

NORTHERN TERRITORY GOVERNMENT

PowerWater

The Ultimate Irrigation User Guide

How to grow a thriving garden in Central Australia while saving water – a best practice guide developed by experts

About this guide

Growing conditions are harsh in Central Australia. Rainfall is variable and evaporation rates high. The result is often high water use or gardens that struggle.

We've developed this guide with irrigation specialists, soil scientists and local arid-zone horticultural experts to help you get the most out of your garden while using water wisely.

Whether you're a homeowner, gardener or landscape professional, this guide is for you. We'll help you adopt efficient irrigation practices, improve soil health and choose the right plants so you can significantly reduce your water use and watch your garden thrive.

Thank you to the following experts for sharing their knowledge:

Dr. Paul Lamble – Irrigation Specialist, Peak Water Consulting

Dr. Michael Battam – Soil Scientist, AgEnviro Solutions

Geoff Miers – Horticulturalist, Garden Solutions

Thanks also to Alice Springs Town Council and Desert Knowledge Australia for their help developing the original Alice Water Smart program, from which this guide has evolved.

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Why is efficient irrigation important?

Most household water in Central Australia is used on gardens, lawns and outdoors – up to 55%!

In a hot, dry climate like ours, thriving gardens don't come from using more water, they come from using water wisely.

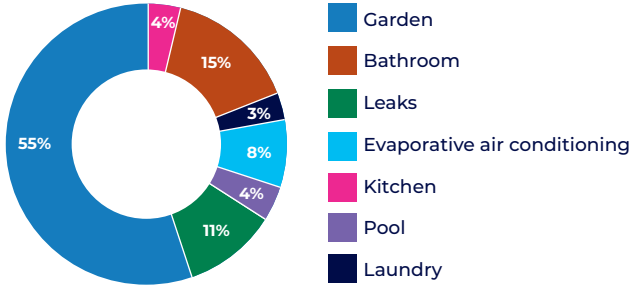
Efficient irrigation is vital, because it helps you:

- grow healthier plants
- save water
- save money
- reduce soil salinity and nutrient lock-up
- prevent damage to soil, plants and irrigation systems.

Too much of a good thing

Plants need oxygen and water in the soil to thrive. Too much water can fill soil pore spaces and reduce the amount of oxygen available, leading to diseases and weakened growth.

Water use in the home



The Central Australia context

Central Australia is an arid to semi-arid region, with highly variable and unpredictable rainfall – some years the region sees below average rainfall, while other years see intense storms and flooding.

In addition, while the average annual rainfall in Alice Springs is around 310 mm, annual evapotranspiration is approximately 2260 mm – around 7 times the rainfall.

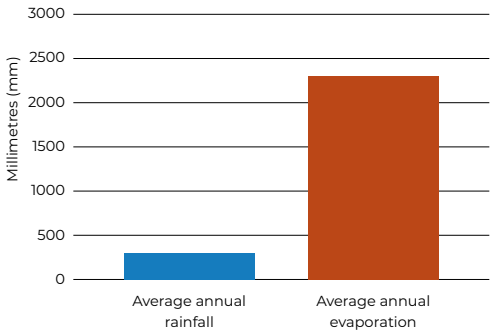
Evapotranspiration is the water lost from the soil by both direct evaporation and transpiration from plants.

This means moisture is lost from soil and plants far more quickly than it is replaced by rainfall. As a result, most gardens in Central Australia rely on irrigation.

Understanding this rainfall-to-evapotranspiration imbalance is essential when designing gardens, selecting plants and programming irrigation systems, as maintaining soil moisture is essential for a healthy garden. This can be achieved by:

- appropriate irrigation scheduling
- adding compost and organic matter
- applying gypsum to clay soils
- heavy mulching
- avoiding soil compaction.

Rainfall vs evapotranspiration



Evapotranspiration is approximately 7 times the annual rainfall. Average annual evapotranspiration (~2260 mm) far exceeds rainfall (~310 mm)

Garden mantras – 8 top tips



1. Make things easy with an irrigation controller
Learn how it works and review it regularly – water savings can be easily achieved by adjusting the controller settings.



2. Group plants by water needs
Irrigate similar plants together to avoid over and under-watering.



3. Garden with the seasons
Mulch, fertilise and adjust irrigation as weather conditions change.



4. Water at the right time
Water between 8 pm and 8 am to minimise evaporation.



5. Know your soil
Understand and improve soil health to grow stronger plants using less water.



6. Choose native plants first
Local species are hardy, climate-adapted and need less water once established.



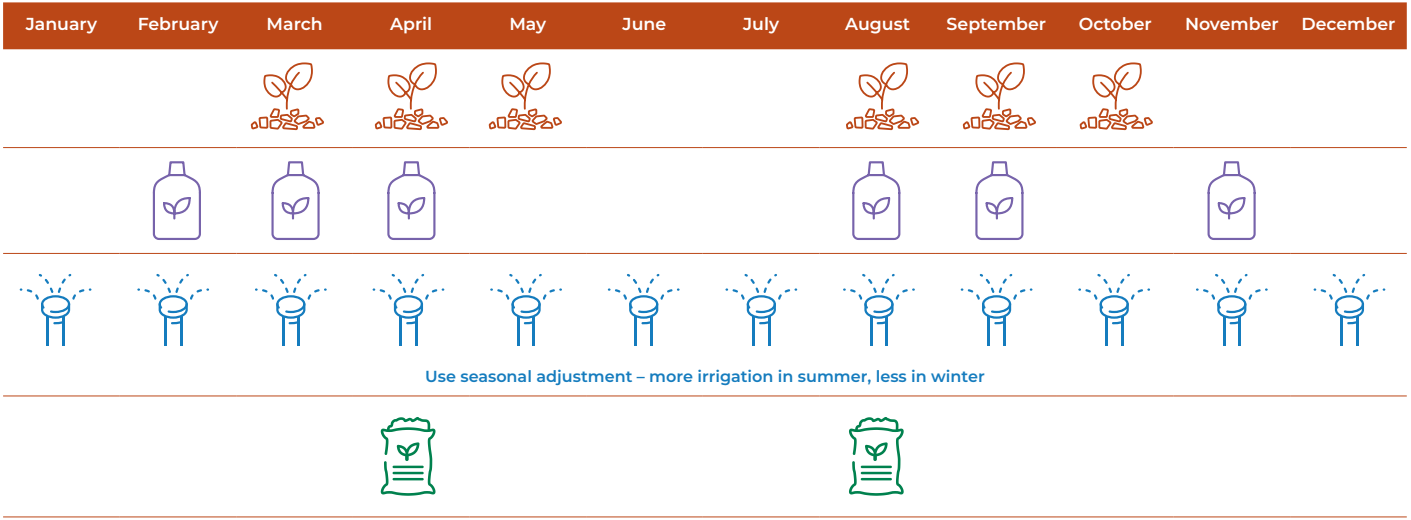
7. Mulch is mighty
Mulching deeply and regularly helps reduce evaporation, protect soil and improve plant health.



8. Set, but don't forget
Check your system regularly for leaks, blockages and performance, especially if it is set to run overnight.

Boost your backyard – a 12-month guide

This calendar highlights the best times of year to mulch, fertilise and adjust your irrigation. Matching these activities to Central Australia's seasons helps plants grow stronger and makes the most of every drop of water.



Irrigation equipment – understanding the basics

The right irrigation equipment helps water reach plant roots efficiently, reducing evaporation and supporting healthier plants.

Drip emitters

Drip irrigation is often the most efficient option for gardens in Central Australia.

Drip Emitters	Features	Best Use	Considerations
Produce water droplets that drip slowly into the soil. 	· Can be pushed directly into the irrigation lateral or connected using a small feeder tube. · Available in a range of flow rates, typically 2, 4, 8 and 16 L/hr). · Operates best between 50 and 200 kPa. · Pressure compensating emitters are useful on sloped areas as they maintain a consistent flow.	· Irrigating individual plants in pots. · Sparsely spaced plants in garden beds (with the emitter placed next to the plant). · Situations where watering needs to be targeted directly at plant roots. · Laid on the soil surface with mulch covering to retain moisture.	· Places water exactly where it is needed, reducing evaporation and runoff. · When connected using a small feeder tube, the emitter can be moved further out as the plant's roots grow. · Ants, calcium and soil can clog drippers, so periodic checking is recommended. · Very low flow drippers may not suit some Central Australian soils where higher application rates help water soak in effectively.

Shrubblers

These emitters apply larger volumes of water in shorter periods and can be adjusted any time.

360 Degree Spike Shrubblers	Features	Best Use	Considerations
Produce small water streams that soak into the soil rather than spraying into the air. 	· 360 degree watering pattern with an adjustable flow rate. · Mounted on a spike for high-volume watering in a short time. · Flow can be reduced or turned off (for example when deciduous plants are dormant in winter).	· Citrus trees and deciduous fruit trees. · Other trees or plants that require larger watering volumes. · High-density planting areas in smaller gardens.	· Flow can be adjusted or turned off as plant watering needs change. · Adjustable emitters may require occasional fine-tuning to maintain the desired flow. · Octa-flow outlets are preferred over fine sprays as they reduce evaporation.

Drip tubes (inline drip systems)

Drip tubes contain built-in emitters spaced at regular intervals along the pipe, allowing water to be distributed evenly where required.

