

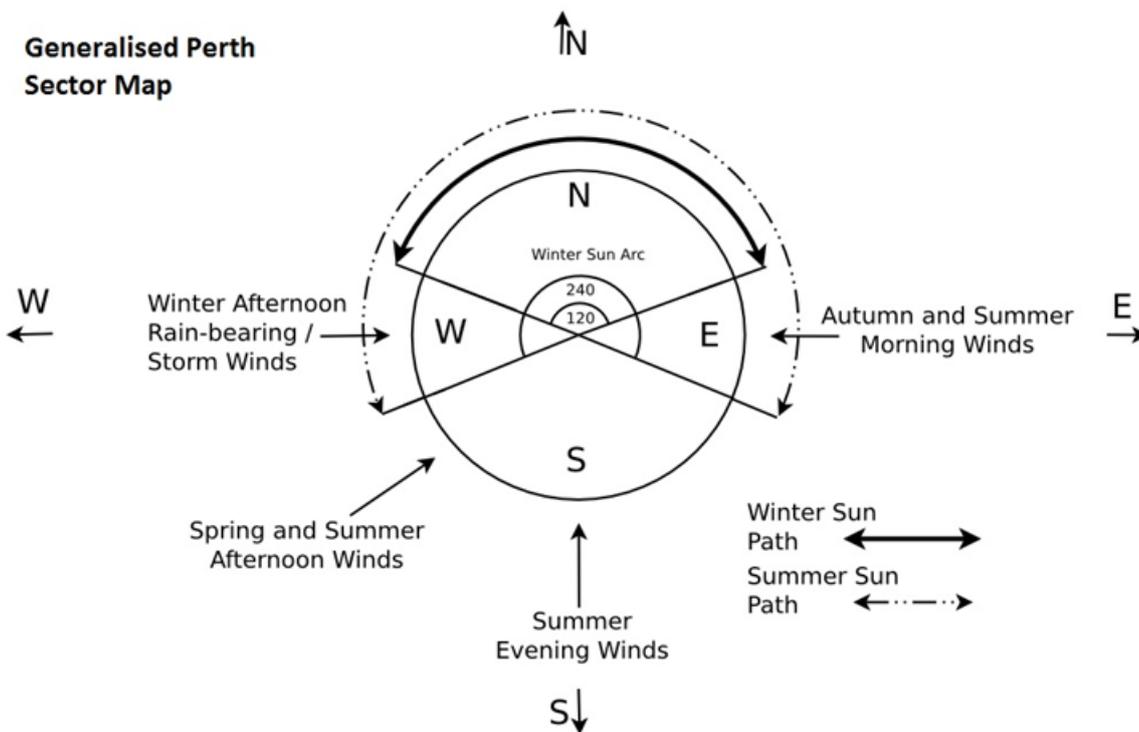
# Healthy Garden Haven Workshops - Joondanna CG

