NORTHERN TERRITORY GOVERNMENT

PowerWater

The Ultimate Irrigation User Guide

How to grow a thriving Top End garden while saving water – a best practice guide developed by experts

About this guide

This guide has been developed by irrigation specialists, soil scientists and local horticultural and sustainability experts, in partnership with Power and Water Corporation and the Northern Territory Government.

Whether you're a homeowner or a landscape industry professional, this guide is here to support you in growing healthy, thriving gardens and lawns – while using water wisely. In the Northern Territory, shifting weather patterns and growing population pressures mean we must take a smarter approach to how we use our water. By adopting efficient irrigation practices, we can all contribute to conserving this vital resource – saving water, money and the environment.

Let's live water smart and grow our gardens and lawns the sustainable way.

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

Emily Hinds – Horticulturalist, Smarter Futures

Contents

Why is efficient irrigation important?

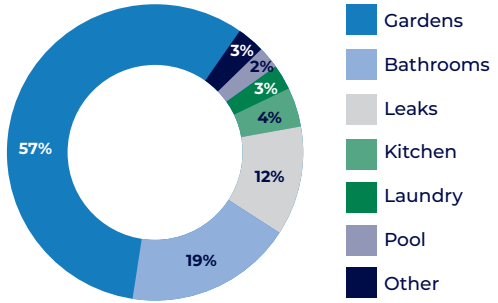
Gardens and lawns are a great place to save water because as much as 60% of a Top End household's water use is in the garden. There are other benefits too – using less water can save you money and your garden may not need it.

Too much of a good thing

Did you know that applying too much water can be bad for your garden, lawns and equipment?

Plants need a mix of both air and water in the soil to thrive. Adding too much water can result in the space around the soil particles being taken up by water, leaving not enough oxygen for healthy plant and turf roots. Soil that is too wet and soft can also increase the costs and repairs associated with damage to the surface, soil profile and irrigation system.

Water use in the home



Garden mantras – eight tips we should all know and use

1. Watering your garden is as easy as 3, 2, 1
An easy rule of thumb is to water lawns three times a week, garden beds twice a week and native plants once a week.

2. Sensors make perfect sense
Rain and flow sensors and rain gauges are handy tools that can help you water only when needed.

3. Plan ahead
Know when to mulch, fertilise and adjust your irrigation.

4. Mulch is mighty
Mulching your garden can save water – and keep your plants and wallet happy.

5. When it rains, give your system a break
You can often turn your irrigation off when it rains – avoid overwatering and save water.

6. There's soil …
and then there's soil
Understand your soils better and watch your plants thrive.

7. Native plants are garden superheroes
They're hardy, look beautiful and are perfectly climate adapted.

8. Set but don't forget
Regularly check your irrigation system for leaks and blockages.

Boost your backyard – a 12 month guide

This handy calendar tells you when to mulch, fertilise and adjust your irrigation, which can make a huge difference to the health of your garden and help save water.

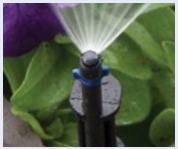
January	February	March	April	May	June	July	August	September	October	November	December
											
 light and frequent	 light and frequent	 heavier application			 if irrigated					 once rainfall begins	
 off	 off	 reduced	 on	 on	 on	 on	 on	 on	 seasonal adjustment	 seasonal adjustment	 seasonal adjustment
											

 Mulch
 Fertilise
 Irrigate
 Compost

Irrigation equipment – understanding the basics

Sprays and sprinklers

All emitters are different, with their own features, pros and cons. Understanding how they work best is key to choosing the right option.

Microspray	Features	Best Use	Pros and Cons
Produces a fine spray pattern 	· Fixed nozzle. · Head is above ground. · Usually operates best at a pressure of 100-200 kPa (at the sprinkler).	· Ideal for small garden areas (e.g. pots, narrow beds) in sheltered locations. · Suitable for orchids, ferns, propagation houses or areas that require a humid and cool environment (microclimate).	· Typically has high application rate and requires short run time. · Vulnerable to damage and blockage so weekly visual checks are essential.

Microsprinkler	Features	Best Use	Pros and Cons
Produces a fine spray pattern 	· Rotating sprinkler. · Head is fixed above ground. · Usually operates best with a pressure of 150-250 kPa (at the sprinkler).	· Suited to small gardens in a sheltered space (to reduce potential water loss to wind). · Suitable for ferns and tropical leafy plants to create a humid and cool microclimate.	· Poor at applying moisture to the soil, so other sprinkler types or hand watering may be necessary during the dry season and for new plantings. · Vulnerable to damage and blockage, so weekly visual checks are essential.

Spray head	Features	Best Use	Pros and Cons
Produces a spray pattern 	· Fixed nozzle. · Head retracts into sprinkler body at end of irrigation cycle. · Usually operates best with a pressure of around 210 kPa (at the sprinkler).	· Ideal in small turf or garden areas in sheltered locations. · Suitable for use in tropical garden beds, exotic shrubs, native garden beds and small lawn areas.	· Typically has high application rate and requires short run time. · Can be vulnerable to blockage so weekly visual checks are essential.

Rotary	Features	Best Use	Pros and Cons
Delivers water in rotating streams 	· Head retracts into sprinkler body at end of irrigation cycle. · Usually operates best with a pressure of around 280 kPa (at the sprinkler).	· Suitable for small areas of lawn, tropical garden beds, exotic shrubs and native garden beds.	· Typically has moderate application rate and run time. · Less vulnerable to plant interference, blockage and wind losses (better for exposed areas).