In Central Australia's sandy soils, water tends to spread narrowly through the soil. For this reason, drip tubes with closer emitter spacings or slightly higher flow rates may be needed to ensure water reaches plant roots effectively.

13 mm Drip Tube	Features	Best Use	Considerations
	· Inline emitters with flow rates of 1.6–3 L/hr. · Available with emitter spacings of 15, 30 and 45 cm. · Suitable for surface or subsurface installation. · Pressure-compensating emitters available. · Mechanical root barriers available for subsurface systems. · Operating pressure 40–250 kPa.	· Densely planted flower beds. · Vegetable gardens planted in rows. · Situations where even water distribution along planting lines is required. · Subsurface installation where evaporation reduction is important.	· Excellent for high-density planting. · Subsurface installation can greatly reduce evaporation losses. · Not ideal for lawns, as it prevents natural soil decompaction. · Drip systems require filters, pressure regulators, air release valves and flush valves for reliable operation. · Subsurface installation can limit digging in garden beds.

8 mm Mini Scape Drip Tube	Features	Best Use	Considerations
	· Can be installed on the surface or below the soil. · Delivers water close to the plant root zone, reducing evaporation.	· Small garden beds. · Container gardens. · Around the drip line of trees. · Small, densely planted vegetable or flower gardens.	· Inexpensive and easy to install. · Directs water to the root zone with minimal evaporative loss. · Well suited to small irrigation zones. · Limited hydraulic capacity, so unsuitable for long runs or large areas (standard drip tube is preferred). · Should be flushed periodically to reduce emitter blockages.

Sprays and sprinklers

Sprays and sprinklers apply water through the air, which can lead to evaporation losses in Central Australia's hot and often windy conditions. For this reason they should be used sparingly.

Drip systems are usually the most water-efficient option in Central Australia, while sprays and sprinklers are generally reserved for turf areas or specialised garden situations.

Where sprays or sprinklers are required:

- use rotaries instead of fine sprays where possible
- avoid watering during the day
- restrict use to turf areas or shaded microclimates

Spray Head	Features	Best Use	Considerations
Produces a spray pattern. 	• Produces a fixed spray pattern. • Fixed nozzle. • Head retracts into the sprinkler body at the end of the irrigation cycle. • Usually operates best at around 210 kPa (at the sprinkler).	• Small turf areas in sheltered locations. • Small lawn areas or compact garden beds. • Watering exotic shrubs or native garden beds in protected spaces.	• Typically has a high application rate and therefore requires shorter run times. • Can be vulnerable to blockage, so regular visual checks are recommended.

Rotary	Features	Best Use	Considerations
Delivers water in rotating streams. 	• Delivers water in rotating streams rather than a fine spray. • Head retracts into the prinkler body at the end of the irrigation cycle. • Usually operates best at around 280 kPa (at the sprinkler).	• Small to medium lawn areas. • Exotic shrubs and native garden beds.	• Typically has a moderate application rate and run time. • Stream pattern is less prone to interference from plants compared with fine sprays.

Gear Drive Rotor	Features	Best Use	Considerations
Produces a single stream of water with sprinkler rotation. 	• Produces a single stream of water as the sprinkler rotates. • Head retracts into the sprinkler body at the end of the irrigation cycle. • Usually operates best at pressures of around 300–400 kPa (at the sprinkler).	• Large turf areas.	• Requires higher operating pressures than other sprinkler types. • Application rate and run time depend on sprinkler spacing, operating pressure, nozzle selection and sprinkler arc (for example half-circle rotors apply water faster than full-circle rotors).

Microsprinkler	Features	Best Use	Considerations
Produces a fine spray pattern. 	• Produces a fine spray pattern. • Rotating sprinkler mounted above ground. • Usually operates best at pressures of 150–250 kPa (at the sprinkler).	• Small gardens in sheltered areas where wind exposure is limited. • Ferns and tropical leafy plants where a humid microclimate is beneficial.	• Fine spray patterns may not soak the soil deeply, so additional watering methods may sometimes be needed. • Above-ground components can be vulnerable to damage or blockage, so regular visual checks are recommended.



Irrigation set-up – designing and installing your system

Designing your irrigation system

A well designed irrigation system helps you save water, time and money while keeping your garden healthy. Spending a little time planning your system before installation can make a big difference to how efficiently it performs.

1. Check your pressure and flow.
2. Consider your garden design (group plants with similar water needs together to conserve water).
3. Select the right sprinkler/emitter for what you are watering.
4. Determine the pipe size and quality you will need.
5. Use drippers for general garden beds, adjustable drippers or shrubblers for high-use areas and inline drip-tube systems for high-density planting of flower or vegetable gardens.
6. Automate your system with the right controller.

Tip

An effective irrigation system applies water evenly with minimal waste. Uneven watering is usually caused by incorrect spacing, low pressure or mixing emitter types within the same zone.

This guide provides the essentials. Seek expert advice if needed.

Optimising the design of your garden irrigation system

Commit to your mode of irrigation



Choose the most suitable irrigation system for each garden zone. Plan your layout by grouping areas such as lawns, orchards, vegetable beds and ornamental gardens - each may require a different system.

Use only one emitter type per zone. Avoid mixing sprinklers and drippers on the same line, as this reduces performance and efficiency.

Check the flow and pressure



Ensure there is enough flow and pressure to run each irrigation system efficiently and according to its specifications.

Use the bucket test to do this (see next page for details).

Pick the right pipes



Use quality pipe suited to the task. For higher-pressure systems (e.g. lawn sprinklers), PVC is often preferred over low-density polypipe.

Select the correct pipe diameter to manage flow and minimise pressure loss. As a guide, keep water velocity below 1.5 m/s in residential systems. Seek professional advice if unsure.

Spacing sprinklers closer together



When installing sprinklers in lawns, space them at 90–95% of their spray radius, slightly closer than head-to-head spacing (100% of the radius).

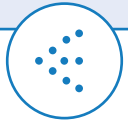
Adding sensors makes sense



The most useful sensors include:

- rain sensors (to prevent irrigation during and after rainfall)
- flow sensors (often used for large irrigation systems to provide alerts when flows are outside the normal range)
- rain gauge (rain events in Central Australia are highly variable, but when it does rain you can give your irrigation a break).

Automate with a controller



Using an automatic controller saves time, water and money, and keeps your garden healthy while you're away.

Controllers range from single- to multi-station systems. They may be battery or mains powered, manually programmed or app-controlled, and can connect to rain sensors or weather stations to optimise irrigation.



Checking pressure and flow

Before installing an irrigation system, check your water supply provides enough pressure and flow to operate sprinklers or emitters efficiently. Low pressure or flow can result in uneven watering.

A simple bucket test can estimate the flow rate of your tap.

The bucket test

Use a bucket with a known volume, for example a 9 litre (L) bucket.

Turn the tap fully on and measure how many seconds it takes to fill the bucket.

Calculate the flow rate using the following formula:

Flow rate (L/min) = (60 ÷ time to fill the bucket in seconds) × bucket volume

Example using a 9 L bucket:

Flow rate (L/min) = (60 ÷ time in seconds) × 9

You can check water pressure using a pressure gauge available from most hardware stores. A licensed plumber or irrigation specialist can also measure your pressure.

Tips

The maximum flow rate in each of your irrigation zones should be 90% of the flow rate from the bucket test (the bucket test flow rate x 0.9).

The available flow and pressure in the main supply can vary over time. Making the zones slightly smaller provides some contingency for when the flow isn't as good as what your bucket test showed.

Watch me!

Watch this video for an easy guide on how to do the bucket test.



Hydrozoning – now's the time to be picky!

The most successful irrigation systems are hydrozoned, which involves grouping plants with similar water and shade needs in the same zones. You can then set the appropriate flow for each zone, reducing the risk of underwatering or overwatering.

Key things to know:

For example:

- Vegetables and annuals: typically need watering 1-2 times per day and should be protected from the sun (in the shade or beneath shade-cloth).
- Exotic perennials: typically need watering every second day.
- Central Australian native plants: if planted in suitable soil (not too sandy or too shallow) require minimal watering once established.

If you mix plants with different water needs in the same zones, you'll need to set your irrigation to a level that suits the thirstiest plants. This results in higher overall water use.

Installing your irrigation system

If installing your own system, consider the following:

- Install an isolation or master valve at the water connection.
- Use pressure-rated pipe for all main and lateral lines.
- Burying pipes protects them from heat and damage.
- Install filters, pressure regulators and flush valves for drip systems.
- Prevent backflow to protect drinking water supplies.

Have an isolation or master valve

Fit an isolation and/or master valve at the mains connection. This allows you to shut off irrigation without turning off water to the entire property.

Install backflow prevention

Backflow occurs when irrigation water flows back into the potable supply. Install an approved backflow prevention device to protect drinking water and community health.

Pressure-rated pipe

Use pressure-rated pipe (e.g. PVC or high-density poly) for all main and lateral lines. Low-density poly is suitable for drip systems but is more prone to leaks and damage.

Use rigid risers in garden beds

For permanent beds, use rigid risers (or articulated assemblies for below-ground systems). They are more durable than flexible feeder tube.

Place pipe correctly

Pressure-rated poly can be installed on the surface or just below mulch. PVC should be installed below ground.

Depth is important

Where pipe is buried, allow sufficient cover to prevent damage, ideally at least 300 mm. Backfill with clean soil and avoid sharp rocks.



