

Growing Your Own Food at Home in Salisbury Series

Pack G 1 WATER SENSITIVE GARDENING

Adelaide's climate is described as Mediterranean; our summers are long hot and dry with low humidity and winters short and wet. Our summer temperatures average approximately 30°C. With longer daylight hours and high temperatures plants often suffer from heat stress or sun burn in the long hot afternoons. Winds, especially those hot dry ones from the northwest may also damage plants. These combined factors contribute to plants not growing well and gardens looking tired.

Planning future gardens, or remodeling existing ones, to cope with the summer weather extremes, and managing soils, shade and water use can produce a garden that thrives in summer and be a joy to be in at the very time of year that brings us outdoors more often.



Contributing factors to plant stress

Sun

The western afternoon can be very intense during summer months, with the morning eastern sun less intense. The amount of summer shade is less at this time of year. Plants can be burnt by intense sun exposure, and the heat increases water requirements.

Wind

Adelaide is characterized by afternoons winds predominately from the south west during spring, summer and autumn. In summer it is common for strong, hot, northerly and north-westerly winds to arise which increase the temperature and evaporation. Winds at other times generally fluctuate.



The south westerly winds are cooler whilst winds from the north are hot and drying.

Winds in general increase evaporation rate and therefore plants water use. Winds 'batter' plants damaging leaves, pulling their roots from the soil, cause them to direct resources to repairing themselves and changing their growth and fruit development.

Water loss

Rainfall varies significantly across the Salisbury area with an average annual precipitation of 460.50mm, some areas of the upper alluvial plain will receive as much as 550 mm, while areas along the coast will receive much less. The coast to Main North Road receives approximately 450mm annual rainfall. Yearly variances can be as much as 100mm.

Through the year there are long periods where evaporation is greater than rainfall and only short periods – June and July, where the moisture is retained in the soil and it is 'recharged'. This is assuming a normal year. Measures to provide water to plants may be need to be taken for 10 months of the year.

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Ways to prevent water loss include:

Shade and wind

Water loss through evaporation due to higher temperatures and hot dry, northwesterly winds is higher during summer than normal. Radiant heat from concrete paths, walls and buildings can also contribute to evaporation. Buildings and solid structures can offer shade and block wind or channel it.

- Trees and tall shrubs in and around your garden may provide shade and microclimates, but they also compete for water. Deciduous trees are a good for providing summer shade
- Designing your garden to have taller sun hardy trees/large shrubs on the western side means they can provide well needed sun protection for summer
- Growing in pots allows flexibility; they can be moved away from summer heat

Soil

Bare soil is useful for warming the soil in winter and spring, but in the summer contributes to increase evaporation rates. An application of mulch is useful to prevent this. Wait until the night temperatures are 15°C before applying means plants have adequate soil warmth for continuous growth. Increase the depth of mulch as the temperatures increase.

Clay soils retain water for longer periods than sandy soils. The subsoil structure (bedrock could be close to surface) will impact drainage; doing drainage test will provide you with good knowledge of your soils.

The water holding capacity of both these soils can be improved by increasing the organic matter content, and this will also improve the soil fertility (humus levels) and soil structure. Sand benefits from the addition of clay to improve its water holding capacity. Increasing organic matter content can be done by adding quality compost; initially dig it in then subsequently lay on the soil surface protected by mulch. Growing and digging in green manure crops will also increase organic matter content.

Slopes and trenches

Slopes and trenching can be used to channel water and direct it to plant roots. The soil can be mounded up. Retaining walls may need to be built in very steep slopes.

Img:<http://www.permacape.com/2012/05/>

Good soil crumbles and has spaces.

The crumbling of soil means that the humus and mineral particles are grouped together. The spaces in soil allow root penetration which enables plants to gain access to water, nutrients and oxygen in the soil. Digging soil in summer destroys its structure, disrupts and kills soil organisms resulting in loss of carbon and results in poorer water holding capacity



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Knowing the conditions in your property will assist you in determining what strategies you need to implement to reduce water lose in your garden.

EXERCISE: Site Analysis

Look at the features in your garden. Sketch your block with the house, garden, paths and other existing features, including neighboring buildings, trees and roads that influence the conditions in your garden.

