in their buds (and other tissues) in autumn. Once that runs out, we need to make sure they can access nutrient from the soil so they don't starve—having come this far and successfully got fruit on the tree, we want to maximise our crop.

> "If you're planning to mulch your fruit trees, wait until the soil has warmed up, put some microbial source, such as compost, and your irrigation system under the mulch."

ON THE GROUND

COMPOST: As always, compost is one of our main tools. Apply a decent layer (5 cm deep if possible) around all fruit trees, and out to the drip line if you have enough. Well-rotted manure is also good as it gives a bit of a nitrogen kick.

COMPOST TEA: Like compost, compost tea is one of those things that you can't get too much of—apply it to the soil as often as possible, and add a bit of extra liquid fish and seaweed as additional microbe food.

FERTILISER: Adding some organic fertiliser is also a good idea at this time of year. Pelletised chook manure is effective and easy to handle, and can be distributed easily by hand at around one good handful per square metre.

There are various complete organic fertilisers available, and an application of one of these wouldn't hurt either, especially on hungrier and more vigorous crops such as apricots, peaches and nectarines. Apply at the recommended rates given on the bag.

WORM CASTINGS: If you have your own worm farm, or can get your hands on some worm castings, do! They're one of the most valuable things you can be adding to your soil.

WOOD ASH AND ROCK DUST: The nutrients in the soil that are only found and needed in very small quantities (micro-nutrients) are also vital for good all-round tree health. The best way to ensure your soil has all of these is to apply a diverse range of materials. They don't need to be applied every year, but it's important that you do it from time to time. Wood ash is a great source of potassium and calcium (both vital for all fruit but especially apples), and rock dust (crushed basalt, often sold as "crusher dust" in garden centres) is a great source of minerals. Spread a shovelful around the trunk of each tree.

FOLIAR SPRAYS

Foliar sprays are a great way to give your trees an instant boost as the season progresses.

SEAWEED is the best all-round spray as it has a wide variety of trace elements.

AT A GLANCE...

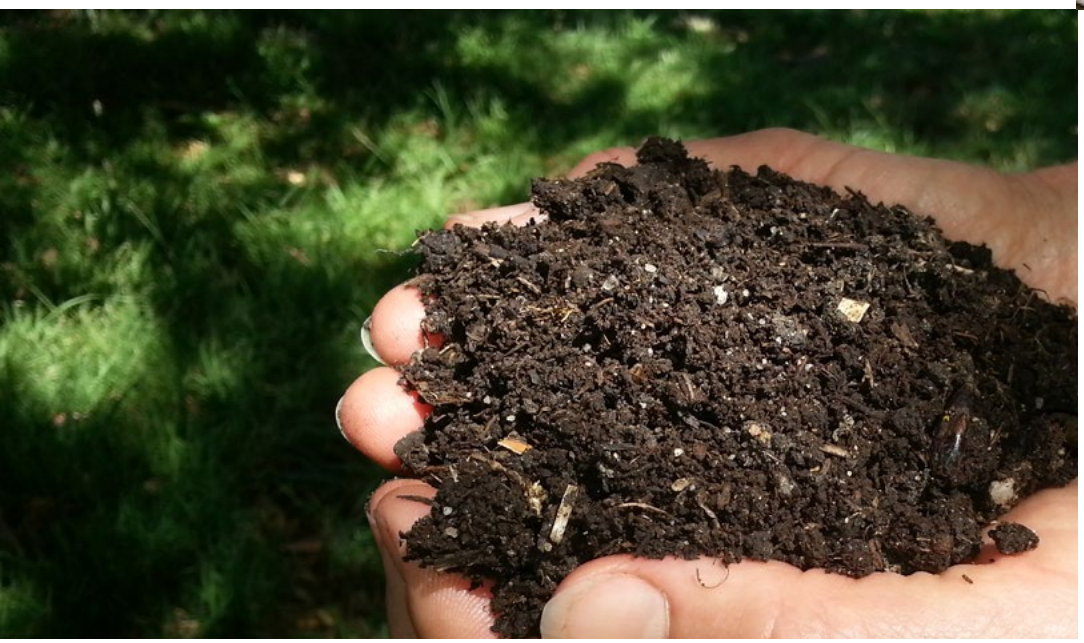
Fruit trees rely on stored nutrients for flowering, initial root growth and fruit set in spring (this nutrition was provided by the microbes in the soil, and any compost or fertiliser you added last autumn).