Irrigation diagram

If you're installing an irrigation system, or paying a professional to do it for you, you want your system to be as efficient and effective as possible. Make sure your system includes:

- The location and number of each solenoid valve.
- The layout of pipework and emitters (e.g. sprinkler heads).
- A connection point to the water supply and system isolation valve (and/or master valve).
- The location of irrigation controller and sensors (e.g. rain sensor, flow sensor).
- A valve schedule providing critical information for each irrigation zone, such as:
  - solenoid valve numbers (if 2 zones are wired into one controller zone output these can be designated as zone 1a, 1b)
  - solenoid valve manufacturer and size
  - zone flow rate, irrigation area (m^2), average application rate (mm/hr)
  - zone emitter type and number of heads/emitters.



Controllers and programming – let them do the work for you

Irrigation controllers automate garden watering and range from simple tap timers to advanced systems with weather-responsive features.

Correct programming is critical

Irrigation audits during the Alice WaterSmart campaign revealed that more than 50% of irrigation controllers are incorrectly set, often applying far more water than gardens require. If you are unsure how to program your controller, seek advice from an irrigation professional or supplier.

The 3 main types are:

- standard controllers
- programmable tap timers
- smart controllers.

Select a controller suited to your garden size, irrigation system and local conditions to maximise water efficiency.

Programming basics

1. **Frequency** – how often watering occurs.
2. **Run time** – how long each zone runs.
3. **Seasonal adjustment** – adjusting run times by percentage rather than reprogramming, to respond to weather changes and reduce water use and costs.

Use seasonal adjustment to respond to weather changes.

The right irrigation controller and correct programming can make gardening simpler, more efficient and far less water intensive.

Questions to consider when choosing an irrigation controller:

- **Functionality:** how complex are your garden's needs? Do you need multiple programs and zones? What other functions such as start times, seasonable adjustment and connected sensors may you need?
- **Connectivity:** will my controller need internet access? If I choose a smart controller, will it have easy access to the internet and good reception?
- **Manual operation:** what happens when there is an internet outage? Is the controller easily operated manually?
- **Control:** how will I operate the controller? Will I use the controller itself, or will I use a phone, a tablet, or a combination of both?
- **Weather data:** Do I want a controller that can access online weather data to switch off/on when weather events happen?



Watch me!

Watch this video to see how a smart controller can leave you more time for the things you love.

Controllers and programming – let them do the work for you

Programming lets you set your system up so it does all the work. There are 3 key elements:

1. Irrigation frequency:

Set watering by selected days (e.g. Sun, Tues, Thurs) or by interval (e.g. every second day).

2. Run time/amount

Run times are provided in minutes. They vary depending on sprinkler type, soil conditions and garden type. Test your system's application rate using the baking pan or water meter method to ensure accuracy – see page 26.

3. Seasonal adjustment

Weather conditions change from month to month and year to year. Seasonal adjustment allows you to modify all run times at once.

- 50% halves all run times.
- 150% increases them by half.

Occasional manual adjustments may also be needed after heavy rain or during extended heatwaves or dry periods.

Did you know?

A common mistake is setting multiple start times, which can double or even triple the amount of water applied to your garden.

If 3 start times are entered instead of one, the entire program runs 3 times, often without you realising.

Seasonal adjustments

Although spring and autumn can be short in Central Australia, seasonal changes still influence how much water plants need. Adjusting irrigation through the year helps keep gardens healthy while avoiding unnecessary water use.

Seasonal changes in the weather represent an opportunity for gardeners to review their irrigation settings several times each year to keep them aligned with seasonal conditions.

One simple way to do this is by using the seasonal adjustment feature on irrigation controllers. This allows watering levels to be increased or decreased by a percentage without needing to reprogram each irrigation zone.

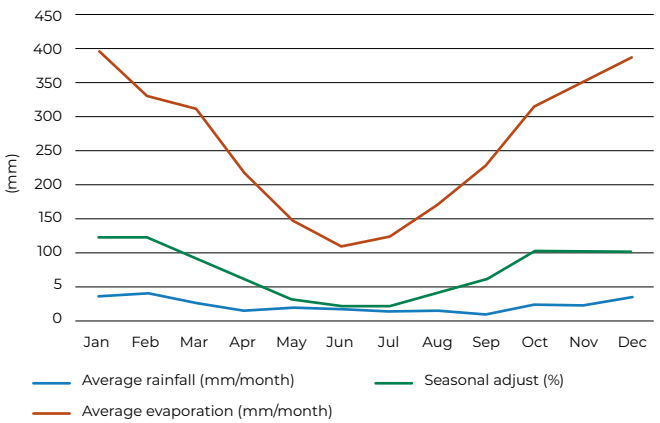
Seasonal adjustment – how and why

Seasonal adjustment allows you to change irrigation depth by percentage rather than reprogramming each zone.

Season	Months	Typical seasonal adjustment
Summer	Dec-Feb	100-140%
Autumn	Mar-Apr	80-100%
Winter	May-Jul	20-40%
Spring	Aug-Nov	60-100%

Always adjust based on plant response and weather conditions. These settings generally meet garden water needs, but exact timing will vary from year to year. Observing how plants respond to watering and adjusting irrigation accordingly will help maintain healthy gardens while using water efficiently. Some gardeners also keep simple notes on rainfall or temperature to help guide seasonal irrigation changes.

Adjusting your controller to align with seasonal changes



Tip

Adjusting your irrigation system when it rains can save you water and money!

Watch me!

Watch this video to learn more about how the magic buttons on your irrigation system make seasonal adjustment easy.

Application rates – how much and for how long?

Application rate is the amount of water applied over time (mm/hr).

Different emitters apply water at very different rates.

Understanding application rates helps you set correct run times and avoid waste.

Simple testing methods include:

- baking pan method
- water meter method.



Microspray – fixed nozzle



Microsprinkler – rotating sprinkler



Spray heads



Rotary



Gear drive rotor full circle



Gear drive rotor half circle

Typical application rate (mm/hour)					
42	9	52	17	10	19
Common range in application rates (mm/hour)					
28-57	6-12	43-64	11-24	5-14	10-28

What is your irrigation application rate?

Irrigation systems are designed to mimic rainfall. The application rate (also known as the precipitation rate) is the amount of water your system will distribute over time (measured in mm/hr). There is wide variation in the application rates of different sprinkler types. One easy way to understand the application rate you need is to use the simple baking pan method.

Application rate test: baking pan method

1. Grab a shallow baking pan and place it on an irrigated section of lawn or garden.
2. Turn your irrigation system on and run it for 15 minutes.
3. After 15 minutes turn the irrigation off and measure the depth of water in the pan in millimetres (mm).
4. Now multiply the number of mm x 4 to get how many millimetres would be applied per hour.
5. Repeat this process for other irrigation zones on your system, to get a complete picture of your irrigation system application rate.



Watch me!

Watch this video to see the baking pan method in action.

Application rate test: water meter method

This method is for those keen to gain a more accurate understanding about application rates:

Application rate (mm/hr) = total flow rate (L/hr) + total irrigated area (m^2)

1. Obtain the irrigated area for each zone* by roughly measuring each side (length x width).
   - An approximate area is sufficient.
   - For estimating purposes, circular shapes are roughly 75% of the area of a square and triangles about 50% of the area of a square.
2. Calculate the water used by running the irrigation zone for 15 minutes ensuring no other water is being used (such as dishwashers or washing machines).
3. Record your meter reading at the start and end of the test (take a photo on your smart phone as the time of the photo is also recorded).
4. Subtract the water meter reading at the end of the test from the read at the beginning of the test. The difference in the 2 reads is the water used in kL or m^3 over the 15 minutes.
5. Multiply the water used by 4 to obtain the kL used per hour.
6. Multiply the kL (or m^3) of water used by 1000 to obtain the litres used (water meters record kL).

* Repeat this test for each irrigation zone on the system.



Manual watering schedule made simple

If you are manually watering your lawns and gardens (you don't have an automated system), the tables below provide a simple seasonal guide to help you water your garden efficiently.

Lawns

Season	Frequency
Summer	3 times per week
Autumn/Spring	2 times per week
Winter	As required

Garden beds (non-native)

Season	Frequency
Summer	Every 2 days
Autumn/Spring	2 times per week
Winter	Weekly or less

Native gardens (established)

Season	Frequency
Summer	Once per week
Autumn/Spring	Fortnightly
Winter	Nil

Tip

Veggies and annual plants need watering once or twice a day, early in the morning or late in the afternoon.



Customising run times for your irrigation zones

If you want to customise the run times for each zone, you can use this procedure:

- **Step 1:** Gather the application rate information for each zone (see water meter method).
- **Step 2:** Record the most common emitter type in each zone.
- **Step 3:** Compare your zone application rate (each zone individually) to the typical value for the emitter type in the emitter table and adjust the run time based on your application rate compared to the typical value.

Example run time adjustment calculation

- One of the irrigation zones has rotary sprinklers that apply water at 15 mm/hr.
- The typical application rate for rotary sprinklers is 17 mm/hr.
- The run time adjustment for the tested rotary sprinklers is 1.13 (= 17 mm/hr ÷ 15 mm/hr).
- If the typical run time for a 5 mm application is 18 minutes, the adjusted run time for this zone of rotary sprinklers is 20 minutes (= 1.13 x 18 minutes).