Path of the summer sun

Where the shade is and how far it extends
What areas are exposed to
morning sun only
middle of the day sun
afternoon
full sun all day

Direction of the wind

wind channels
wind blocks

Radiant heat sources

Hot walls, paths

Drainage

Where water runs
Where water sits in winter

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What to grow?

Some plants cope with hot dry conditions better than others. Observe your garden to utilize the areas that have shade, best water holding ability and plant appropriate plants there. If you are keen on certain plants and the conditions don't suit, some of the alterations and measures will need to be taken for your garden to thrive. This may mean making changes to the drainage, soil fertility, shade covers, wind breaks, swales and trenches and deciding which plants are the most important for you to grow. For growing vegetables soil drainage and fertility will need to be changed and supportive plants included to aid soil nutrient up-take and reduce pest numbers.

Determining the limits of your resources and capacity is important to ensuring that you enjoy your gardening.

For less effort and maximum results, plan your garden to survive summer conditions. Choose plants that will cope well and plant them in the appropriate position in your garden, or design and plant your garden in vertical layers to create shade and/or utilize built shade structures. Group plants with similar water requirements.

Walk around your neighborhood and see what grows well and in which conditions.

Drought tolerant plants employ various strategies to capture water and reduce its loss. They often have silver or light coloured leaves, hairy or thick glossy leaves and store water in their bases and leaves.



Information on local native species

Natural Resource Management (NRM)

<http://www.naturalresources.sa.gov.au/adelaidemtloftyranges/plants-and-animals/native-plants-animals-and-biodiversity/urban-biodiversity>

State Flora Nursery Belair

Queens Jubilee Dr, Belair
(08) 8278 7777

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EXERCISE:

What do you want to use your garden space for? E.g. Beautiful flowers all year to attract the birds and or increase biodiversity? A mixed flowers and vegetable garden?

List your top priorities

- 1.
- 2.
- 3.
- 4.
- 5.

Using the map of your garden from the site analysis. List what is the best space for which plants? The front yard may have the best conditions for growing summer vegetables!

What changes will I need to make?

Are these feasible given my resources?

What time frame is reasonable?

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Shelter and shades

During the long days of summer, depending on where they are growing, you may need to provide your plants with extra shelter, especially from the western sun in mid to later summer. It is essential in days of extreme heat or if there is a hot north wind, as both increase evaporation rates. By sheltering the plants you will prevent heat stress and burning of foliage and fruit, which could quickly put an end to months of hard work.

- Young seedling may need more shelter because of the longer hours of day light. Some plants such as lettuce, chard, broccoli and coriander will bolt to seed in the heat and will need to be grown in a protected area.
- Protection from late afternoon sun throughout summer may also be necessary for some plants to survive. Even sun loving tomatoes prefer protection from the afternoon sun.
- Shelter can be provided through temporary or more permanent structures. Any shelter structure should not touch the foliage; therefore future growth will need to be considered to avoid redoing the shelter as the plant grows.
- Shelters can be made of bamboo, prunings and stakes. They can be simple “bean pole tripods’ or more complex with wire mesh that is sturdy enough to support shade cloth. Wire mesh circles are easy to construct. A chair with a white sheet draped over it works well if nothing else!
- Removing leaves can help a plant in distress.

Temporary shelter structures examples

- Shelter from other plants:
Grow plants such as runner beans, cucumbers and melons vertically can provide natural shade protection to other crops underneath. Corn and raspberries provide similar benefits. Grow trailing plants- pumpkin, sweet potato or squash as ground cover.



Img:<http://gardeningnaturallywithclaudia.blogspot.com.au/2012/03/companion-plants-good-neighbors-in.html>

- Placing umbrellas in the ground to cover low growing plants.
- Laundry basket turned upside down to cover plants.
- Branches stuck in the ground with old bedsheets or net curtains hung between them to provide shade.
- Poly pipe looped over the plants with shade cloth/net curtain/bed sheets placed over top. **Permanent shelter structures**



Img:<http://www.vegiepatch.com.au>

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Making a frame from sturdy stakes, wooden or metal posts to support shade cloth which can be removed in winter.