As they move into spring, the stored nutrient runs out, and as soon as the tree's roots are well established, they'll be looking for more nutrient from the soil.

Your job, at this time of the year, is to wake up and revitalise your soil microbes so they can start doing their important job of feeding your fruit trees, and to make sure there is enough supplementary nutrient in the soil by adding some organic fertiliser and/or compost.

FISH EMULSION is also excellent, although the smell does put some people off. An application of either or both of these once a month through spring and summer will be of great benefit.

knapsack for foliar spray...



Worm castings are a great addition to your soil in spring...

FOUR GOOD REASONS FOR THINNING...

Fruit thinning involves pulling off a proportion of the fruit while it is very small, and is one of the most important jobs in your fruit tree calendar, though it is often sadly neglected by home gardeners. It is routinely used for most deciduous fruits except cherries.

In fact, it's one of the most important crop management tools we have in the toolbox.

A common misconception is that the only reason to thin is to grow large fruit, which many people don't want, preferring smaller or lunch-box size. Left unthinned however, fruit can often be so small as to be impractical and even unpleasant to pick, process or eat. However, while growing larger fruit is one of the advantages of thinning, it is not its primary purpose.

So, what are the main reasons for thinning? There are four important ones.

1. TO PREVENT BIENNIAL BEARING AND IMPROVE FOOD SECURITY

A lot of deciduous fruit trees are naturally biennial bearing, which means a heavy crop one year will be followed by a light crop the next year in an ever-repeating cycle. Breaking this cycle should be the goal of every fruit grower, whether you're growing fruit to make a living (like us), or to feed your family. It costs you just as much time, water and effort to grow your fruit trees whether they have a crop or not, so it's important to maximise the chances of getting a return on your investment.

Trees naturally biennially bear because a heavy crop of fruit will inhibit the development of next year's flower buds. This happens because of competition for nutrients, and by the release of gibberellins (hormones) from seeds. The tendency of trees to bear biennially depends on both the variety and the district.

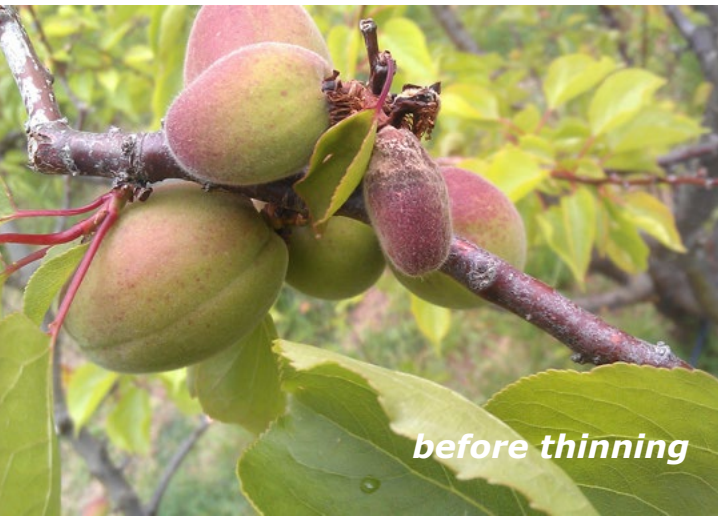
If during the heavy crop year a high percentage of the fruit is removed ***early in the season***, it 'tricks' the tree (hormonally) into reacting as if it had a light crop, and it will respond by producing a lot of blossom and a heavy crop the following year. By thinning every year, it's possible to break the cycle of biennial bearing, and persuade your fruit trees to produce year after year. Growing a medium crop every year is far less stressful for the tree than having to cope with an unmanaged, overly heavy crop every second year.