Drip irrigation – best fit for Central Australia

Drip irrigation is the most efficient irrigation method for arid environments.

Benefits:

- Minimal evaporation losses.
- Precise delivery to plant roots.
- Reduced weed growth.
- Improved plant resilience.

Essential components:

Drip systems typically require the installation of these items:

- **Filter**: to reduce the risk of blocking emitters.
- **Pressure control valve:** to ensure dripline pressure does not become too high.
- **Flush valve:** to allow easy removal of any debris that gets into the lines.
- **Air valve:** to minimise soil being sucked into emitters when watering stops.

Install systems in loops where possible to balance pressure and improve uniformity.

For sparsely planted gardens with minimal understory, plug-in drip emitters should be installed:

- close to plants (avoid unplanted areas), especially on the upslope side.
- so at least 50% of ground beneath the canopy of each plant is wet.

If more than one emitter is needed, install a grid of emitters 0.4 to 0.6 m apart around plants.

Drip tube is often better suited to gardens with understory plants. Ensure:

- drip tube is spaced evenly apart (0.3 to 0.4 m apart), but consider gravity effects.
- pressure compensating drip tube is used in large gardens or sloped gardens.

Drip irrigation – best fit for Central Australia

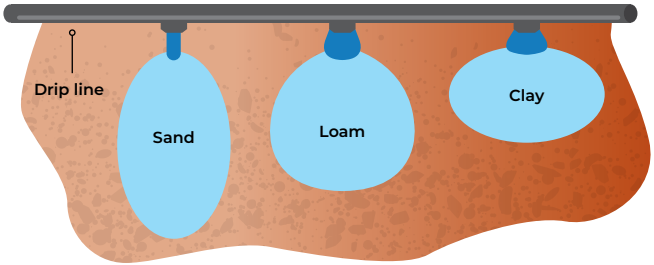
Drip irrigation systems are relatively inexpensive, easy to install and well suited to Central Australian conditions. A drip system is the most practical method of irrigating your garden in the arid zone as it:

- applies water only where it's needed, reducing waste in uncultivated areas
- delivers water directly to the root zone, minimising evaporation losses
- encourages deeper root growth and improved drought tolerance
- reduces the need for hand watering
- can be automated with an irrigation controller, allowing gardens to be watered while you're away.

Drip irrigation performance depends heavily on soil type. In clay soils, water spreads sideways more easily, while in sandy soils it drains quickly and stays close to the emitter. Flow rate also matters – higher-flow emitters spread water further than low-flow ones.

In Central Australia, soils are often sandy with high infiltration rates, so water typically wets only a narrow area (about 100–180 mm radius). This makes correct emitter spacing, placement and flow rate especially important.

Because drip emitters have small openings, they also require good filtration and pressure regulation. Understanding soil type and system setup is essential for efficient drip irrigation.



Types of drip irrigation systems

Individual drip emitters

Best for: Individual plants in pots or sparsely planted garden beds.

Install a tap timer directly to the tap, followed by a pressure reducer and the required fittings to connect the polypipe. Where possible, run 13 mm or 19 mm polypipe in loops to promote even flow and pressure.

Use 4 mm feeder line or rigid risers from the polypipe to position drippers near plants. This allows emitters to be easily repositioned as plants grow. Bury the main polypipe 50–100 mm below the surface to protect it from heat and physical damage, while keeping feeder lines flexible and accessible at the plant base.

Individual emitters are not recommended for irrigating large areas such as vegetable beds or under established trees.

In Central Australian soils, use 4 L/hr or 8 L/hr drippers, as 2 L/hr emitters produce very small wetting patterns.

Pressure-compensating drippers are preferred, as they deliver a consistent flow regardless of pressure variations.

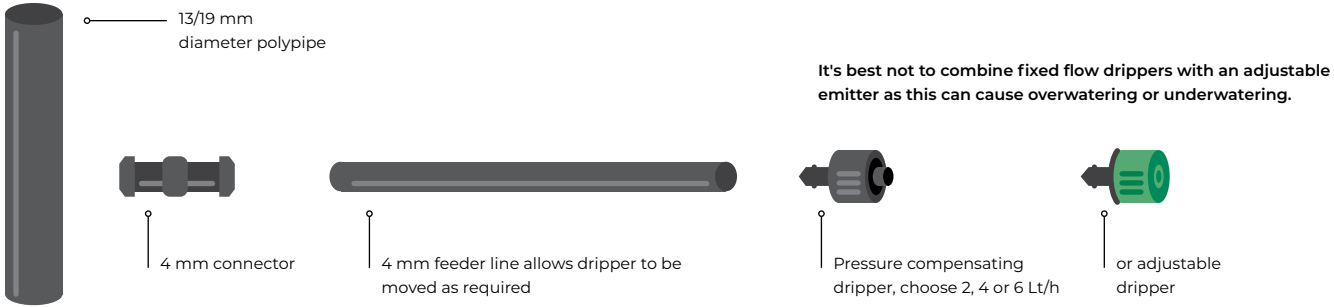
Drip tube (inline drip systems)

Pressure-compensating drip tube is recommended to ensure even water distribution. Install drip tube on the soil surface and cover with mulch to reduce evaporation.

- **Standard 13 mm drip tube:** suitable for larger areas and under established trees (e.g. citrus).
- **Miniscape drip tube (6–8 mm):** suitable for small areas, pots and planter boxes.

Where possible, install drip tube in straight, evenly spaced lines. Rings of drip tube around trees can also be effective.

Due to the sandy soils common around Alice Springs, drip tube rarely provides 100% coverage. Dry patches between emitters are normal. Where full coverage is required, sprinklers may be more suitable.





Drip irrigation system – essentials

- Choose the highest flow rate available (2 L/hr for miniscape, 3 L/hr for standard drip tube).
- Space drip lines closely (less than 200 mm for miniscape and 300 mm for standard drip tube).
- **Hydraulics:** Do not exceed the maximum number of emitters or length of drip tube allowed for the hydraulic capacity of the pipe. Overloading reduces performance and uniformity.
- **Filtration:** Filtration is essential for drip systems, as emitters and drip tube can easily block. Install filters at the water connection point.
- **Pressure regulation:** Drip systems operate best between 50–200 kPa. Install pressure regulation on each drip irrigation zone to ensure consistent performance.

Scheduling for drip irrigation

Drip irrigation schedules depend on the level of coverage provided:

- **Full coverage (e.g. a single emitter serving one plant, or multiple emitters fully covering the root zone):** use shorter run times with less frequent irrigation.
- **Partial coverage (e.g. dry areas between drip tube emitters):** use shorter run times with more frequent irrigation to maintain soil moisture.

The recommended drip irrigation schedules in this guide account for both scenarios.

Watering requirements – Drip irrigation of hardy exotic plants and hedges

Drip emitters (full coverage i.e. emitters for each plant)	**Summer**		**Autumn**			**Winter**			**Spring**			**Summer**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Every 2nd day											
Depth	7 mm											
Seasonal adjust %	125	100	75	50	25	25	25	50	75	100	100	125
Arc	**Length of irrigation event to program controller (minutes)**											
Drip Emitters (4 L/hr & 8 L/hr)	**6 minutes** per zone											

Drip Tube (about 45% coverage across area)	**Summer**		**Autumn**			**Winter**			**Spring**			**Summer**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Every day											
Depth	4 mm											
Seasonal adjust %	110	100	90	70	40	20	20	50	70	90	100	110
Arc	**Length of irrigation event to program controller (minutes)**											
3 L/hr 0.3 Drip Tube Installed at 0.3 m spacing	**8 minutes** per zone											

Watering requirements – Drip irrigation of native gardens

Drip emitters (full coverage i.e. individual emitters for each plant)	**Summer**		**Autumn**			**Winter**			**Spring**			**Summer**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Once per week											
Depth	8 mm											
Seasonal adjust %	100	100	100	80	30	20	20	60	100	100	100	100
Arc	**Length of irrigation event to program controller (minutes)**											
Drip Emitters (4 L/hr & 8 L/hr)	**7 minutes** per zone											

Drip Tube (about 45% coverage across area)	**Summer**		**Autumn**			**Winter**			**Spring**			**Summer**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Every 2nd day											
Depth	3 mm											
Seasonal adjust %	90	90	80	60	20	20	20	50	70	90	90	90
Arc	**Length of irrigation event to program controller (minutes)**											
3 L/hr 0.3 Drip Tube Installed at 0.3 m spacing	**6 minutes** per zone											

Soil health and why it matters

Soil in Central Australia

Thriving, water-efficient gardens start with healthy soil. Healthy soils:

- hold more water
- support deeper roots
- improve nutrient uptake.

Central Australian soils are often sandy or loamy sand, with low organic matter and nutrients. They can have a high pH, particularly where gardens have been irrigated extensively over time.

They vary from free draining alluvial soils to poor draining clay soils, to sometimes quite saline conditions in previous flood-out zones.

You can help your garden thrive by preparing the soil.

What is my soil texture?

There is an easy way to test the texture of your soil:

a) Dig out a soil layer and crush it so there are no lumps.

b) Add a little water and mix into the soil for one minute. Slowly add more water so it is wet, but not saturated.

c) Read off the soil type and amendment recommendation from the table at right (ignore the soil colour).