Shading tips

Use 50 – 70 % shade cloth white or coloured is adequate for most gardens.

- Have the shelter at least 5 cm above the plants so bees and beneficial predators can still fly around. If the cloth is too close it can trap heat and cook the plants.
- Be careful to secure your shelter from high winds. Put the post for shelter in early so as not to disturb the plant roots.

Watering

Plants need a regular supply of water during summer to reduce plant stress, provide them with nutrients so they can produce the leaves, stems and fruits we are growing them for. Plants with roots 1 metre deep usually have access to double the amount of water that plants with roots ½ metre down do. The amount and frequency you water will depend on the soil, climate and protection from the factors that lead to water loss. Many gardeners over water and waste water and nutrients as they do. While others water too often but not thoroughly enough for plant health.

Watering plants enough and not wasting water will require you to regularly check your garden in summer.

Nutrients for plants are dissolved in water and held in the soil, which is a water reservoir. This reservoir is filled by rain, or irrigation (including hand watering), and emptied by plants, evaporation and leaking through the bottom. The size of the reservoir depends on the depth of the soil wetted by rain or irrigation. Different soil types have different water holding abilities; therefore varying amounts of water is available to plants.

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When to water?

The only sure way to know when to water is to check the soil. It will need to be checked regularly on the surface and at depth.

Check the soil moisture before watering

Place your index finger in the soil down to its second knuckle if it is moist (the soil will look dark and stick to your finger) then no need to water yet. Check regularly and watch also the plants to see how they behave. If it is dry it may be time to water; some plants require less water and can access the deep reservoirs of clay soil, so they may tolerate a longer period before watering than others.

- Recognise and look for signs of water stress in plants. Cucurbit leaves (pumpkin, cucumber etc.) may look droopy during the day but revive in the evening without extra water
- Different part of your garden may require different watering regimes. What are the plants needs and what area needs to be watered?
- Check the plants both type of plant and condition. Some plants tolerate high temperatures and require less water. A deeper rooted plant in clay soil will do better than a shallow rooted one in sandy soil
- If the sub soil is very dry to begin you may need to water more frequently at the start. Check the soil. Dig a finger in the soil two knuckles down. If its moist it doesn't need watering
- Do not let soil dry out especially if it is prone to become non-wetting.

Saving water can be achieved through the following measures.

- **Train for less frequent watering** Train plants to form deep roots from when you plant them as seedlings, give plants a *thorough soaking once a week*. In heat waves you may have to give them subsequent watering if the soil is dry. This will encourage their roots to grow deeply to seek water, which will form stronger plants that are able to withstand wind and heat stress
- **Before planting** water the soil well to encourage deep roots
- When you think you have watered enough, **check whether that has been a deep soak** by sticking your finger, or trowel, in the soil to determine how far the water has penetrated. Aim to soak the soil to the depth of desired plant's root system; around 20 -30 cm deep for most vegetables
- **Soaker hoses, or drip irrigation systems**, on a timer reduce the amount of time you will spend hand watering, and can be especially useful in larger gardens
- **Protect your plants from the heat and wind** by providing some type of cover

Watering in Heat Waves

Water thoroughly a few days before but not during a heat wave -unless the soil is dry. Provide enough water for the plant to survive but not encourage new growth as this is vulnerable to burning



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to reduce water loss. Shade trees or shelters

- **Mulching** around the plants will keep the roots cool and reduce water loss. Don't mulch too thickly, as this will attract pests. Keep the mulch away from the stems to prevent rotting the stems
- **Build mounds** around plants to hold water and direct it into root zone



- Don't water in the heat of the day or when very windy
- **Water in the evening or early morning** when it is cooler
- **Water the soil**, not the leaves
- **Watch** what you are doing!
- **Use a timer**

Watering Pot Plants

Pot plants may need more frequent water than plants in soil depending on size of pot, plant variety and location. They may benefit from shifting into a shadier part of garden in summer. If soil has become non-wetting (water running over top of root ball and down the sides of the pot), plunge smaller pots into a bucket of water and wait for bubbles to stop. Larger pots use organic soil wetter.