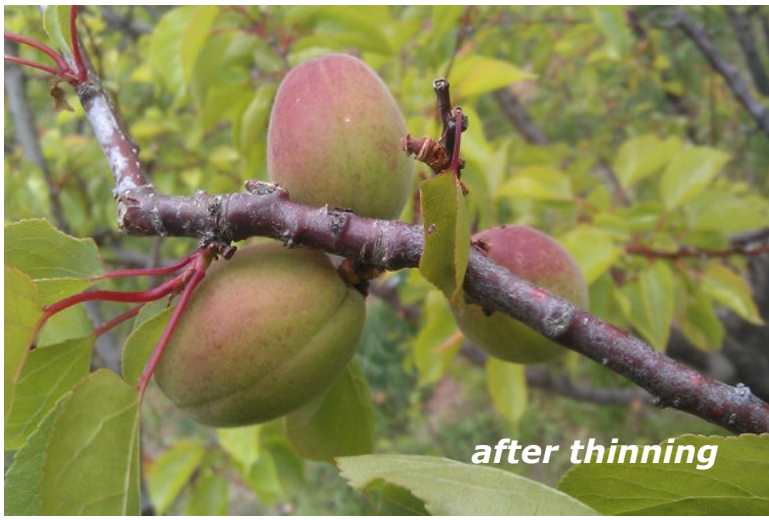
2. TO PROTECT THE STRUCTURE OF YOUR TREE

If a limb or lateral (a small branch on a limb) is allowed to carry too much fruit, it is at great risk of breaking under the weight of the fruit, and then both fruit and limb are lost! This will upset the structure and shape of your tree and reduce its bearing capacity while it recovers.

OTHER FACTORS THAT CAN AFFECT FRUIT SIZE

Other than thinning, fruit size also depends to some extent on the health of flower buds, which was determined during last summer; buds might be poor if the tree was stressed by dry conditions, poor soil, insufficient nutrition or disease. In essence a healthy tree produces healthier buds which produce bigger fruit. However, even healthy trees with excellent buds can produce small fruit if the tree roots are too dry at flowering time, when cell division within the flowers determines the potential size of each piece of fruit. Dry soil at flowering time will lead to reduced cell division, which cannot be made up for later in the season. This is something to particularly look out for in drought years, when there might not be enough soil moisture in spring and trees might need some early watering.





3. Improve fruit size and quality

The third reason is to ensure fruit reaches a reasonable size. There's no need to aim for really big fruit (unless that's what you want); we know through our experience of selling fruit at markets for many years that lots of people actually want smaller fruit, particularly for children. However, it's important to avoid growing fruit that's ***too*** small—you end up growing a higher ratio of core or stone to fruit (which means there's more wastage, and it's a much less satisfying experience, either for eating, cooking, or showing off your fruit-growing prowess!).

4. To improve fruit quality and prevent pest and disease damage

Thinned fruit will not only be larger but also better quality; it's less prone to be misshapen or damaged, and the extra air flow and sunshine around the fruit will reduce the chance of disease. Less crowding will also and increase fruit colour and flavour by harvesting more sunlight.

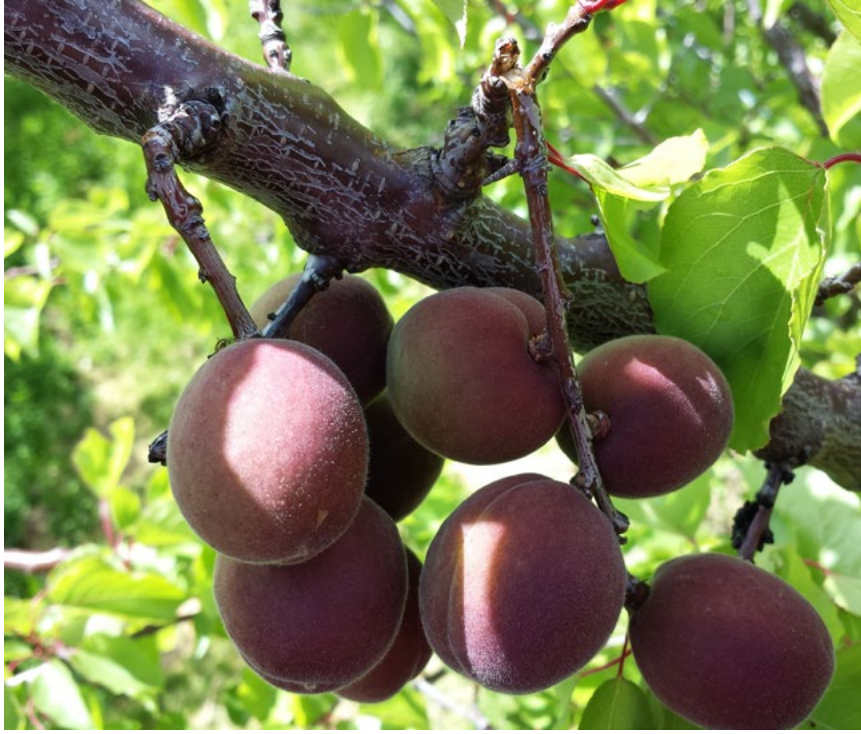
Breaking up bunches of fruit also removes habitat for many pest insects (such as earwigs) by removing those lovely dark hideaways in amongst dense bunches of fruit. It's also a great chance to remove any fruit that has been damaged by apple dimpling bug, early brown rot, freckle, other diseases, limb rub, weather or birds, and it's also a chance to get rid of fruit that is growing in the wrong place, such as a fork in the limb.