Gear Drive Rotor	Features	Best Use	Pros and Cons
Produces a single stream of water with sprinkler rotation 	· Head retracts into sprinkler body at end of irrigation cycle. · Usually operates best with a pressure at or above 300-400 kPa (at the sprinkler).	· Suitable for large areas of turf. · Application rate – and therefore run time – dependent on sprinkler spacing, operating pressure, nozzle selection and sprinkler arc (e.g. half circle gear drive rotors put water on twice as fast as full circle).	· Ideally suited for larger areas of lawn. · Requires higher operating pressures than other sprinkler types.

Irrigation set-up – designing and installing your system

Designing your irrigation system

The ultimate irrigation system will give you the best chance to save water, time and money. There can be a bit to think about initially but doing this work early really pays off in the long-term.

1. Check your pressure and flow
2. Consider your garden design (hydrozoning)
3. Select the right sprinkler for what you are watering
4. Determine the pipe size and quality you will need
5. Space your sprinklers to maximise efficiency
6. Automate your system with the right controller

The best irrigation set-up should see water applied evenly with minimal waste. Uneven watering is often the result of incorrect spacing of sprays and sprinklers, operating at low pressure or mixing emitter types within an irrigation zone.

Most of the answers you need are included in this guide and you can always ask an expert for advice!

Optimising the design of your irrigation system

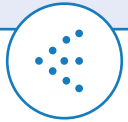
Commit to your sprinkler type

Have a single sprinkler type in each irrigation zone. Different sprinkler types on the one zone will affect the performance of your irrigation (you may end up over watering one section and under watering another).

Space sprinklers closer together

Sprinklers should be spaced at about 90-95% of the radius of the throw (closer than head-to-head coverage, which is spacing at 100% of radius of throw).

Automate and optimise your system with a controller



Some controllers can be operated from a mobile device and linked to rain sensors and weather stations to optimise your irrigation use – saving you time, water and money.

Pick the right pipes

Choose good quality pipes (they last longer!) that have a large enough internal diameter to handle the required flow rates in each zone and minimise pressure losses. A rule of thumb for residential or smaller scale projects is to size the pipe so the velocity of water in the pipe is below 1.5 m/s. Seek professional advice if you need!

Check the flow and pressure

Ensure there is enough flow and pressure to run the sprinklers efficiently and according to its specifications. Use the bucket test to do this (see next page for details).

Adding sensors makes perfect sense

In Darwin the most useful sensors include rain sensors (to prevent irrigation during and/or after rainfall), a rain gauge (a low-cost yet invaluable piece of equipment) and flow sensors (typically used for commercial/large open space irrigation systems to provide alerts when flows are outside the normal range).

Checking pressure and flow

Ensuring there is enough pressure and flow to run your sprinklers efficiently and according to their recommended use is important. Doing a simple bucket test is an easy way to know what available flow you have.

The bucket test

This can help you check the flow rate.

1. Determine the time in seconds it takes to fill a 9 litre (L) bucket.

2. The flow rate in L/min can be determined by the following formula:

Flow rate (L/min) = 60/time to fill bucket (in seconds) x volume of bucket (9 L)

You can get a pressure gauge from a local hardware store, or you can ask a licensed plumber or irrigation specialist to check your available pressure before you install an irrigation system.

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!

Hydrozoning is when your irrigation system is zoned by groups of plants that have similar needs. This is a great way to avoid over or underwatering of different areas. In simple terms it means being selective in what plants you choose and where you put them.

Key things to know:

- Group plants that have similar needs for water and shade together.
- Plants that are tough, such as natives, won't need as much water as plants with lush tropical foliage.
- Understand what plants and microclimates (shading) are in each irrigation zone. This is crucial for scheduling and application of the right amount of water.
- In areas of mixed plantings, the irrigation needs are determined by the more sensitive plants which can result in higher overall water use.

Installing your irrigation system

If you're planning to install your system yourself there are some things you need to know.
These tips are designed to help you make it as easy as possible to operate and maintain your irrigation system:

Have an isolation or master valve

An isolation valve and/or master valve at the connection point to the mains water supply is critical for when something goes wrong.

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.

Pressure rated pipe

Use pressure rated pipe for all irrigation main and lateral lines such as uPVC or high density poly pipe (blue or green line). Low density poly pipe is more vulnerable to leaks and accidental damage and has a reduced lifespan.

Rigid pipe risers

For permanent garden beds, use rigid pipe risers for emitters (or articulated riser assemblies for below ground installations) as these are more robust than flexible pipe (e.g. spaghetti tube).

Pipe placement

Pressure rated poly pipe can be placed on the surface (or just below mulch) whereas uPVC should be installed below ground.

Depth is important

When installing pipe below ground, ensure there is sufficient depth to avoid damage (ideally a minimum 300 mm cover to top of pipe and use clean fill to backfill ensuring no sharp rocks are put back in the trench).

Irrigation diagram

If you are having a new irrigation system installed, ensure you receive an irrigation plan from your installer with the following information:

- Location and number of each solenoid valve.
- Layout of pipework and emitters (e.g. sprinkler heads).
- Connection point to the water supply and system isolation valve (and/or master valve).
- 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 two 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.