Soil type	Description	Amendment for lawns
Sand	Sand that can't be moulded.	**Too sandy:** mix with heavier soil so it has a loamy sand or sandy loam texture.
Loamy sand	Sand that can be made into cylinders that just hold together. This represents most Alice Springs soils.	Suitable if it contains less than 25% gravel and stones.
Sandy loams, clay loams and light clays	Feels like playdough and can be easily moulded.	Suitable if it contains less than 25% gravel and stones.
Heavy clay	Requires a lot of strength to mould.	Not suitable for turf, many trees, and many general gardens, often requires excavation and replacement with well-draining sandy loam with a blend of gypsum.

Watch me!

Watch this video to learn more about the importance of knowing your soil.



Improving your soil

Addressing these issues before planting is critical to long-term plant health and efficient water use.

Soil preparation will vary depending on soil type, slope, previous land use, weed pressure and the type of garden being created. Understanding your soil conditions – and matching improvements to your planting goals – is the key to success.

Sandy soils require smaller, more frequent watering, while clay soils hold water longer and should be watered less frequently.

Improving soil structure and drainage

- **Sandy soils:** Add compost, leaf litter, potting mix and well-aged manures to improve water-holding capacity, nutrient availability and microbial activity.
- **Clay soils:** Incorporate coarse river sand and gypsum to improve drainage and aeration. Adding organic matter further improves structure and soil health.

A blend of sandy red loam (around pH 6.5) mixed with coarse river sand provides a good starting point when developing new garden beds.



Impact of irrigation water

Central Australian water is mostly artesian and has a relatively high percentage of total dissolved salts that can increase your soil pH over time. Careful planning, building up your soils and watering efficiently will make it easier to maintain a healthy garden while also saving water.

Managing soil alkalinity and salinity

High soil pH can cause nutrients to become unavailable to plants, particularly when pH exceeds 8.5, which is common in Central Australia.

Regularly adding organic matter helps buffer soil pH and improve nutrient availability. Where required, a periodic application of sulphur or sulphate of ammonia in September, early December and February can help manage alkalinity, particularly in native gardens. Improving soil health and irrigation efficiency also reduces the total volume of water – and salts – applied to the garden.

Soil depth – do you have enough topsoil?

Adequate topsoil depth is essential for resilient, water efficient gardens. Shallow soils dry out quickly and increase plant stress.

As a guide:

- Ideal depth: more than 250 mm.
- Acceptable in shaded areas: around 200 mm.
- Less than 150 mm: most turf and garden plants will struggle.

Soil depth can be increased gradually through topdressing. Apply no more than 10–12 mm at a time, allowing plants to adjust between applications.

Managing your soil moisture level

After irrigation or rainfall, water will move into the spaces (pores) between soil particles and excess water will drain through the soil. Once water movement within the soil stops, it is at field capacity.

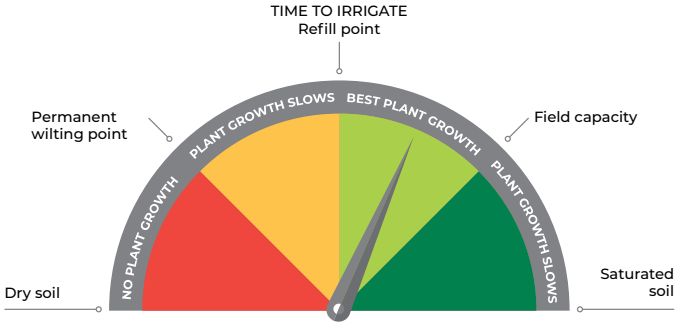
Soil at field capacity will feel moist and should be easy to crumble. Over time, water evaporates from soil or is removed by the plant (transpiration). As the soil gets drier the plant needs to apply more effort to remove any remaining water from the soil (like sucking harder through a straw). Eventually the plant cannot remove any more water. When this occurs the soil's water bank is said to be at permanent wilting point.

The water bank, also known as available water, is the water held in the soil between field capacity and permanent wilting point. Available water is the maximum amount of water a soil can supply to plants.

When setting your water applications, the duration and timing must maintain the available water in the soil. Most soils in the Central Australia region have a loamy sand texture and will hold around 15% of readily available water for the plant, which is:

- 30 mm of water if the soil depth is 200 mm
- 45 mm of water if the soil depth is 300 mm.

Soil moisture and plant growth



NSW Government Department of Primary Industries, 2016, Ag Guide: Managing for healthy soils.



Sensors and soil moisture

Sensors help irrigation systems respond to real conditions.

If there is a storm or it rains, a rain sensor can automatically shut off the irrigation. However, rain sensors require regular maintenance to ensure they are working. An alternative is to manually switch the controller to the off position when it is raining and turn it back on 3 days after the rain has stopped (2 days after hot weather).

Recommended tools:

- Rain sensors.
- Rain gauges.
- Soil moisture sensors (where practical).

In Central Australia, a 'top-up and maintain' approach is recommended during hot periods.

Tip
Rain sensors or rain gauges are great tools for maintaining the right moisture levels. You can also get rainfall information from reputable weather sources, of even dig down into the soil to see how far the rain has penetrated!



Water repellent soils

What are water repellent soils?

Any soil can become coated with natural fats or waxes that repel water. These soils are sometimes called hydrophobic (water repellent) and are a common cause of plant losses.

Is my soil water repellent?

Place a droplet of water on the surface to see if it wets the soil. Water often sits like a bead on repellent soils (see left).

What causes soil to become water repellent?

Any soil can become water repellent, but it's more likely if:

- the soil is allowed to dry out
- your watering system applies water unevenly
- fatty materials such as 'blood and bone' are added
- the topsoil soil is sandy or very shallow in dry areas under trees and on steeper slopes.

Water repellent soil is quite common in gardens, but also frequently occurs in lawns.

How to fix water repellent soils

- Apply a wetting agent (granular or liquid), which is available from most garden retailers and landscape suppliers. Check the label for instructions.
- Gypsum applied and raked in will assist with bonding fine soil particles, improving water penetration.
- Apply the wetting agent prior to cool weather, and wash off any agent that lands on leaves.
- Alternatively, saturate organic materials and add them to the soil followed by frequent watering of the area.

How to prevent the problem from reoccurring

Don't allow the soil to dry out by ensuring:

- water is applied according to the relevant water scheduling noted in this guide
- water is applied evenly to all areas
- additives are carefully selected with relevant horticultural advice
- the soil is well aerated.



Nutrients and mulches

Let's talk nutrients

Mineral fertilisers

Some mineral fertilisers only provide one or 2 types of nutrients. These are known as a straight fertiliser. In contrast, a complete fertiliser contains all the nutrients required for plant growth.

Compost

Quality composts not only provide a source of nutrients, but also organic matter such as humus and humic acids. The addition of organic matter can increase the water-holding capacity of your soil and provide a source of beneficial microorganisms that help plants absorb nutrients.

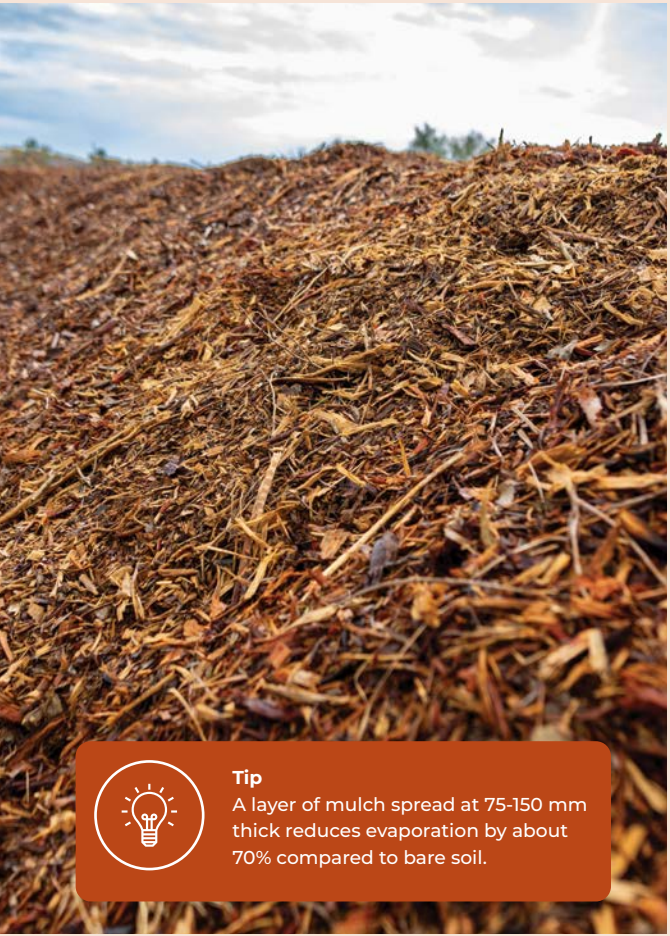
Manures

Animal manures are an excellent way of adding nutrients and improving soil health in highly productive food gardens.

- Aged or composted chicken, sheep, pig and cow manures are often excellent. Nutrient concentrations will vary depending on the diet of the animal.
- Horse manure should not be used unless it has been properly treated, as it can introduce nematodes (plant pests that are hard to remove). If soaked in a drum for at least 3 months, it can be safely used as a soil conditioner but will add very little nutritional value to the soil.