**Eat the Heat - Growing more food in summer - by Terra Perma**

**Sun - should be the solution not the problem.**

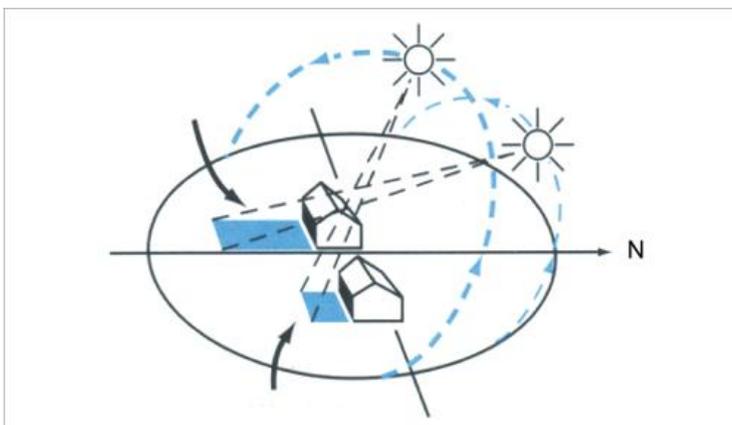
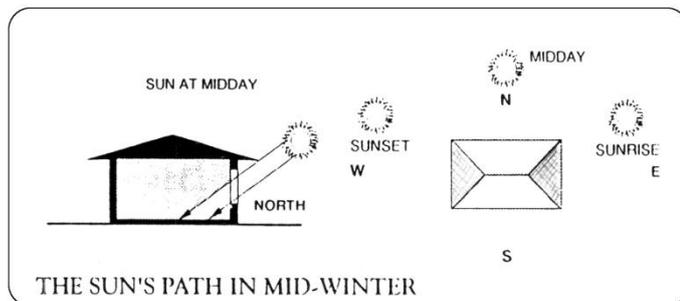
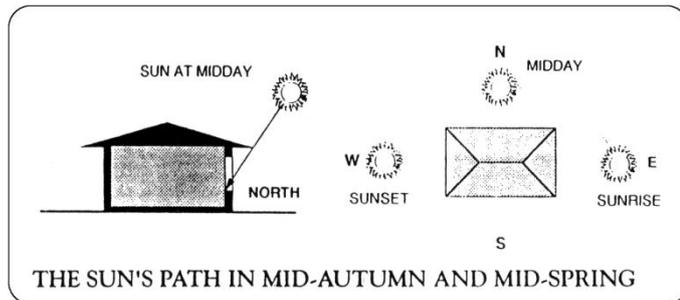
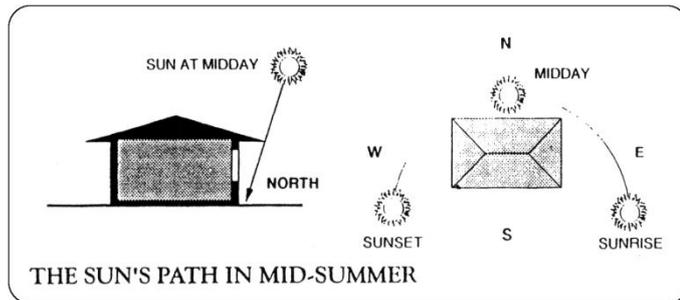
If we equate sunlight to fuel/energy the more we have, the more potential to do stuff. Understanding the sun's seasonal effects and movement and how to best convert sunlight into things we want allows productive rather than destructive summers.

Map the daily change in Summer of sunny and shady areas. Sun is both the energy source of life and the destroyer. You could also consider winds. Rules of Thumb are:



- Morning summer sun (good for plants) 7-10 am and then dappled shade.
- Morning summer shade (ok for plants)
- Midday summer sun (bad for plants) after 10am the sun is too intense for most veggies.
- Midday summer shade (good for plants) natural shade is better than shade cloths
- Afternoon summer sun (bad for plants) already stressed plants dont need the long afternoons sunlight.
- Afternoon summer shade (good for plants)

## The Sun's Yearly Path



Sun movement from high angle in summer to low angle in winter.

Summer Azimuth approx 80 degrees (over head sunlight)

Winter Azimuth approx 30 degrees (a low angle sunlight from the north)

## Shade - Creating and using shade.

Key Point - Shade is great, man-made shade things degrade over time, nature made shade things grow over time. It is very easy to prune/ chop down a tree, but it takes a long time for one to grow.

Plants create the best shade, soil temperature under tree shade can be 10°C cooler and air temperature reduced by a few degrees (depending on how much area is under shade/foliage).

The larger the tree the less competitive the shade (tree) with smaller plants and veggies. It is attractive to use fruit trees as shade but they could do with shade (or sharing the intense sun themselves) and often need to be kept smaller for netting and harvesting.

That is trees evaporate water out of their leaves thus cooling that way, via shade and via reflecting most thermal infrared. The larger the tree the deeper the roots, the less of your veggie bed water they are reliant on.