Watering schedule – as easy as 3, 2, 1

If you are manually watering your lawns and gardens (you don't have an automated system), the 3, 2, 1 rule of thumb makes it super easy to know how often to water.

3, 2, 1 rule of thumb

- Lawns **3 times per week**
- Garden beds **2 times per week**
- Native plants **once per week or less**

The 3, 2, 1 rule of thumb is great because it not only helps to save you water, but it also builds the resilience of your plants to withstand our tough weather conditions. It encourages deeper root systems and gives plants better access to water and nutrients within the soil.

If you have an automated watering system, we recommend following this guide to learn more about how to optimise your irrigation.

Tip

Water your garden in the right place at the right time with the right amount!

Watch me!

Watch this video for tips on how to train your lawn like an athlete – with the right amount of water and the right amount of encouragement.

Controllers and programming – let the work be done for you

The right controllers and programming can make your garden up-keep simple and easy. They're also great tools to make sure you're giving your garden just the right amount of water.

Irrigation controllers

These are devices that automate the watering of lawns and gardens. They range from basic timers to advanced systems with features such as weather-based adjustments and rain/soil sensor additions. When used correctly, these controllers can enhance water efficiency by delivering the right amount of water consistently. They can also save you precious time while potentially lowering your water bills.

Types of controllers

There are 3 main types of irrigation controllers: standard, programmable tap timers and smart controllers. What works in one garden or location may not work in another – there is no one size fits all solution. That's why it's important to ask these questions when choosing a controller:

- **Functionality:** how complex are my garden's needs? Think about whether you need multiple programs and zones. What other functions such as start times, seasonal adjustment, connected sensors will 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 or tablet – or a combination of both?
- **Weather data:** will I need to access online weather information? Do I need the controller to be able to access online weather data?

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 the work be done for you

Programming

Programming is a great way to set your system and let it to do the work for you. There are 3 key elements:

1. Irrigation frequency

This can be set by days per week (e.g. Sun, Tues, Thurs) or an interval (e.g. every second day).

2. Irrigation amount/run times

This guide provides recommended run times (in minutes), based on the sprinkler type. It also describes the irrigation amount in depth (in mm) to encourage thinking about irrigation as a replacement to rainfall. Run times vary greatly depending on the sprinkler type and other elements. Testing the application rate on your irrigation system is easy to do by using either the baking pan method or water meter method (see page 21).

3. Adapting to climatic conditions

No year or month is the same:

- Seasonal adjustment is an easy way to adjust the irrigation depth without having to manually change all the run times for each zone. A seasonal adjust of 50% means all the run times are halved, 150% means all the run times are doubled.
- One-off manual irrigations may occasionally be needed during the build-up and wet season if there are extended periods without rainfall (particularly if you don't have a rain sensor).

Seasonal adjustments

From dry to wet and wet to dry

The beginning and end of the wet season varies each year. When the transition between seasons gets underway, the irrigation schedule must balance:

- avoiding overwatering (irrigating just before or after rain)
- avoiding underwatering (and then needing to play catch up for the remainder of the dry season).

A great way to save water is to use the seasonal adjust function on your irrigation controller. This guide recommends an automated approach for irrigation in March, November and December with reliance on a rain sensor to prevent irrigation during and immediately after rainfall.

Without a rain sensor, manual operation of the controller is required for irrigation in March, November and December. The controller should be switched to the off position when it is raining (or rain is forecast) and turned back on 3 days after rain (where more than 5 mm has fallen).

In some years there may be extended periods where no rain falls during the wet season. During these drier periods, a single irrigation event may be applied by manually running a program in the controller.

As a general rule, this may be needed if there has been less than 15 mm of rain:

- **over the past 3 days for lush plants (high water requirements)**
- **over the past 6 days for turf or hardy plants (moderate water requirements).**

Manual irrigation should be applied every second day until the next rain event.

Tip

When it does rain, be sure to adjust your system. This is a great way to save water and money!

Watch me!

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

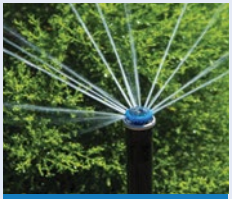
Application rates – how much and for how long?

Knowing how much water your spray or sprinkler is applying is key to understanding how long to water. All sprays and sprinklers produce different amounts of water in different ways and so understanding the **application rate** of your equipment is vital.

Microspray – fixed nozzle

Microsprinkler – rotating sprinkler

Spray heads



Rotary

Gear drive rotor full circle

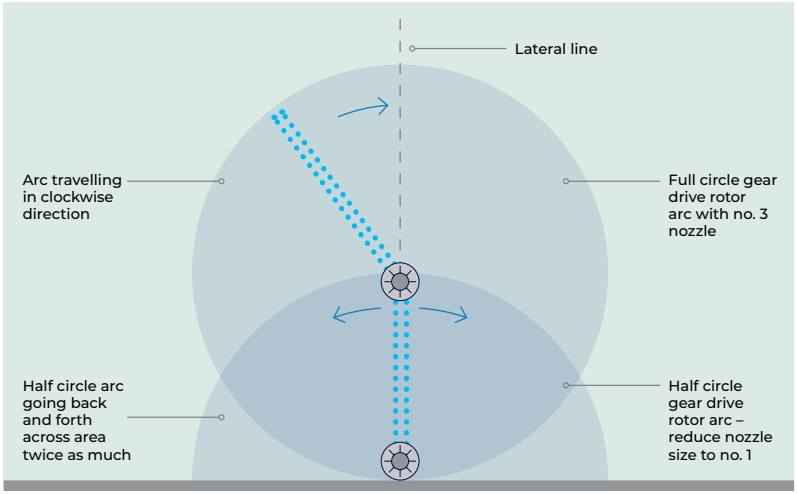
Gear drive rotor half circle

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

Managing half and full circle sprinklers

- For most gear drive rotors, if the sprinkler arc is reduced from full circle to a half circle, then 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



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 put down 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. From your kitchen grab a shallow baking pan and place it within a section of your lawn or garden that is under irrigation.
2. Turn your irrigation system on and run it for 15 minutes.
3. After 15 minutes turn the irrigation off and then 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 the meter readings 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.