Once you understand the reasons for thinning, it becomes obvious why this job must be done every year; if you take a year off, so will the tree the following season.

It must also be said that thinning is not foolproof; the best we can hope for is to influence the myriad of factors that determine how well a tree will crop. Despite your best efforts, occasionally a tree will take a holiday and have a light crop, or no crop at all! This may be due to a range of other factors, including

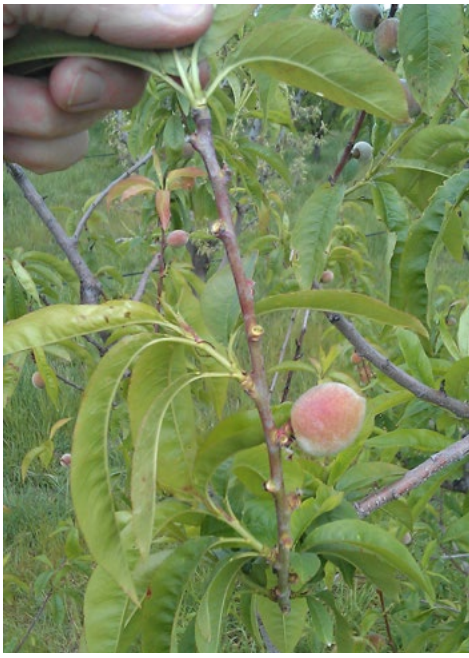
- not thinning early enough;
- pruning too hard the year before, which both removes a lot of fruit buds and prompts the tree to grow a lot of replacement wood;
- something affecting the flowering, such as frost or too much rain (causing blossom blight);
- lack of bees or insufficient sunny days for bees to successfully do their work;
- lack of an appropriate polliniser tree in the vicinity.

Some varieties are particularly prone to light crops, while others produce reliably every year with no thinning at all (this is noted for particular varieties in the Fruit Tree Database). How reliably a tree produces can also be very dependent on your local conditions, for example whether sufficient pollinators are present, local weather conditions and various other factors. At our place in central Victoria, both Ruby Blood plums and Donsworth blood plums have proven to be extremely inconsistent and light croppers for more than 7 years in a row, however we're aware that these varieties crop extremely well in other climates. Some varieties (e.g., Greengage plums) take several years to start cropping regularly, so don't give up too soon.



This sort of damage (above) is easily preventable by thinning at the right time

Before thinning...



After thinning. Yes, only one piece left! But better to have one good piece of fruit than a broken lateral and no fruit at all!

WHAT IS ALLELOPATHY?

AND HOW WILL IT HELP ME GROW FRUIT SUCCESSFULLY?

We love weeds! We've said it before, and we'll say it many more times...because of the positive benefits they give to your fruit trees (and the rest of the garden) by providing habitat for soil microbes, a food source for worms and microbes, keeping the ground protected and cool from the sun, making vital nutrients available for your fruit trees, and storing carbon in the soil...among other things!

However, these benefits have to be weighed against the negatives of competition from weeds for water, sunlight and nutrients. For some weeds there is also the extra impact of allelopathy to consider.

Allelopathy is defined as "the effect of one plant on another through the release of a chemical compound into the environment" – it's basically chemical warfare between plants! Plants will often produce herbicides, which suppress the growth of other plants nearby. More than 240 weed species have been found to be allelopathic either to nearby plants of the same species (autotoxicity), or to other crop or weed species.