Drip irrigation systems

Check drippers are working, especially under mulch.

Drippers spaced at 30 cm are emitting 2 litres of water per hour. When watering aim for 50% porosity of soil with "saturation" of the pores at 50% saturation with water (i.e. ½ the soil is "spaces" or pores and when ½ of these are full of water the soil is said to be saturated or at field capacity).

With the measurements of :

10cm x 10 cm x 10 cm = 1 litre

30cm x 30 cm x 30 cm = 27 litres ½ x ½ = 1/4

We need ¼ of 27 litres to saturate the soil down to 30 cm deep or approximately 7 litres of water.

If we run this water in slowly it will fill the pores gradually directly below the dripper and then spread out. It may not spread out to cover the entire 30 x 30 cm. Pulse watering can overcome this and ensure an even spread.

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Pulse Watering

If we need 7 litres of water from a dripper emitting 2 litres per hour then the delivery can be split into two waterings. The first watering of an hour is followed by a break of 4 to 8 hours then 2-3 hours watering. If you want the water to go deeper, increase the second watering say to 4 hours. This allows the water to spread evenly under the soil surface. This technique can also be used on non-wetting soils, the first watering may be shorter and three or more watering may be required.

Mulching

Retaining soil moisture is essential in maintaining soil organism life thus soil fertility. Both high temperatures and wind increase evaporation and dry soils. Mulch serves to maintain soil temperature, reduce evaporation and assist in reducing plant stress over summer heat. Organic mulches also contribute to building soil texture as they break down.

Mulch needs to protect the soil from sun and wind whilst being open enough to breathe, allowing gasses such as oxygen and carbon dioxide to move in and out of the soil.

What materials?

The best mulches for food crops come from plants that grow as annuals. They have an open texture and break down readily adding to the soil texture over time.

For **Vegetable Gardens** use

- Bedding straw (available from garden suppliers)
- Sugar cane mulch
- Pea straw, but it can make a good habitat for pests- earwigs, millipede, slaters and slugs
- Lawn clippings if not weed infested or from chemically treated lawns
- Lawn clippings are best when dried out and applied in thin layers up to 1 cm deep

Not suitable as mulch for vegetable beds

- Shredded paper can mat when wet, providing an impenetrable and unacceptable mulch
- Mulching can reduce evaporation and assist in reducing plant stress over summer heat.

Fruit Trees

- Wood chip mulches are great for fruit trees. These can be applied 1-3 cm thick.



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Garden paths

- Sawdust is good for pathways. Once it has darkened it can be used on the garden.
- Woody mulches
- Recycled roofing tiles
- Gravel
- Scoria
- Lucerne hay used as the base for no dig gardens is wasted as mulch.
Manures likewise, they both lose a lot of their fertility when used as mulches

When and how much?

Mulches are very important not just for summer but for winter as well, though less is necessary in winter, to keep soil from drying out. The aim is to keep the organic layer- the living fertilisers such as compost or worm casts at the soil surface from drying out completely. When you are planting and applying fertiliser to the soil surface apply mulch.

Mulch does not have to be spread evenly. As summer progresses add thicker layers of coarser mulch such as straw, bagasse or composted mulch as required.

Winter: A mulch layer- ½ cm may be enough.

Spring: Increase to 1 cm.

Summer: Night time temperatures guide when to mulch; when they are over 15°C regularly it's time to start mulching.

- Early on a thin mulch of lawn clippings, leaves, straw or composted mulch around 1 cm thick may be applied. Later in summer up to 2 cm thick
- When applying mulch with seedlings protect seedling plants individually with collars
- When sowing seeds directly into the soil clear the mulch away until the seeds have germinated. Seedlings may need to be protected with collars when they are tall enough. In summer protect the soil with shade cloth to reduce evaporation



img:<http://www.veggiegardeningtips.com/wp-content/uploads/2008/05/fingerling-potatoes.jpg>

Resource: Kevin Handreck, Good Gardens with Less Water, CSIRO Publishing, 2008

Adapted from Harry Harrison Grow Your Own Food workshop series 2015

Compiled by Shannan Davis, November, 2020

Garden Coordinator, 8406 8525