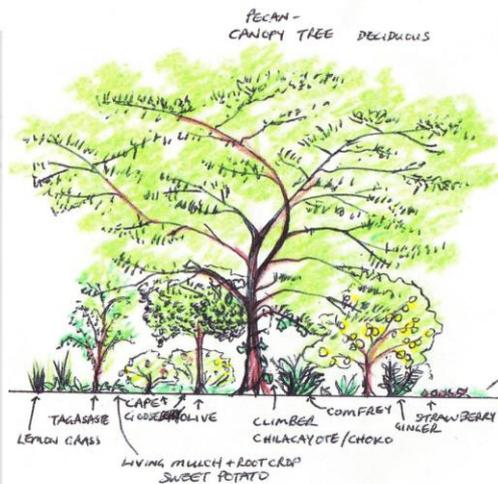
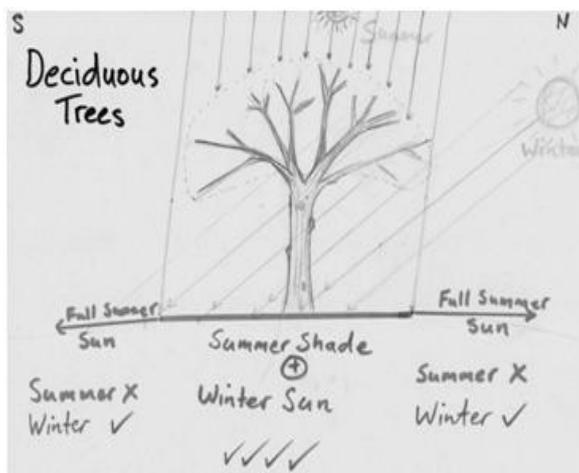
Shade cloths can only create shade, and absorb and radiant heat, degrade in UV and look ugly.

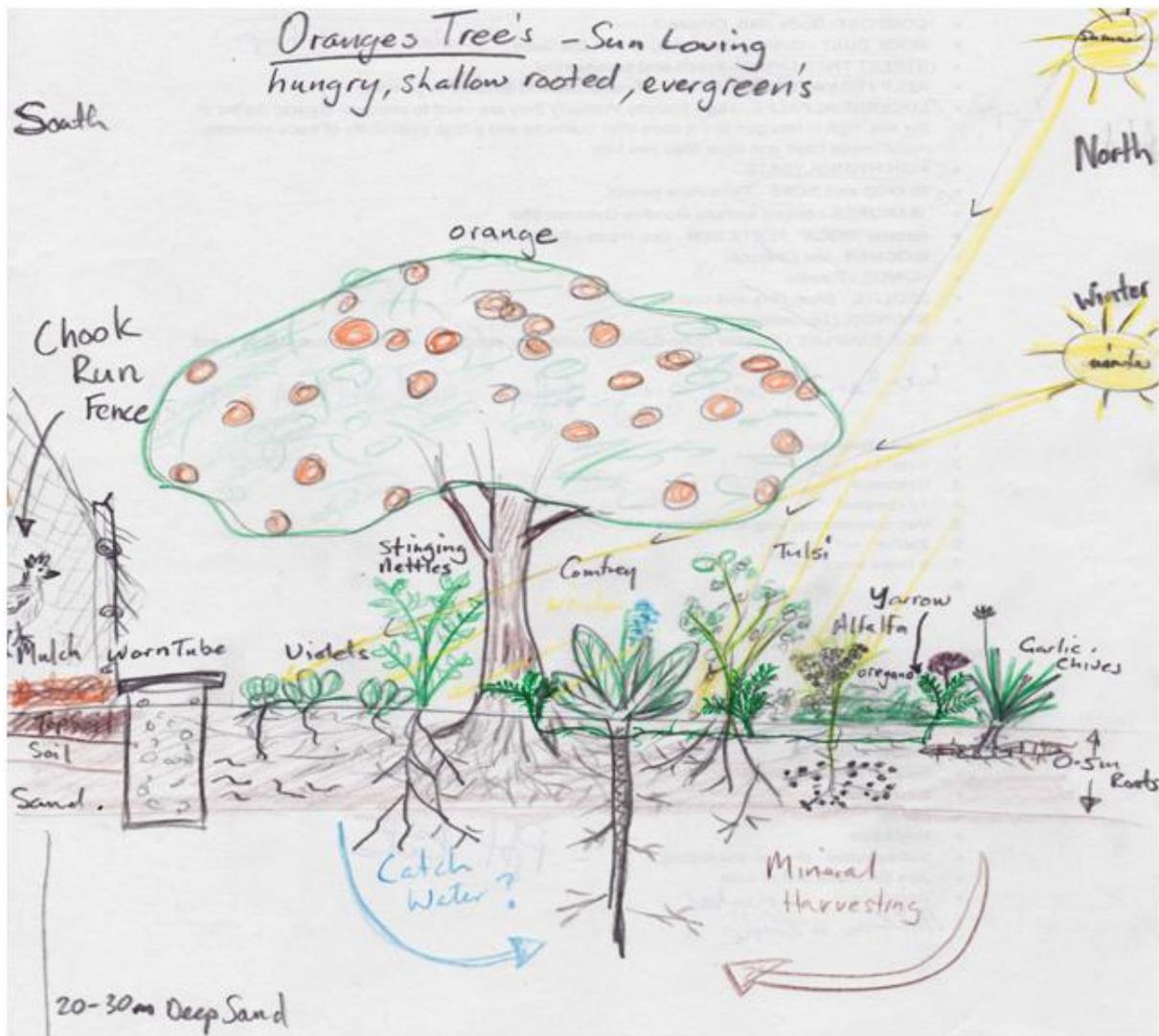
Tree shade is not always possible, but should be the aim when there is too much sunlight in an area. Sharing the sun with multiple different types of plants is a win win situation.