The table below gives a general estimate of nutrient percentages in some common animal manures:

Type of manure	Nitrogen (N) %	Phosphorous (P) %	Potassium (K) %
Cattle	0.3-0.6	0.1-0.3	0.3-0.6
Horse	0.7	0.3	0.6
Poultry	0.7-0.8	0.6	0.2



Tip
A layer of mulch spread at 75-150 mm thick reduces evaporation by about 70% compared to bare soil.

Mulch is mighty

Whether it's retaining moisture and reducing water loss through evaporation, suppressing weeds or moderating soil temperature extremes, mulching gardens in Central Australia is essential when cultivating a healthy garden and moderating water consumption to support the garden.

Mulching arid zone gardens is essential

Mulch:

- reduces evaporation by up to 70%
- moderates soil temperature
- suppresses weeds.

Materials used for mulching garden beds can be either organic (hay, wood chip, compost, bark, bush mulch) or inorganic (gravel, sand, rock, or recycled glass).

Organic mulches

Mulching reduces soil temperature extremes, lowers plant stress and significantly reduces water loss through evaporation. For best results, apply mulch deeply and top up as required, ideally twice a year.

Organic mulches that break down slowly and add nutrients and organic matter provide the greatest benefit. Suitable materials include leaves, bark, straw, pea mulch, bush mulch, compost and spinifex brush. Cardboard or shredded paper can be used as an underlay to suppress weeds and further reduce evaporation.

Before mulching, incorporate organic matter into the soil to improve water-holding capacity. Over time, organic mulch breaks down, improving soil structure and encouraging beneficial soil organisms such as worms, fungi and bacteria. This process releases nutrients that are readily taken up by plants.

A 75–150 mm layer of organic mulch can reduce evaporation losses by up to 70% while improving soil health and plant performance.

Mulch is mighty

Inorganic mulch

Inorganic mulches include sand, gravel, rock and crushed rock. They are primarily used for appearance and weed suppression, particularly in large public and private spaces where a neat, low-maintenance finish is preferred.

Unlike organic mulch, inorganic materials do not improve soil health. They add no nutrients, do not support soil biology and may increase soil temperatures. Weeds can still grow through such mulch choices.

Tips for applying mulch

Inorganic mulch

- Apply crushed rock at 50–100 mm depth.
- Unscreened sand and river pebbles may be applied at 150–200 mm, where specified.

Organic mulch

- Apply at 75–150 mm depth.
- Top up once or twice per year.
- Apply slow-release nitrogen or organic fertiliser beforehand to reduce nitrogen drawdown.

As organic mulch breaks down, soil organisms temporarily use nitrogen from the soil, known as nitrogen drawdown, particularly with fresh mulch.

Keep all mulch clear of plant stems and trunks to prevent moisture build-up and disease.



Did you know?

Soil temperatures measured at a 10 cm depth on un-mulched soil can be up to 6 °C higher than those of mulched soils. High soil temperatures can inhibit plant germination, as well as water and nutrient uptake.



Watch me!

Watch this video to learn more about how mulching is good for your garden.



What else can I do to improve my soil?

Many Central Australian soils have an acceptable starting pH (around 6.5), but are typically low in organic matter and nutrients. They will only support healthy plant growth for a short time without improvement. Preparing and improving soil before planting is essential for long-term garden success, particularly for higher water and nutrient-demand plants.

The level of soil improvement required depends on the type of garden being developed:

- Vegetable and herb gardens, orchards, roses and exotic plantings generally require thorough soil preparation and ongoing improvement.
- Native gardens using Central and inland Australian species usually require less intervention, as these plants are better adapted to local soil and climate conditions.

Improving sandy, free-draining soils

Sandy soils drain quickly and hold little water or nutrients. Improve these soils by:

- adding composted organic matter to increase structure and water-holding capacity
- blending in heavier soils where appropriate
- using water-retaining products (such as water crystals) in planting holes where soils are extremely free draining.

Improving heavy clay soils

Clay soils often drain poorly and restrict air and water movement. Improve clay soils by:

- incorporating coarse sieved river sand and gypsum to improve drainage and aeration
- adding smaller amounts of organic matter to stimulate soil biology over time.

Gypsum is particularly valuable on fine clay soils and can be applied generously, as it helps bind fine particles and improve soil structure without harming plants.



Soil improvements

Any product that alters or improves a soil is known as a soil amender. This includes organic materials such as composts and manures, fertilisers, conditioners, mineral applications, and products that alter pH (acidity).

Elemental sulfur

Additional elemental sulfur can lower the pH of the soil. Given most Central Australian soils are alkaline this will help improve nutrient availability. It will also help overcome sulfur deficiency, which is common in Central Australian soils.

Soil conditioners

Products such as compost, compost teas, biochars, microbial inoculants or kelp/seaweed-based products don't contain enough nutrients to be classified as fertilisers but can provide other benefits. These might include beneficial microorganisms, active compounds and acids to promote healthy soil organisms, small amounts of nutrients, organic films and waxes.

Water storage crystals

Water crystals are often made from super-absorbent polymers that are added to soil to increase water storage.

- Water crystals should be applied directly around the root zone of plants.
- When irrigation occurs, water crystals pull water close to the roots rather than allowing the water to move out through the soil profile and away from the plant root zone.
- Water crystals work well in sandy soils or for establishing single trees when the surrounding soils are dry.



Water harvesting

In arid climates, best practice garden design aims to capture and retain rainwater on site, rather than directing it into the street. Even small rainfall events can provide valuable moisture when water is harvested effectively.

Start by installing roof gutters and connecting them to rainwater tanks. You can also shape your garden to catch and slow rainfall, guiding water into low areas where it can soak into the soil.

Effective water-harvesting features include:

- gutters and downpipes directed into gardens
- landscaped dry creek beds, particularly in native gardens
- shallow depressions, sumps or soakage pits
- trenches filled with gravel or rocks
- contoured paths and driveways that direct water into planted areas.

These features temporarily hold water, allowing it to infiltrate the soil rather than running off. This process helps flush salts and calcium from the topsoil, improving soil condition and creating a healthier growing environment for plants.

By harvesting rainfall, gardens rely less on irrigation, soil salinity and pH build-up are reduced, and overall plant health and resilience are improved.



Growing a native garden

Choosing species suited to Central Australian conditions and the characteristics of your site will reward you with a resilient, low-water garden.

Central Australian native plants have evolved to survive in arid environments and should be the first choice for most gardens. Group plants with similar water needs together and observe which species perform well in your local area. Local horticultural advice and the *Department of Lands, Planning & Environment – Species Guide for Landscaping in the Northern Territory* are useful references.

Before planting, undertake a simple site assessment. Consider soil type and depth, pH, water-holding capacity, slope, existing vegetation, structures and opportunities for water harvesting. Testing and improving your soil before planting will guide plant selection and significantly improve long-term water efficiency and garden health.

Choosing suitable plants:

Choose plants that suit your region and site conditions and you won't have to battle the elements to keep your garden healthy or use lots of water to make it thrive.

Species Guide for Landscaping in the Northern Territory

Trees for Central Australian gardens

Botanical Name	Common Name	Botanical Name	Common Name	Botanical Name	Common Name
Acacia aneura	Mulga	*Corymbia aparrerinja*	Ghost Gum	*Grevillea striata*	Beefwood
Acacia cyperophylla	Red Mulga	*Corymbia opaca*	Bloodwood	*Hakea divaricata*	Fork-leaved Corkwood
Acacia holosericea	Silver Wattle	*Eucalyptus gamophylla*	Blue Mallee	*Hakea lorea*	Long-leaf Corkwood
Atalaya hemiglauca	Whitewood	*Eucalyptus lucens*	Shiny-leaved Wattle	*Melaleuca bracteata*	Black Tea-tree
Acacia pruinocarpa	Black Gidgee	*Eucalyptus minniritchi*	Red Mallee	*Melaleuca glomerata*	Inland Tea-tree
Brachychiton gregorii	Desert Kurrajong	*Eucalyptus socialis*	Grey Mallee	*Santalum acuminatum*	Quandong
Callistemon pauciflorus	Desert Bottlebrush	*Eucalyptus thozetiana*	Thozet's Box		
Callitris glaucophylla	White Cypress Pine	*Eucalyptus victrix*	Little Ghost Gum		

Shrubs for Central Australian gardens

Botanical Name	Common Name	Botanical Name	Common Name	Botanical Name	Common Name
Acacia tetragonophylla	Dead Finish	*Eremophila alternifolia*	Narrow-leafed Fuchsia	*Prostanthera striatiflora*	Mint
Acacia kempeana	Witchetty Bush	*Eremophila bignoniiflora*	Gooramurra	*Senna artemisiodes*	Silver Cassia
Acacia victoriae	Victoria wattle	*Eremophila christophori*	Dolomite Fuchsia	*Senna filifolia*	Desert Cassia
Atriplex nummularia	Oldman Saltbush	*Eremophila glabra*	Black Fuchsia	*Senna sturtii*	Sturt's Senna
Crotalaria cunninghamii	Parrot Pea	*Eremophila maculata*	Spotted Fuchsia	*Stemodia viscosa*	Clammy Stemodia
Capparis spinosa	Native Passionfruit	*Eremophila polyclada*	Lignum Fuchsia		
Dodonea viscosa	Native Hop Bush	*Gossipium sturtianum*	Sturts Desert Rose		



Ground cover plants, grasses

Botanical Name	Common Name
Enchylaena tomentosa	Ruby Saltbush
Eremophila macdonnellii	Splendid Fuchsia
Eremophila ovata	Krichauff Range Fuchsia
Eremophila obovata	Blue Flowering Emu Bush
Ipomea muelleri	Native Morning Glory
Cymbopogon ambiguus	Native Lemon Grass
Themeda triandra	Kangaroo Grass
Eulalia aurea	Silky Brown Top
Eragrostis elongata	Clustered Love Grass
Triodia	Spinifex
Rhagodia spinescens	Creeping Saltbush

Creating and maintaining your lawn

Lawns can be maintained efficiently with the right approach.