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).

Watch me!

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

Soil health and why it matters

Soil in the Darwin region

Soil plays a vital role in plant health but also in holding moisture. The most common topsoils observed around Darwin backyards and open spaces have a sandy loam texture, minimal nutrients and are prone to setting hard without rainfall or irrigation. The good news is that you can improve your soils with organic matter, nutrients and efficient watering to ensure your lawn and garden thrives.

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 below (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	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. Most Darwin soils have a sandy loam texture	Suitable if it contains less than 25% gravel and stones
Heavy clay	Requires a lot of strength to mould	Not suitable for turf or most trees

How to improve your soil

Darwin soils are typically low in calcium, potassium, sulphur and phosphorus. Some of these issues can be overcome by applying gypsum, aged manure and a balanced fertiliser. The choice and quantities will depend on your plant selection so it's best to consult your local horticulturalist for advice. For larger projects it's always best to seek advice from the experts before you get started.

Key nutrient deficiency	Potential solutions (see packaging label for application rates)
Nitrogen	Most manures, composted garden organics and fertilisers high in nitrogen
Calcium	Gypsum and/or agricultural lime addition
Potassium	Sulphate of potash or fertiliser high in potassium
Sulphur	Gypsum, sulphate of potash or fertiliser high in sulphur
Phosphorus	Fertiliser high in phosphorus
Micronutrients	Most manures and compost and some fertilisers

Soil depths – do you have enough topsoil?

Plants do best when there is adequate depth of topsoil. Plants in shallow soils are less resilient and can be vulnerable to deficiencies in water and nutrient supply. They are also likely to be more stressed and susceptible to pest and disease attack.

- For turf and most garden plants, the ideal topsoil depth would be more than 170 mm.
- Sometimes as little as 120 mm can be enough in shaded areas.
- Apart from a few extremely hardy exceptions, turf and most garden plants will struggle in less than 100 mm of topsoil.
- Increasing the available soil depth can occur gradually over time through topdressing. Apply no more than 12 mm each time, allowing plants time to adjust before reapplying.

Managing your soil moisture levels

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

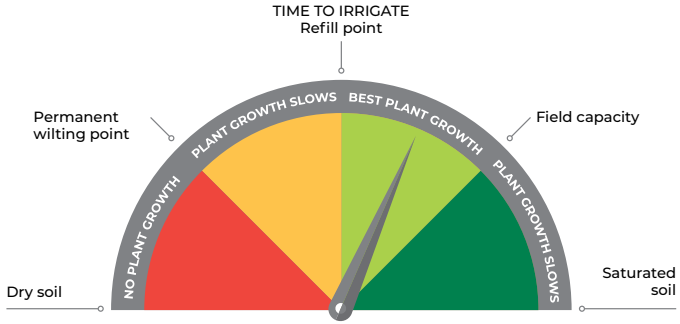
Soil at field capacity will feel moist and should be easy to crumble. Over time water evaporates from soil or removed by the plant (transpiration). As the soil dries the plant need to apply more effort (like sucking harder through a straw) to remove the remaining water from the soil. Eventually the plant can no longer extract any 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 that is held in the soil between field capacity and permanent wilting point. Available water is the maximum amount of water that a soil can supply to growing plants.

When setting your water applications, the duration and timing must maintain the available water in the soil. Most loam soils in the Darwin area will hold around 15% of readily available water for the plant, which is:

- 15 mm of water if the soil depth is 100 mm
- 30 mm of water if the soil depth is 200 mm.

Soil moisture and plant growth



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

Seasonal watering

- During the wet season: rainfall alone will generally maintain the soil water bank between field capacity. Plant growth will be lush and constant as the water bank is full.
- During the dry season: many irrigation systems remain switched off for weeks after the rainfall ends. Without consistent topping up from irrigation, the water bank can fall to permanent wilting point so that plant growth suffers.

Sensors and soil moisture

To maintain optimum soil moisture levels, particularly during November, December and March, we recommend a top up and maintain approach to irrigation. This uses less water overall and avoids damage to plants from water stress.

With a rain sensor: irrigation systems kept on with a low seasonal adjustment. The irrigation will top up moisture levels in drier periods and the rain sensor will prevent irrigation during and immediately after rainfall.

Without a rain sensor: manual operation of the controller is required. The controller should be switched to the off position when it is raining (or rain is forecast) and turned back on 3 days after rain has stopped.

Tip
A rain sensor or rain gauge are great tools to help you maintain the right moisture levels. Alternatively check a reputable weather source. Or you can dig down in 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 (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
- on steeper slopes.

It is very common in gardens, but also frequently occurs in lawns.