Evergreen Trees keep their leaves in winter. Deciduous loose there leaves in Winter.

Therefore we get a different effect where the shade would have been if they the leaves stayed on. Canopy lift ever green so the winter sun shines under the tree.

Deciduous trees are a common choice for improving living spaces for people and veggie gardens, but not all lose their leaves in Perth mild winters and if all our plants hibernate in winter when it is raining (free water) our gardens cannot prepare themselves for summer dry.





### Shade cloth

The colour of shade cloth does not matter other than aesthetically for the owner. Most nurseries use white. Shade cloth should go up in summer (once consecutive days over 35 start), and come down when they stop, this will extend the life of your shade cloth and reduce the chance of storm damage.

The more unnatural your spaces (narrow paths beside a house and fence) the more unnatural the solutions need to be. This is a good spot for a narrow strip of shade cloth over summer.

## **Mulch - What types of mulch for what job.**

Key point: Mulch for summer water saving and mulch for soil feeding - are two quite separate things. Everyone should mulch their soil for many good reasons.

If trees get all the minerals they need and grow then it's obvious that the best mulch for them is their own pruning's. Practice chop and drop mulching a few times a year to keep tree shape.

Mulch is great for:

- Retaining moisture at the soil/mulch interface for a longer period of time, preventing 'crusting' of the soil surface and providing a rich environment for worm and microbe activity which, in turn, aids the fertility of the soil, creates a neutral pH zone and supplies nutrients to the soil for plants to use.
- Regulating soil temperature and protecting the root system from the extremes of summer and winter.
- Increasing the water penetrability of the soil.
- Controlling soil erosion by reducing water run-off.
- Controlling competing and unwanted self-seeding species.

Mulch, for the purpose of **water saving**, needs to be made up of large irregular shapes that do not hold water. This is to prevent the mulch both forming a waterproof layer (think grass clippings rotting into a lump) nor the capillary action/wicking of the soil moisture back through the mulch to the sun and wind.

Leaf, bark and wood chips - Mulch for **Water saving and slow release soil building and fungi food**.

Deep mulch, otherwise it will dry out, wash away, allow weed seeds to germinate and be otherwise ineffective. 5 cm deep would be the minimum, but a free or cheap source should be 10-15cm thick.

As the tree clippings are a mix of leaves, bark and woodchips, you can see that the leaves and bark decompose rapidly and sink through the harder cellulose woodchips, leaving a hardy water retentive irregularly mulch. The action of nitrogen draw down is not as much of an issue - the food supply is aimed at fungus rather than bacteria and the slowly released low amounts of nitrogen in the leaves and bark is enough to feed the fungus as it very slowly breaks down the hard woodchips at the soil/mulch interface. The beauty of this is it slowly builds to soil and soil biology while you concentrate your efforts on other higher input/output growing zones or other life priorities and, when you come back to it a few years later, you can have beautiful soil to evolve into more yielding systems.