How to create a new lawn

Step 1: Shape the ground so excess water can run off

- There should be no depressions or humps. A smooth level will make maintaining your lawn easier and prevent scalping and an uneven finish when mowing.

Step 2 : Prepare the soil

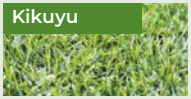
Use these steps to see if existing soil can be used. If not, import suitable soil:

- Dig out a soil layer and crush it so there are no intact aggregates (lumps).
- Mix a little water into the soil for one minute with your hand.
- Slowly add more water so the soil is wet, but not saturated.
- Read off soil type and amendment from table on the right.
- For healthy turf the topsoil media should be least 250 mm of suitable soil.

Soil type	Description	Amendment for lawns
Sand	Sand that can't be moulded.	**Too sandy:** mix with heavier soil so it becomes a loamy sand.
Loamy sand (typical Alice Springs topsoil)	Sand that moulds into cylinders that just hold together.	**Suitable** if it contains less than 25% gravel and stones.
Loams and light clays	Feels like playdough.	**Suitable** if it contains less than 25% gravel and stones.
Heavy clay	Lots of strength to mould.	**Often not suitable without major amendments.**

Creating and maintaining your lawn

Step 3: Choosing the turf

Lawn type	Mowing	Light traffic			Sport traffic		
		Full sun	Part shade	Lots of shade	Full sun	Part shade	Lots of shade
Kikuyu 	High	Yes	Yes	No	Yes	Just	No
Buffalo 	Moderate	Yes	Yes	Yes	Yes	Just	No
Santa Ana Couch 	Low	Yes	Yes	No	Yes	Yes	No
Bermuda Couch 	Moderate	Yes	Yes	No	Yes	Yes	No
Zoysia 	Low	Yes	Yes	Yes	Just	No	No
Dichondra repens (Tom Thumb) 	Low	Just	Yes	Yes	No	No	No

Creating and maintaining your lawn

Botanical name	Common name	Watering requirement	Additional information
Cenhrus clandestinus (syn. Pennisetum clandestinum)	Kikuyu	Drought tolerant, but water regularly during warmer months to maintain good condition.	Vigorous, fast-growing lawn with high-wear tolerance. Performs best in full sun and is not shade tolerant.
Cenchus ciliaris	Buffalo	Drought tolerant and self-repairing. Water regularly in warmer months.	Tolerates sun to partial shade, is frost tolerant and requires less mowing than kikuyu. Sir Walter Buffalo grass performs well locally.
Cynodon dactylon var. Santa Ana	Santa Ana Couch	Drought tolerant once established. Requires regular irrigation in warmer months to stay green.	Fine-textured, low-growing lawn with high-wear tolerance. Winter dormant after frost. Suited for residential and commercial use and tolerates light shade.
Cynodon dactylon	Bermuda Couch	Drought tolerant. Water during warmer months and reduce irrigation significantly in winter.	Warm season, highly wear-resistant lawn. Recovers well from traffic. Limited shade tolerance. TifTuf has improved shade tolerance.
Zoysia japonica	Zoysia	Drought tolerant once established. Water regularly during warmer months.	Low-maintenance, fine-bladed lawn. Performs well in full sun and tolerates some shade.
Dichondra repens	Tom Thumb	Requires regular watering. Not drought tolerant during hot months.	Low-growing, attractive groundcover. Shade tolerant and low maintenance when adequately watered.







Creating and maintaining your lawn

Step 4: Laying turf

a) Avoid laying on very hot days (above 35 °C).

b) Prior to laying, ensure surface is smooth and firm, but not compacted.

c) Lay turf so there are no gaps between rolls. Cut turf with a Stanley knife.

Step 5: Watering new turf

Water turf within 30 minutes of laying. Then water with 3 mm watering events:

- 4 times a day until turf cannot be pulled up easily (~3 to 5 days after laying).
- Daily until turf is 3 weeks old and well established.

After this time, water using the normal schedule for lawns.



Maintaining your lawn

These tips can help improve the condition of your lawn and its water efficiency:

Mow to the right height

Only cut 1/3 of the overall height of your turf on each mow. Scalped lawns or lawns cut too low are more susceptible to drying out, disease and pests. In hot months, mow at one notch higher to limit potential burning.

Fertilise when necessary

Fertilise 2-3 times per year – where needed. A suitable all-purpose lawn fertiliser rather than a high-nitrogen fertiliser is best (will encourage both leaf and root growth).

Mow without a catcher

Consider doing this once a month. By not using a catcher you are returning the lawn clippings directly to your soil, which will return some nutrients to the ground.

Top-dress annually

A fine compost or granular manure will replace lost organic matter and nutrients. This is particularly important for lawns constantly mowed with catchers.

Aerate compacted areas

Compaction may become an issue over time, particularly from heavy traffic by people, animals or vehicles. Aerate by using a garden fork or a spiked aerator tool and/or improve the soil structure by adding organic top-dress, composts and manures.

Residential lawns – Irrigation schedule

		Summer		Autumn			Winter			Spring			Summer
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency		Every second day					Every second day						
Depth		6 mm					6 mm						
Seasonal adjust %		120	120	90	60	30	20	20	40	60	100	100	100
Arc		**Length of irrigation event to program controller (minutes) for 6 mm depth**											
	**All arcs**	**7 minutes** per zone					**8 minutes**		**7 minutes** per zone				
	All arcs	**22 minutes** per zone					**25 minutes**		**22 minutes** per zone				
	**Half circle**	**19 minutes** per zone					**21 minutes**		**19 minutes** per zone				
	**Full circle**	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)					**23 minutes per cycle**		**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)				



Watering guides for different plant types

Vegetables and annuals

Water needs for vegetables and annual plants vary widely depending on the crop, season, soil type and irrigation system.

The following tips can help save water and improve outcomes:

- Protect plants from the sun using shade cloth, or the shade created by buildings and larger plants or trees.
- Use soft mulch like pea straw or lucerne to lower soil temperatures and reduce evaporation losses.
- Water every day and sometimes twice a day (morning and evening) in summer.
- Use miniscape irrigation line with emitters every 15 cm for small gardens (less than 10 m lengths) or techline (up to 50 m) for larger gardens. Greater coverage can be achieved by off-setting emitters in each row, minimising dry spots.
- Use a soil moisture indicator to help guide your irrigation.

Tip
Grow vegetables and herbs under 50% white shade cloth in summer. This reduces the intensity of the sun without impacting plant growth.



Hardy exotic plants

These can be a great visual addition to any garden and are easy to care for.

1. Ask your local horticultural expert for advice on what to plant and where.
2. Healthy, fertile soil helps plants thrive and use water efficiently. When planting, mix compost, manure or mulch into the soil.
3. Place a long-life fertiliser tablet in the bottom of the planting hole.
4. Saturate the soil prior to planting and water deeply for the first few months after planting to establish deep roots.
5. Your watering schedule will change with the seasons. In spring, after planting, water daily for 1 hour (about 4 L) for 2–3 weeks. Then 1.5 hours every second day (about 6 L) for 2–3 weeks. After that, water for 2 hours every 3 days (about 8 L). During autumn, water for 2.5 hours every 4 days for 2 months. Reduce to 3 hours every 7–10 days in winter.
6. Continue to enrich soils, using organic mulches and light applications of composts and manures twice a year.
7. After one year, move the dripper further from the base and add another to water the expanding root zone.
8. Lightly prune in late spring and early autumn to encourage lateral growth and maintain shape. If required, hard prune in early spring to remove frost damage, reshape plants and promote strong new growth.

Tip
Plant small palms and soft exotics in protected areas away from frost and harsh sun. Hardier options for exposed sites include frangipani, hibiscus, murraya, duranta, cycads, tecoma and abelia.



Maintenance and troubleshooting

Irrigation systems aren't something you can set and forget. They often have complex components and need regular check-ups.

Weekly

Check your sprinkler and spray heads weekly during spring, summer and autumn.

Monthly

Check your rotary and gear drive heads.

Beginning and end of each season

A full check of your system – including any sensors – is best at the start and end of spring, summer and autumn.

Troubleshooting

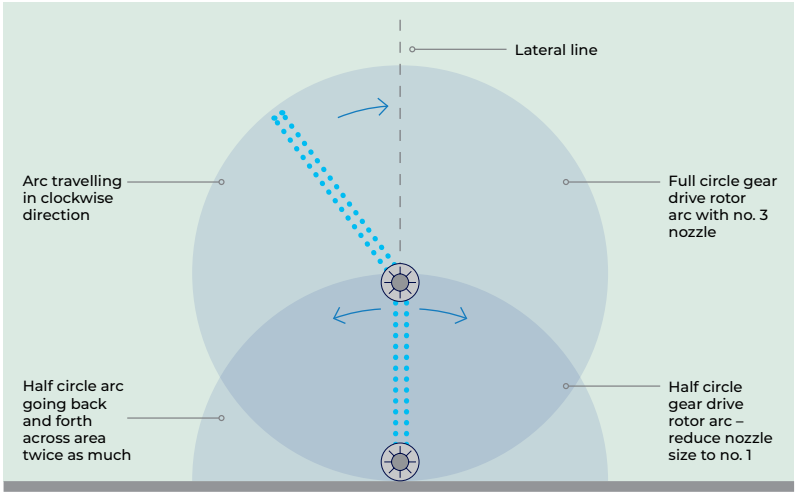
Dry or excessively wet patches in turf or gardens, or water running down pathways, are signs something might be wrong and it's time to check your system.