Allelopathy can also have a good effect though; some plants produce chemicals that actually promote the growth of other species (this is thought to be one of the reasons why companion planting works). A good example is *Leucaena leucocephala*, the 'miracle tree' (called *subabool* in India). Not only is this tree useful for revegetation, soil and water conservation, livestock nutrition, biomass production and human food, but it also increases the yield of rice growing nearby (positive allelopathy). It contains a toxic compound that inhibits the growth of other trees but not its own seedlings, and will reduce the yield of wheat grown nearby (negative allelopathy). Unfortunately it's also incredibly invasive, and has become a real pest in many parts of the world.

HOW DOES ALLELOPATHY WORK?

Allelopathy is a very old concept, but a new science, and not a lot of research has yet been done on specific plants that may have an allelopathic growth retardant effect on fruit trees.

The compounds can be released into the environment by leaching, as exudates from the roots, as the plant decomposes or the leaves can release them as a gas.

The allelopathic chemicals can help defend the plant by reducing seed germination or reducing seedling growth of other plants growing nearby. Or, they might prevent nutrient uptake, inhibit cell division or even stop the plant being eaten by animals!

It's hard to isolate the allelopathic effect of weeds because it's always complicated by the competition effect, as has been proven in dozens of studies. Several allelopathic compounds also suppress pathogen and nematode pressure.

WHICH PLANTS ARE ALLELOPATHIC?

PLANT	ALLELOPATHIC EFFECT
Rye grass	The residue can reduce the emergence of weeds such as green foxtail, red-root pigweed, ragweed and purslane.
Oats	Residue can reduce germination in several different weed species.
Barley	Can make a good "cleaning crop" to get rid of weeds because it forms a dense canopy, is a vigorous competitor, has good germinating ability, has good seedling vigour and releases at least two allelopathic chemicals that inhibit the germination and establishment of nearby seedlings. Barley straw has the same effect as it's breaking down, so it makes a great mulch.
Hairy vetch	Legume that makes an excellent cover crop under fruit trees
Eucalyptus	Inhibits growth of many shrubs, herbs and grasses
Black walnut	Can severely reduce growth of apple trees
Oaks	Herbs, grasses
Tall fescue	Fruit trees

FRUIT TREE	'BAD' COMPANIONS	'GOOD' COMPANIONS
Apples	Potatoes	Chives, horsetail, foxgloves, wallflowers, nasturtiums, garlic, onions
Apricots	Tomatoes, sage	Basil, tansy, southernwood
Cherries	Potatoes	
Peaches		Garlic, tansy, basil, southernwood
All fruit trees		Horseradish, chickweed (said to increase the yield of fruit)