How to fix water repellent soils

- Apply a wetting agent (granular or liquid), which are available from most garden centres and landscape suppliers. Check the label for instructions.
- Apply wetting agent prior to cool weather and wash off any material that hits the 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.

Let's talk nutrients

Fertilisers can be either organic (manures and composts) or inorganic (manufactured mineral products). Fertilisers can provide one or two types of nutrients, known as a straight fertiliser, or as a complete fertiliser containing all the nutrients required for plant growth.

Organic based fertilisers, composts and animal manures will contain lesser amounts of nutrients, while inorganic versions contain greater percentage of nutrients. In animal manures, the higher the quality of the diet, the higher the nutrient level of the waste. This is also true of composts.

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

Quality composts contain organic matter, humus and humic acids, and provide a source of beneficial microorganisms to the soil, which can increase the uptake of plant nutrients, improve soil structure and, importantly, increase the water holding capacity of your soil.

Mulch is mighty

Whether it's retaining moisture, suppressing weeds or reducing soil temperature, mulch can be pretty mighty in your garden. Mulches can be either organic (hay, woodchip, grass clippings) or inorganic (gravel, sand, recycled glass).

Organic mulches

These have many advantages, including:

- reducing evaporation and cooling the soil surface
- providing a source of organic material for soil organisms to decompose
- providing a source or plant available nutrients as the organic material breaks down
- increasing the population of soil fauna and flora, reducing the incidence of plant pathogens
- increasing soil infiltration through crumb formation (aggregation)
- improving soil structure and therefore the movement of both air and water through the soil
- increasing organic matter improves the ability of soil to recover after a stress event or disturbance.

Tip
A layer of mulch spread at 40 mm thick reduces evaporation by about 70% compared to bare soil.

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

Mulch is mighty

Inorganic mulches

These are for aesthetics and weed suppression. They have limited advantage for retaining soil moisture and have several disadvantages, including:

- increased retention of heat and transfer to the soil surface and surrounding areas
- no cycling of nutrients into the soil as would occur with an organic mulch
- increased demand for water by plants due to the increased heat and reduction in soil organic matter
- compression and compaction of the soil surface over time, particularly with rock mulches
- reduction in the microorganism population in the soil beneath
- reduction in the transfer and movement of air at the soil surface
- weed growth can still occur and manual weed control is often more difficult when gravel and stone is used.

Tips for applying mulch

- Recommended mulch depth is at least 75-100 mm across the surface (some commercial landscape contracts will request specific thicknesses for mulch layers).
- Organic mulch materials can be applied at greater depths of 150-300 mm, as the rate of decomposition during the wet season will be quite rapid.
- Consider the height of the plants so that small, new plantings don't become smothered by excess mulch.
- Mulch should not be applied against the trunks or stems of plants as this can injure the plant, encourage pathogens and/or fungal attack.
- Always thoroughly wet the soil prior to applying mulches. Some mulch materials and depths will reduce the amount of water that reaches the soil surface (and will require extra irrigation and rainfall). Consider current soil moisture levels and short-term changes to your irrigation schedules when applying thick layers of mulch.
- Mulching applications should coincide with fertiliser applications in the pre dry season (April/May) and pre wet season months (September-November).
- A maintained organic mulch layer will reduce the need for frequent fertiliser applications as nutrients from the organic material are released by microorganisms as the mulch decomposes.
- Ensure that any mulch you use is weed free. Barks and woodchip mulches should be partially composted and aged (not fresh). A 'green' bark or woodchip mulch can draw nitrogen from the soil, competing with plants. Young and newly established plants will often show signs of nutrient deficiency (yellowing leaves) when fresh woodchip or barks are used. Adding adequate nitrogen to a well wetted soil, prior to mulching with these materials, will offset the deficiency.

Soil temperatures measured at 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.

What else can I do to improve my soil?

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 the acidity of a soil.

Soil conditioners

Products such as 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 crystals

Water storage crystals are often made from super-absorbent polymers that are added to soils to increase the water holding capacity around the root system of plants.

- Water crystals should be applied directly around the root zone of plants.
- When irrigation occurs, water crystals absorb and hold the water applied, rather than allowing the water to move out through the soil profile and away from the plant root zone.
- Water crystals are particularly useful in sandy soils or in single tree establishment, where surrounding soils are dry.

Biochar

Biochar is an organic carbon material produced by combustion of plant material, manures or other organic wastes at low oxygen levels. It benefits soils through the increase in water retention, availability of nutrients and by providing pore space for roots and soil microorganisms. The composition of biochars depends on the source material used for their production. It is not widely available.

Creating and maintaining your lawn

How to create a new lawn

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

• All areas should have a slope more than one in 100 (more than 0.6 degrees).

• There should be no depressions or humps, so excess water cannot pool in any location (or install a drainage pit).

Step 2 : Prepare the soil

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

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

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

c) Read off the soil type and amendment recommendation from the table below.

d) For healthy turf the topsoil should consist of at least 170 mm of suitable soil (120 mm will be enough in shaded areas).

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.	Suitable if it contains less than 25% gravel and stones.
Sandy loams, clay loams, light clays	Feels like playdough and can be easily moulded. Most Darwin soils have a sandy loam texture.	Suitable if it contains less than 25% gravel and stones.
Heavy clay	Requires a lot of strength to mould.	**Significant amendment required:** mechanical and frequent application of gypsum at recommended rates.