You can also mulch Veggies and annual plants for summer evaporation reduction with tree pruning's but it doesn't feed the bacteria or other soil biology much. I recommend using a feeding mulch underneath at the same time.

Crop Straw, Lucerne, Lupin, pea mulch or course aged (low nitrogen/phosphate) animal manure makes great **soil feeding** 'slow release' fertiliser and gradual supply of organic material to your soil. This is similar to digging in compost each time except the soil structure stays intact and nutrients are released and used as required rather than wasted all at once.

## **Clay - Water and nutrient holding plus organic matter**

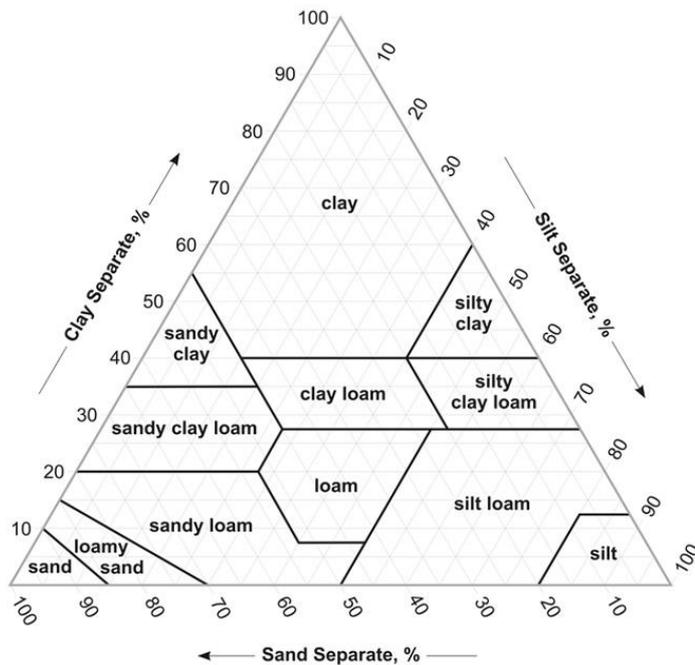
Most of us in Perth coastal plain have 100% sand soil.

The physical properties (size and number of each size) are the primary means of classifying different soils – (Source: Elements of the Nature and Properties of Soils, Brady, N.C. and Weil, R.R., 2004)

Clay – <0.002mm - Silt – 0.002 to 0.05mm - Sand – 0.05mm to 2mm - rock fragments – >2mm

The proportion of each size range (in volume %) dictates the way we describe the overall soil in terms of the **Soil Texture and its usefulness.**

Realistically the best we can achieve is a "loamy sand" and mix in enough organic matter to feed the soil food web unless we used containeries garden beds or all imported soil . Compost can be used achieve this instantly for productive garden soils, and decomposing organic mulch achieves a slow release both are needed.



Source:

[http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/kthru6/?cid=nrcs142p2\\_054311](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/kthru6/?cid=nrcs142p2_054311))

10% clay is lot of clay to buy but it moves sand to loamy sand. Calcium Bentonite clay holds 6 times it weight in water, so 1 tonne of clay will hold 6 kL of water in your soil