Tip
A 5-minute visual check is the best way to make sure your system is running well. Turn each irrigation zone on for 5 minutes. Are you happy with the water distribution and how your sprays and sprinklers are working?

Managing half and full circle sprinklers

- For most gear drive rotors, if the sprinkler arc is reduced from full circle to a half circle, water will be applied twice as fast.
- Gear drive rotors that are half circles should be valved separately to full circle sprinklers (and the run time adjusted – half circle sprinklers about half the time).
- Where existing systems have half and full circle gear drive rotors on the same valve, a compromise solution is to install a smaller nozzle for the half circle sprinkler.
- The nozzle on the half circle sprinkler should have about half to 2/3 the flow rate of the nozzle for the full circle sprinkler.
- Most spray heads and rotary sprinklers have different flow rates depending on the sprinkler arc (e.g. full or half circle). This means the amount of water will be roughly equivalent (matched precipitation rate), regardless of whether a full circle, half circle or quarter circle arc is used.

Understanding your sprinklers



Schedules for commercial operators

Watering requirements – Sporting fields (tier 1 and 2) – 1 day gap

	Summer		Autumn			Winter			Spring			Summer
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	4 days per week*											
Depth	6 mm											
Seasonal adjust %	120	110	100	70	30	20	20	30	80	100	110	120
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**	**19 minutes** per zone											
 **Full circle**	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)											

* Ensure one day gap between each irrigation event (i.e. no 2-day gaps), for example: Sunday, Tuesday, Thursday, Saturday nights.

Watering requirements – Sporting fields (tier 1 and 2) – 2 day gap

	Summer		Autumn			Winter			Spring			Summer
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	3 days per week*											
Depth	9 mm											
Seasonal adjust %	120	100	90	60	30	20	20	30	60	90	100	110
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**	**29 minutes** per zone											
 **Full circle**	**56 minutes** per zone (use cycle and soak – 20 minutes per cycle)											

* Irrigation on a Sunday, Tuesday and Thursday night leaves a 2-day gap on Friday and Saturday during which the stored soil moisture sustains the turf.

Watering requirements – Active public open space turf areas (tiers 1 and 2)

	Summer		Autumn			Winter			Spring			Summer
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	4 days per week											
Depth	6 mm											
Seasonal adjust %	120	110	100	70	30	20	20	30	80	100	110	120
Arc	**Length of irrigation event to program controller (minutes)**											
 **All arcs**	**7 minutes** per zone											
 **All arcs**	**22 minutes** per zone											
 **Half circle**	**19 minutes** per zone											
 **Full circle**	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)											

Watering requirements – Passive public open space turf areas (tier 3 sites)

	Summer		Autumn			Winter			Spring			Summer
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	4 days per week											
Depth	6 mm											
Seasonal adjust %	110	100	100	60	30	20	20	30	60	100	110	110
Arc	**Length of irrigation event to program controller (minutes)**											
 **All arcs**	**7 minutes** per zone											
 **All arcs**	**22 minutes** per zone											
 **Half circle**	**19 minutes** per zone											
 **Full circle**	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)											

Glossary

Term	Description
Aerate/Aeration	The practice of mechanically perforating the soil to allow air, moisture and nutrients to penetrate the root zone. Aeration helps to alleviate soil compaction and allows roots to grow more deeply to produce healthier turf. Specialised equipment is used for large-scale areas of turf. At home it can be done using readily available tools such as aeration sandals.
Aggregates	Groups of soil particles (sand, silt and clay) held together in larger stable units by organic matter. Soils with lots of aggregates (or peds) are said to be well structured. They are less compacted and often drain faster than soils without aggregates (poorly structured).
Application rate	Also referred to as precipitation rate. As irrigation systems are designed to mimic rainfall, this term refers to the amount of water a sprinkler will apply over a given area measured in millimetres over time (mm/hr). Sprinkler types will have different application rates and this will influence how long you will need to apply the irrigation to reach the necessary depth.
Backflow and backflow prevention	Backflow is the unwanted flow of water from an in-line irrigation system to Power and Water's potable water supply system. It has the potential to contaminate the drinking water supply. A backflow prevention device is important to keep you and the community safe.

Term	Description
Cycle and soak	A function that can be programmed into most automated irrigation controllers and repeats the run time on a specific zone. It reduces surface run off and can help water soak in more deeply. A cycle and soak function is ideal for sloping and narrow surfaces such as road reserves.
Decompaction	Loosening hard or compacted soil so water, air and roots can move through it more easily.
Depth	In irrigation terms, depth refers to how much water you need to apply to replace the depleted levels of moisture in your soil and is measured in millimetres. It is directly related to your application rate, so if your sprinkler application rate is 15 mm/hr, to achieve 5 mm of depth you'd need to run the irrigation for 20 minutes.
Fertiliser	A natural or artificial product that increases soil fertility to improve plant health and productivity. The 3 key chemicals found in fertilisers are nitrogen (N), phosphorus (P) and potassium (K) and the ratios are expressed on the labelling as N:P:K

Glossary

Term	Description
Field capacity	Refers to the amount of moisture held in your soil after the excess has drained away.
Flow	Refers to the volume of water available for your irrigation system and expressed in litres over minutes (l/min). Sprinkler types will often state the minimum amount of flow required for the sprinkler to operate.
Hydrozoning	The principle of placing plants with similar water needs together, then using the appropriate sprinkler and run time to ensure they are not overwatered or underwatered.
Irrigation zone	Also referred to as an irrigation station, this is a section of area operated by a single solenoid valve. Depending on the area, plant type and your available pressure and flow, you may need multiple zones to achieve the necessary coverage.
Isolation valve	This is installed to allow you to shut off or isolate your irrigation system from the mains water supply. An isolation valve is essential to carry out repairs to your irrigation system while ensuring you still have mains water supply to the rest of your property.
Kilopascal (kPa)	A unit of measurement for pressure typically used in Australia. Psi (pound per square inch) can also be seen as an alternative unit of measure.

Term	Description
Master valve	This acts as an automated isolation valve. It is a fail-safe in the event of an individual or multiple irrigation zone valve failure and helps to reduce water wastage. It is more commonly used in commercial or large-scale irrigation systems.
Microbial inoculant	These are tiny bacterial or fungal micro-organisms that play a significant role in a plant's ability to receive nutrients within the soil through a mutually beneficial (symbiotic) relationship. Microbial inoculants are often applied in agriculture to improve plant health and productivity.
Microclimate	A variance in climatic conditions in smaller areas. An easily understood example of a microclimate is the temperature variance provided under the shade of a tree.
Permanent wilting point	The point of no return for plants, where there is no longer any available moisture in the soil and the plant dies.
Pressure	Refers to the force pushing through your pipes. When your irrigation system is operating, it is under constant pressure and it's important the pipes you use are rated for the pressure they will be under. Pressure ratings are labelled on pipes.
Run times	Refers to how long you would run an individual irrigation zone for and is measured in minutes.

Glossary

Term	Description
Schedule	Refers to both the run time and frequency for all your irrigation zones.
Seasonal adjust	This function is available on most irrigation controllers. It allows the user the user to automatically adjust the irrigation programming in percentage increments to factor for seasonal changes such as frequent rain events or higher temperatures.
Soil conditioner	The term soil conditioner covers a wide range of products that are not strictly fertilisers but do improve the condition of the soil. Examples include compost tea, microbial inoculants and biochar. Other common soil conditioners used are fish or seaweed/kelp emulsion, blood and bone mixes and compost.
Soil pH	Refers to how acidic or alkaline the soil is. Certain plants will prefer a more acidic soil while others will prefer a more alkaline soil. Soil pH is not static and changes over time especially when you apply mulches, fertilisers and water. If you are regularly applying mulch and fertiliser, your soil may become more acidic over time. You can adjust your soil pH by using products such as lime to increase soil pH or iron chelates to reduce it.

Term	Description
Solenoid valve	A type of valve that will automatically open or shut when wired to an irrigation controller. Solenoid valves are available for either AC (plug in controllers) or DC (battery operated controllers).
Top-dress	The practice of spreading a thin layer of soil over the ground. It is usually performed to either increase soil depth or fill in holes so the surface is more even. If organic matter is top-dressed over the area it is usually being applied to amend the soil on lawns.
Water bank	Refers to the concept of thinking of your soil profile as a 'bank' whereby you deposit water, and the plants and climate withdraw it.
Water repellent soils	When soils have been depleted of all moisture and the field capacity is now at permanent wilting point, soils may become water repellent (or hydrophobic). Fats and other insoluble substances in the soil profile can also create a repellent layer. A wetting agent and top dressing with organic matter will remedy water repellence over time.
Wetting agent	A store-bought product that works like a detergent to help water repellent soils absorb water.

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