Creating and maintaining your lawn

Step 3: Choosing the turf

	Mowing	Light traffic			Sport traffic		
		Full sun	Part shade	Lots of shade	Full sun	Part shade	Lots of shade
Buffalo 	Moderate	Yes	Yes	Yes	Yes	Just	No
Couch 	Moderate	Yes	Yes	No	Yes	No	No
Carpet grass 	Low	Yes	Yes	No	Yes	No	No
Zoysia 	Low	Yes	Yes	Yes	Just	No	No

Creating and maintaining your lawn

Step 4: Laying turf

a) Avoid laying on really hot days (above 35 degrees).

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

c) Lay turf so no gaps between rolls. Cut turf with 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 the turf cannot be pulled up easily (about 3 to 5 days after laying).
- daily until turf is 3 weeks old and is well established.

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

Creating and maintaining your lawn

Maintaining your lawn

Lawns are responsible for the bulk of water use in landscapes. These tips can help improve the condition of your lawn and its water efficiency:

- **Mow to the right height**
  Generally, you should only cut 1/3 of the overall height of your turf on each mow. Lawns cut too low generally have shallow root systems (making them more susceptible to drying out), while lawns that are left to grow too long and then mowed low can be 'scalped' (which exposes growing tips and increases the chances of pest and disease attack).
- **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 (as these will only encourage maximum leaf growth at the expense of root growth).
- **Mow without a catcher occasionally**
  Consider doing this once a month. By not using a catcher you are returning the lawn clippings directly to your soil. This is good organic matter that will improve soil composition and help it to retain moisture.
- **Top-dress annually**
  A fine compost or granular manure will replace lost organic matter and nutrients. This is particularly important for lawns that are mowed with catchers constantly.
- **Drainage is key**
  For best results, plan and implement soil preparation prior to turf. This includes excavation for fall and creating a suitable subsoil and topsoil layer for grasses.
- **Aerate compacted areas**
  Compaction may become an issue over time, particularly from heavy traffic by people, animals or vehicles. Aerate by spiking and/or improve the soil structure by adding organic top-dress, composts and manures. Note: the product you add to heavy soils should be coarser than the soil to avoid clogging up any of the soil pores. Adding coarse sand to sieved composts and manures is best.

Creating and maintaining your lawn

Lawn species best suited to the Darwin region

Botanical name	Common name	Watering requirement	Additional information
Zoysia japonica	Empire couch, Japanese lawn grass, zoysia	Moderate	Suitable for both sun and shade, tolerates traffic and wear. Mow regularly to avoid overgrowth and scalping.
Axonopus compressus, A. fissifolius (syn. A. affinis)	Buffalo grass, Carpet grass, Tropical Buffalo grass, broad and narrow leaf carpet grass	High. Note the narrow leaf species (*A. fissifolius*) has lower water requirements	Suitable for partly shaded to full sun areas, reduced mowing frequencies due to flat growth. Easy care. Dark green in colour, tolerates heavier soils.
Cynodon dactylon	Green couch, Greenlees park	Moderate	Struggles in more than 4 hours of shade. It is heat and wear tolerant. Requires frequent mowing.
Paspalum notatum	Bahia grass, Hairy leaf buffalo, smooth variety is Argentine	Moderate	Hairy leaves can cause irritation. Full sun, heat and wear tolerant. Survives on little water and greens up when rain starts. Mowing frequency is high during growing season. Considered weedy by some, but common in urban parks and ovals.

Watering guides for different plant types

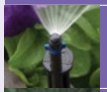
Home lawns

Are your lawns your pride and joy or the bane of your existence? Either way, the following tips can help!

Choosing and maintaining your turf

1. If you're spending time and money on a new lawn, it's always best to ask your local turf farm or a horticultural expert for advice on choosing a grass type.
2. Top-dress to fill low or shallow spots. Top-dress should be a mix of soil and fine compost/manure. Aerate to incorporate.
3. Use a suitable complete fertiliser to improve your lawn.
4. As a rule of thumb, water lawns 3 times a week. Watering less frequently can be a good way to encourage strong root growth!
5. Mow at taller heights particularly during the hottest months. This avoids heat stress and evaporation from exposed soil.
6. Don't be afraid to change turf varieties as your trees mature and provide more shade.
7. Vehicles, humans and animals cause wear and compaction. Common fixes are manual or mechanical spiking, or coring.

Residential lawns – Irrigation schedule

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	Every two days									
Depth	-	-	5 mm									
Seasonal adjust %	-	-	30	90	90	90	100	100	110	100	60	60
Arc	**Length of irrigation event to program controller (minutes) for 5 mm depth**											
 **Half circle**	Nil	Nil	**7 minutes** per zone									
 **Full circle**	Nil	Nil	**33 minutes** per zone (use cycle and soak – 20 minutes per cycle)									
 **All arcs**	Nil	Nil	**6 minutes** per zone									
 **All arcs**	Nil	Nil	**18 minutes** per zone									
 **Half circle**	Nil	Nil	**16 minutes** per zone									
 **Full circle**	Nil	Nil	**31 minutes** per zone (use cycle and soak – 20 minutes per cycle)									

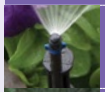
Lush tropical gardens

Tropical plants originate from rainforest type environments and thrive in moist, fertile soils that are constantly topped up by falling leaf litter. With this in mind, they need careful placement in your garden and have specific needs when it comes to soil and watering.