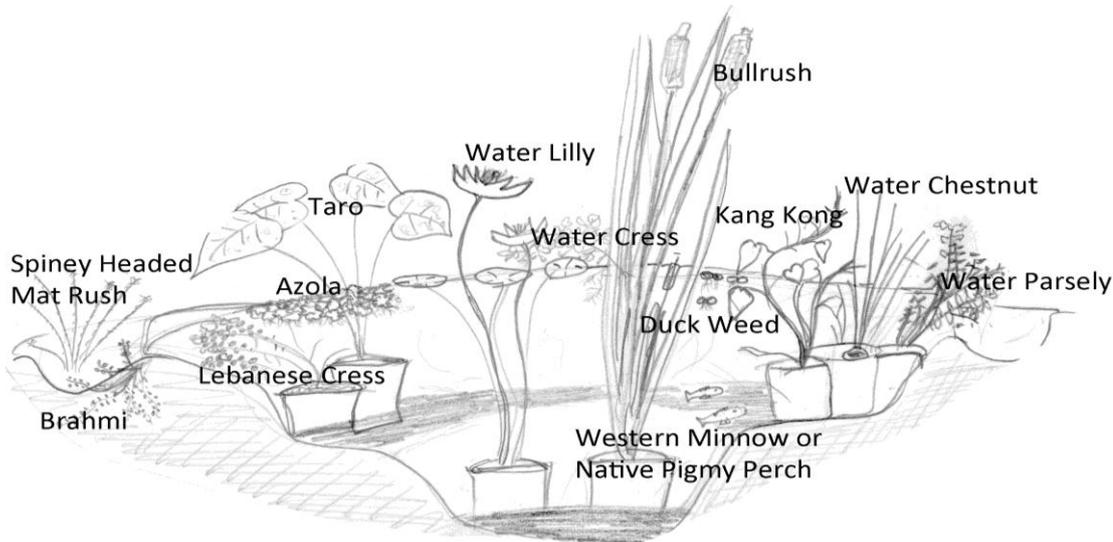
Compost and humus (soil carbon) can hold 30 times it weight (but it is light) so offers about the same water holding. However organic matter will always be used up to feed the soil food web were as clay is a 'inert' long term water holder.

If starting with 100% Sand try the following. Rotary hoe mix in: 5% clay 5% compost and some rock minerals. Mulch heavily and continue to feed the soil compost, worm castings and fertilisers as you crop. With at least 5% clay your soil fertility can start to increase instead of leaching out each year.

## Edible Garden Ponds

A pond or water garden is essential in any ecologically productive garden. It relaxes us, feeds us, and provides a habitat and drink for many insects and creatures. A water garden is a diverse aquatic ecosystem, one of nature's most productive and efficient systems - far more productive than any land based system. This is because the aquatic plants have a constant supply of water that has nutrients dissolved in it.

This makes ponds an ideal place to be growing summer greens. Some of the edible pond plants that thrive in the summer heat are listed below.



While a pump is not required fish are to control mozzie breeding. Small natives like Western Minnow and Pigmy Perch are recommended to stop them eating frog spawn but goldfish and other hardier warm water low oxygen fish cohabit fine as long as there is enough vegetation to frog spawn.

The trick to creating a stable aquatic ecosystem is the various types of plants in it, each of which plays a specific role to support and sustain aquatic life. Most people go wrong by not adding enough plants and end up fighting algae.

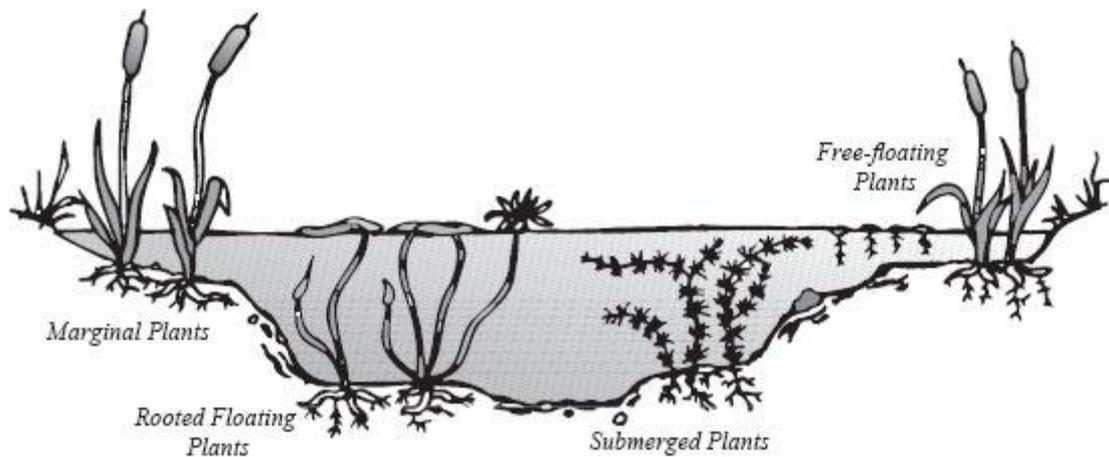
We need:

1. 'Rooted' floating plants, such as water lilies, Nadoo, Lotus
2. Marginal plants (Bullrush, Spiney Headed Rush, Pickerel Rush, Vietnamese Mint, Water Chestnut, Gotakola and Brahmi)
3. Submerged (oxygenating) plants (Millfoil, Water Primrose)
4. Floating plants (Duckweed, Azolla, watercress)

**Rooted Floating Plants** are sun-loving plants and can survive with 10-20cm or more of water above the plant's crown. They produce floating leaves that shade the water, which reduces the growth of algae. They also provide shade and a hiding place for fish.

**Marginal Plants** grow in the shallow margins around the edge of a pond, and they can survive with up to 10cm of water over the plant crown. These plants do best in still to slow moving water. These plants can serve several functions. Adding height and shape to the water garden, as well helping to blend in the edges of a pond into the surrounding ground. They provide more practical functions, such as shelter from the wind, and shade. They also serve as a barrier around the water's edge, providing protection to fish and frogs from predators.

**Submerged plants** also called Oxygenators, grow with their roots anchored in soil, but the leaves stay underwater. Oxygenators are essential for keeping the pond healthy and the water clear. Milfoil is the most common option in WA. These plants absorb carbon dioxide and release oxygen into the water, and by oxygenating the water they help it support more aquatic life such as fish and beneficial aquatic insects.



Floating Plants do not need soil, or anchorage and they grow by extracting nutrients from the water. They control algae in two ways, by shading the surface of the water restricting the light that algae needs to grow, and by remove excess nutrients from the water. Duckweed is a protein rich food source for fish, goldfish consume it greedily! Azola is a tiny fern which supports nitrogen-fixing bacteria just like legumes do, so it captures its own nitrogen from the air. This makes it a great nitrogen source. Together these categories of plants create a balanced ecosystem, similar to the *stacking* of the seven defined vertical layers of a forest garden; an aquatic ecosystem has these four layers.

For 1m<sup>2</sup> of pond surface area you should aim for:

- one Rooted Floating Plant,
- **three** Oxygenating Plants and
- two Marginal Plants.

For coverage of the water's surface to both avoid algal growth but allow oxygenation of the water **half** of the water's surface should be covered with rooted (1) and free (4) floating plants. However, if plants like azolla are cropped continuously for mulch and hence the coverage fluctuates above and below half, then this stipulation can be over looked

An excellent local source of plants and information is Swan Valley Fish and Lilly.  
[http://www.fishandlily.com.au/water\\_plants/](http://www.fishandlily.com.au/water_plants/)

## Summer plants

Sweet potato, yes I know I rant about it at every workshop, but it is our best summer food crop. While primarily a tuber crop, the leaves and plant tips are edible, numerous, virtually pest free, and grow all year round, especially in hot summer when most other fresh produce is suffering the heat. It has a mild coconut flavour to me and is great in Asian stirfries, soups or just cooked as a spinach substitute.

We cannot control the weather other than in small microclimates so we must choose plants and design our understory foods well enough to deal with rain and 10oC in winter, humid mildew shoulder seasons, and sun and 40oC in summer.

A bowl of 'garden salad' will normally contain at least 10 varieties of green leaves alone, then add flowers, vegetables / fruits, and you can see why you only need 2-3 leaves of each plant species to be making a big salad.

Kale is a staple, better in winter and shoulder seasons but in good soil it is perennial and while suffering the heat of summer will come back with better flavour as cooler weather returns.

English/French dandelions (not the wild yellow flowered 'dandelions' in most lawns they are cross bred with less palatable Cats Ear and other species), Chicory, Sow Thistle, provide year round staple supply of nutritious greens. Loose leaved plants they allow plucking of 2-3 new leaves per plant each week without any loss of vigour. There is more goodness in a single (sometimes bitter) dandelion leaf than an entire Iceberg Lettuce (except for vitamin A - which is high in Iceberg but that's all it has). These plants are all mildly bitter so are a good minor addition, lots of mineral so we only need smaller amounts. One leaf of each per person in the salad is ample, if you don't like the taste view these as preventative medicine (no medicine tastes good), wrap the leaves around a chip like my kids do or eat with meat, and you won't even taste it.