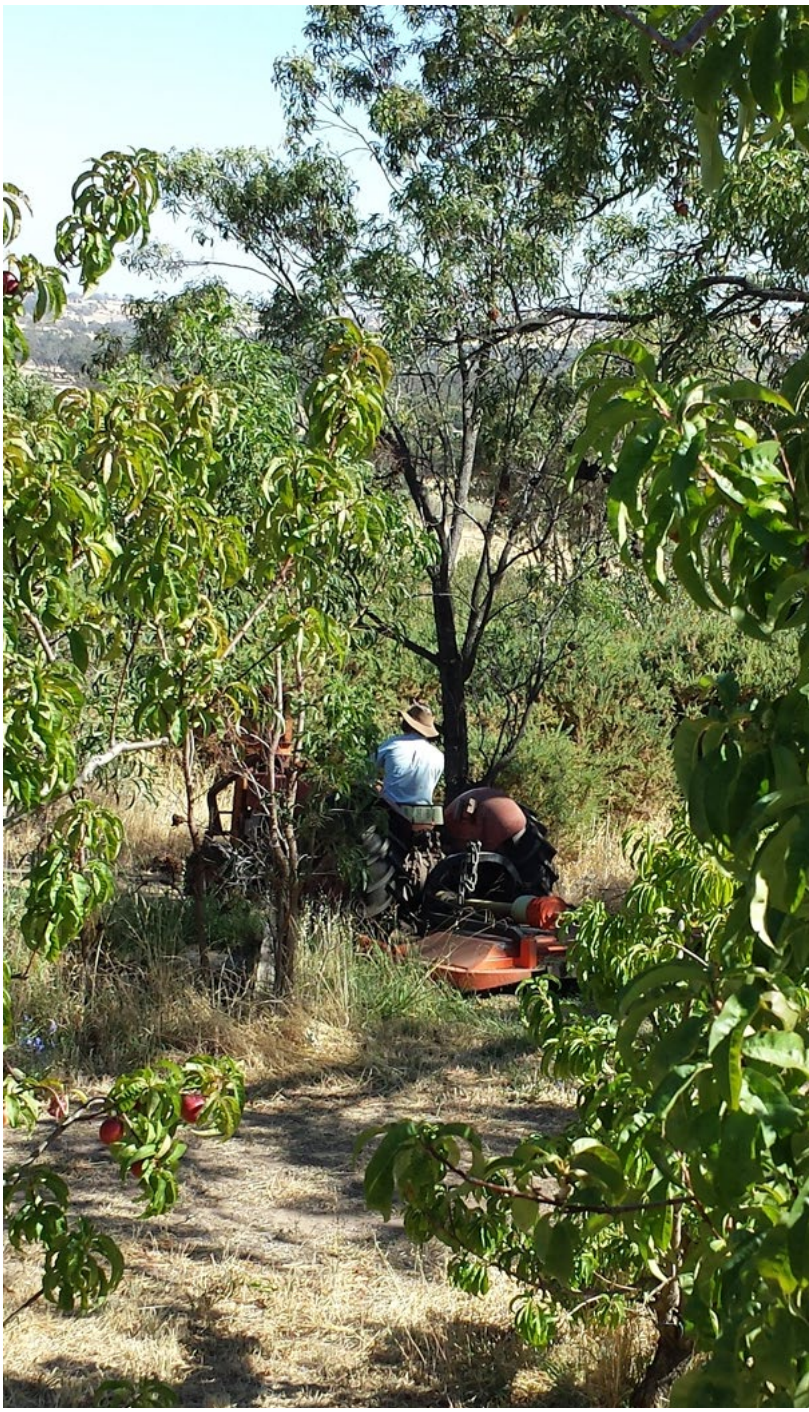
Other plants that are known to have an allelopathic effect on other selected species are: alfalfa, asparagus, barley, bean, beetroot, broccoli, cabbage, clover, corn, cucumber, oat, pea, potato, canola, rice, soybean, sunflower, tomato, wheat, cocklebur, common lambsquarters, field bindweed, foxtail, jimsonweed, kochia, pigweed (purslane), couch grass, ragweed, smartweed (knotweed), velvetleaf, wild mustard, wild oat, and yellow nutsedge.

We can also draw on companion planting folklore to make a few more assumptions about some allelopathic relationships that may exist, but haven't been proven yet. (We can't back these ones up with science, but it's fun to share!)

SO WHAT DOES IT ALL MEAN?

Allelopathy can be used to our advantage when growing fruit trees by:

- Choosing plants (from the list above) as a living mulch that are allelopathic to other less-favoured 'weeds'. Hairy vetch (Vicia villosa) has been shown to be one of the most useful species for weed control around fruit trees –it produces nitrogen that the fruit trees can use, at the same time as inhibiting other, more competitive weeds.
- Using an allelopathic winter cover crop that suppresses weeds before planting your preferred crop. It will come as no surprise that many of the plants recommended for use in green manure crops have allelopathic properties.
- When using mulches, use a mulch with an allelopathic effect (e.g., wheat, rye, barley or oat straw, or eucalyptus wood chips) for an extra antiweed kick!