1. The best tropical gardens are protected and sheltered under trees or buildings – creating microclimatic zones that are shady and humid.
2. Maintain the microclimate around your tropical garden with trees, shrubs or built shade and maintain a soil that is moist to touch.
3. Pop-up spray heads and rotary heads are your best choices for irrigation.
4. Keep spray heads well clear of foliage that will block the application of water. Risers can be added to lift them as your plants mature.
5. To enrich poor soils, use organic mulches such as forest mulch and hays. Light applications of composts and manures can also be used.

Tip
Tropical plants that prefer shade include: Aglaeonaemas, Diffenbachia, Alocasias, Caladiums, ferns, Bromeliads, Philodendrons.

Lush tropical gardens – watering requirements

		Wet Season				Dry Season					Build Up		Wet
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency		Nil	Nil	Every second day									
Depth		-	-	8 mm									
Seasonal adjust %		-	-	30	100	100	100	100	100	110	110	80	60
Arc		**Length of irrigation event to program controller (minutes) for 8 mm depth**											
	**Half circle**	Nil	Nil	**11 minutes** per zone									
	**Full circle**	Nil	Nil	**53 minutes** per zone (use cycle and soak – 30 minutes per cycle)									
	**All arcs**	Nil	Nil	**9 minutes** per zone									
	**All arcs**	Nil	Nil	**28 minutes** per zone (use cycle and soak – 20 minutes per cycle)									
	**Half circle**	Nil	Nil	**25 minutes** per zone									
	**Full circle**	Nil	Nil	**50 minutes** per zone (use cycle and soak – 25 minutes per cycle)									

Hardy plants and hedges

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

1. Ask your local horticultural expert for advice on what to plant and where.
2. A well-structured and fertile soil will offer the best opportunity for healthy plants and effective water use. When establishing, add organic material such as manures, composts and mulches into the planting hole.
3. Saturate the soil prior to planting and water deeply for the first few months after planting to establish deep roots.
4. Continue to enrich soils, using organic mulches such as forest mulch, hays and light applications of composts and manures.
5. Keep foliage away from sprinklers so they can water evenly. Risers can be added to lift the sprinklers as plants mature.
6. Light pruning can occur during and after the wet season. A hard prune prior to the wet will encourage new growth.

Tip
Crotons should be planted in protected locations. Hardy species for other areas include Ixora, Wrightia, Frangipani, Hibiscus, Murraya, Allamanda, Duranta, Calliandra, Cycads.

Hardy plants and hedges – watering requirements

		Wet Season				Dry Season					Build Up		Wet
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency		Nil	Nil	Every second day									
Depth		-	-	6 mm									
Seasonal adjust %		-	-	30	100	100	100	110	110	110	110	80	60
Arc		**Length of irrigation event to program controller (minutes)**											
	**Half circle**	Nil	Nil	**9 minutes** per zone									
	**Full circle**	Nil	Nil	**40 minutes** per zone (use cycle and soak – 20 minutes per cycle)									
	**All arcs**	Nil	Nil	**7 minutes** per zone									
	**All arcs**	Nil	Nil	**22 minutes** per zone									
	**Half circle**	Nil	Nil	**19 minutes** per zone									
	**Full circle**	Nil	Nil	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)									

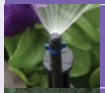
Native gardens

Northern Territory native plants will always be the most suited to our local soils and climate. Once established, they can withstand long dry periods over 2 to 3 seasons – making them the superheroes of any garden.

1. When establishing, add organic material such as manures, composts and mulches into the planting hole. A popular myth is that native plants shouldn't be fertilised. However, most organic and native branded fertilisers are safe to use and should be applied up to three times a year.
2. Saturate the soil prior to planting and ensure deep watering for the first few months to establish deep root systems.
3. Use organic mulches and top up through the year.

Tip
Popular native plant choices include grasses, groundcovers such as Chrysopogon and Gardenia and shrubs such as Acacia, Grevillea, Vitex and Bossiaea.

Native gardens – watering requirements

		Wet Season				Dry Season					Build Up		Wet
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency		Nil	Nil	Nil	Two days per week							Nil	Nil
Depth		-	-	-	5 mm							-	-
Seasonal adjust %		-	-	-	100	100	100	100	100	120	100	-	-
Arc		**Length of irrigation event to program controller (minutes)**											
	**Half circle**	Nil	Nil	**7 minutes** per zone								Nil	Nil
	**Full circle**	Nil	Nil	**33 minutes** per zone (use cycle and soak – 20 minutes per cycle)								Nil	Nil
	**All arcs**	Nil	Nil	**6 minutes** per zone								Nil	Nil
	**All arcs**	Nil	Nil	**18 minutes** per zone								Nil	Nil
	**Half circle**	Nil	Nil	**16 minutes** per zone								Nil	Nil
	**Full circle**	Nil	Nil	**31 minutes** per zone (use cycle and soak – 20 minutes per cycle)								Nil	Nil

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 the dry and build up.

Monthly

Check your rotary and gear drive heads during the dry and build-up.

Beginning and end of each season

A full check of your system – including any sensors – is best at the start and end of both the dry and the wet.

Troubleshooting

Dry or extra wet patches in turf or gardens or water running down pathways are examples of signs that something might be wrong and it's time to do a check.

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?