As with the above three, purslane, chickweed, fat hen, rocket, parsley, and mallow are self perpetuating or self seeding often weedy species. This makes them perfect for the open plan nature of an understory perpetual food supply system. The plants never become weedy as you are eating them every other day and they are naturally suited (hence becoming weeds) so need far less effort to maintain. The added bonus is that they have more nutrients than conventional veggies like broccoli, and lettuce.

Leeks, chives, garlic chives, shallots, etc can make a nice minor addition to salads, a bit like a salad onion but without having to wait the 3-4 months to grow the salad onion bulb. The point here is that you can get most of your garlic and onion flavours from the leafage rather than battling with growing times, season limits, and challenges of plumping up onions/shallots/garlic, but we can discuss this more in cooked greens.

A good source of hardy summer greens in Malabar (Ceylon) Spinach, a climbing succulent plant. Like the mallows it has mucilaginous leaves which people either like or dislike. But if you don't enjoy it in salads it makes a fine Quiche Spinach replacement.

Perennial beans (7 year beans) specifically Lab Labs provide edible flowers, leaf tips and young pods. Lab Labs needs some space/trellis to climb. I have one growing up a deciduous Maple Box Alder tree, the added bonus is it is a nitrogen fixer, so is highly recommended. The Choko vine, slipper gourd and perennial zucchini Chilacayote also provide edible leaves, flowers, and even roots, as well as their main vegetable / fruit. These plants are easy growing once established, but all perennials take the first year to establish a large strong root system, so don't expect a huge harvest or thriving vine in the year of planting.

The hardy summer loving Moringa (Drumstick Tree) provides high nutrition peppery leaves highly regarded and widely used in India and Kutuk an asian sup-tropical are 'tree' greens. Establishing the tree (seedling stage) can be challenging, but, once you have a tree, it can be pruned for edible salad greens all summer for many years.

Other less know but highly recommended raw greens are: Salad Burnet, Strilloto (Scullpit), Shinjuku (Chrysanthemum), scorzoni. All are hardy in Perth and provide green in summer when tradition leafy greens may be suffering.

In summary, for the most hardy edible understory (wild garden) start with the following, Fat hen, Kale, Dandelions, Chicory, Garlic Chives, Parsley. These will grow on our poor sandy soils even before you improve the soil or create specific garden beds. All produce seed prolifically so can become weedy if you don't 'eat your weeds', but these are hardy easy food-supplying Perth Permie Plants.

Weeds like Sow Thistle, Dandelion, Spiky Lettuce may arrive themselves, many weeds are edible and even nutritious, familiarise yourself with the edible weeds articles on the Terra Perma website to take advantage and even cultivate (cultivated weeds taste better!), and avoid or remove inedible and very occasional poisonous weeds.

Summer sub-tropical's like winged bean, New Guinea bean, Armenian Cucumber, Tomobonchino, Wax Gourd/Winter Mellon. All are worth planting early summer, provide a tree or substantial climbing frame and stand back.

There are hundreds of fruiting vegetables other than those mentioned, this is a small selection of those hardy enough to take some neglect and lesser known but very appropriate in a Perth sustainable/ecological thoughtful garden situation. Start with those above skill up, make your observations, improve your soil and learning and then hit the plant catalogues at Diggers, Yilgarn, Green Harvest, Italian Gardener, Seed Savers networks and diversify or even get a bit extravagant with your mainstream shop favourites.

Grouping plants and Reticulation - We will cover in detail in a workshop later as we retrofit the CG.

Q and A time ?

For a digital copy of these notes more information on Sustainable Living Gardening and Permaculture.

[www.terraperma.com.au](http://www.terraperma.com.au)

and

[www.permaculturewest.org.au](http://www.permaculturewest.org.au)



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