Fruit trees planted near eucalypts and other large native trees are always going to struggle

ABOUT US

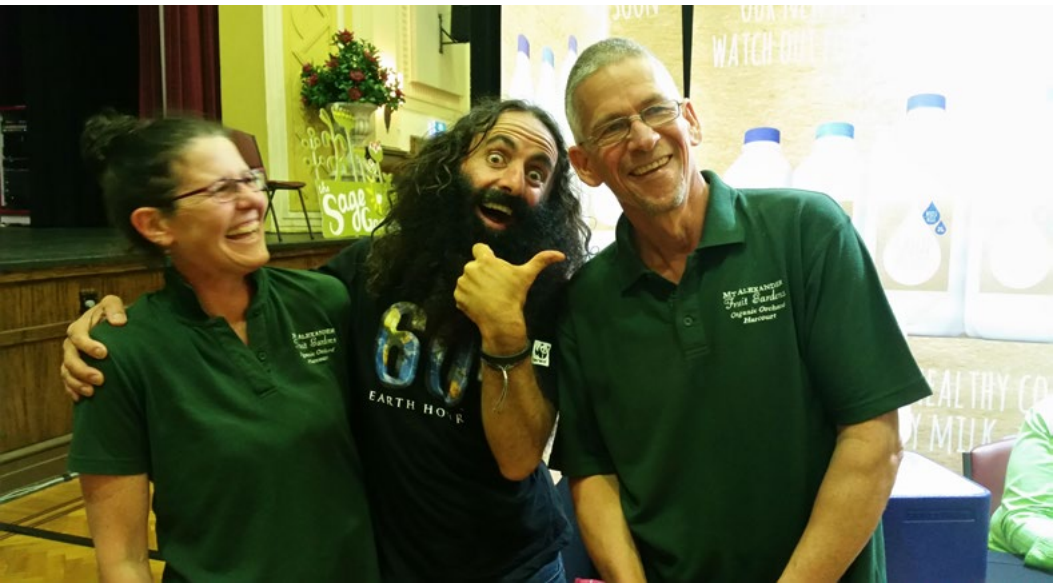
We—Katie and Hugh Finlay—run Grow Great Fruit from our farm in central Victoria, Australia. Teaching organic fruit growing was a natural progression from growing fruit commercially for years, and being asked thousands of fruit tree questions as we were selling fruit at markets.

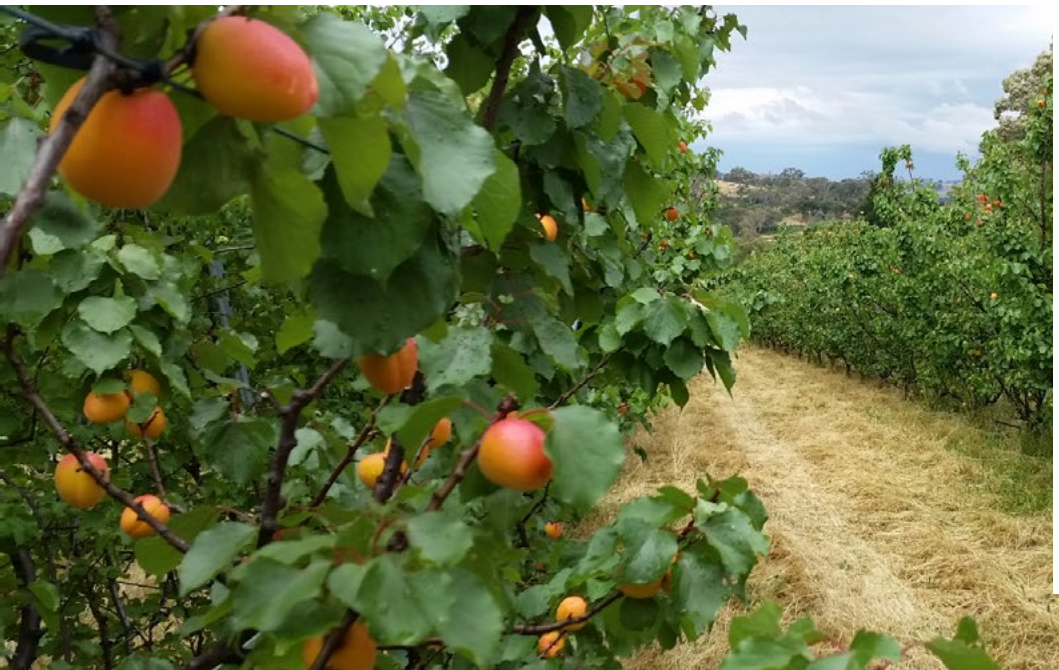
We've always used organic, biological and regenerative farming methods, relying on building healthy soil to grow healthy trees and fruit—so that's what we teach. The trees get their nutrients from a diversity of microbes in the soil and plant tissues and from their relationships with other plants, rather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