Advanced tips for commercial operators

Watering requirements – premier playing fields

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Manual*		4 days per week									
Depth	5mm		5 mm									
Seasonal adjust %	100	100	60	100	100	100	100	110	120	120	80	70
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**	As for 5 mm program		**16 minutes** per zone									
 **Full circle**	As for 5 mm program		**31 minutes** per zone									

* Single, one-off irrigation events as required.
Manually operate a single program if there has been less than 15 mm of rain in the past 6 days.

Watering requirements – most playing fields

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	4 days per week									
Depth	-	-	5 mm									
Seasonal adjust %	-	-	25	90	90	100	100	100	110	100	60	60
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**	-	-	**16 minutes** per zone									
 **Full circle**	-	-	**31 minutes** per zone									

Watering requirements – feature lawns

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	Every second day									
Depth	-	-	6 mm									
Seasonal adjust %	-	-	30	100	100	100	100	110	110	110	80	60
Arc	**Length of irrigation event to program controller (minutes)**											
 **All arcs**	Nil	Nil	**7 minutes** per zone									
 **All arcs**	Nil	Nil	**22 minutes** per zone									
 **Half circle**	Nil	Nil	**19 minutes** per zone									
 **Full circle**	Nil	Nil	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)									

Watering requirements – active parkland lawns

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	Every second day									
Depth	-	-	5 mm									
Seasonal adjust %	-	-	30	100	100	100	100	110	120	100	60	50
Arc	**Length of irrigation event to program controller (minutes)**											
 **All arcs**	Nil	Nil	**6 minutes** per zone									
 **All arcs**	Nil	Nil	**18 minutes** per zone									
 **Half circle**	Nil	Nil	**16 minutes** per zone									
 **Full circle**	Nil	Nil	**31 minutes** per zone (use cycle and soak – 20 minutes per cycle)									

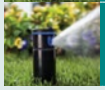
Watering requirements – passive parkland lawns

		Wet Season				Dry Season					Build Up		Wet
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency		Nil	Nil	Every second day									
Depth		-	-	5 mm									
Seasonal adjust %		-	-	20	80	80	80	90	90	100	90	50	50
Arc		**Length of irrigation event to program controller (minutes)**											
	**All arcs**	Nil	Nil	**6 minutes** per zone									
	**All arcs**	Nil	Nil	**18 minutes** per zone									
	**Half circle**	Nil	Nil	**16 minutes** per zone									
	**Full circle**	Nil	Nil	**31 minutes** per zone (use cycle and soak – 20 minutes per cycle)									

Watering requirements – lush roadside gardens

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	Every second day									
Depth	-	-	8 mm									
Seasonal adjust %	-	-	30	100	100	100	100	110	110	110	80	60
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**			**11 minutes** per zone									
 **Full circle**			**53 minutes** per zone (use cycle and soak – 30 minutes per cycle)									
 **All arcs**	Nil	Nil	**9 minutes** per zone									
 **All arcs**	Nil	Nil	**28 minutes** per zone (use cycle and soak – 20 minutes per cycle)									
 **Half circle**	Nil	Nil	**25 minutes** per zone									
 **Full circle**	Nil	Nil	**50 minutes** per zone (use cycle and soak – 25 minutes per cycle)									

Watering requirements – hardy plant and hedge roadside gardens

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	Every second day									
Depth	-	-	6 mm									
Seasonal adjust %	-	-	30	100	100	100	100	110	110	120	80	60
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**			**9 minutes** per zone									
 **Full circle**			**40 minutes** per zone (use cycle and soak – 20 minutes per cycle)									
 **All arcs**	Nil	Nil	**7 minutes** per zone									
 **All arcs**	Nil	Nil	**22 minutes** per zone									
 **Half circle**	Nil	Nil	**19 minutes** per zone									
 **Full circle**	Nil	Nil	**37 minutes** per zone (use cycle and soak – 20 minutes per cycle)									

Watering requirements – native roadside gardens

	Wet Season				Dry Season					Build Up		Wet
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	Nil	Nil	Nil	Two days per week								Nil
Depth	-	-	-	5 mm								-
Seasonal adjust %	-	-	-	100	100	100	100	110	110	100	50	-
Arc	**Length of irrigation event to program controller (minutes)**											
 **Half circle**	Nil	Nil	Nil	**7 minutes** per zone								Nil
 **Full circle**	Nil	Nil	Nil	**33 minutes** per zone (use cycle and soak – 20 minutes per cycle)								Nil
 **All arcs**	Nil	Nil	Nil	**6 minutes** per zone								Nil
 **All arcs**	Nil	Nil	Nil	**18 minutes** per zone								Nil
 **Half circle**	Nil	Nil	Nil	**16 minutes** per zone								Nil
 **Full circle**	Nil	Nil	Nil	**31 minutes** per zone (use cycle and soak – 20 minutes per cycle)								Nil

Watering requirements – roadside turf

		Wet Season				Dry Season					Build Up		Wet
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency		Nil	Nil	Every second day									
Depth		-	-	5 mm									
Seasonal adjust %		-	-	30	90	90	90	100	100	110	100	60	60
Arc		**Length of irrigation event to program controller (minutes)**											
	**All arcs**	Nil	Nil	**6 minutes** per zone									
	**All arcs**	Nil	Nil	**18 minutes** per zone									
	**Half circle**	Nil	Nil	**16 minutes** per zone									
	**Full circle**	Nil	Nil	**31 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) that are held together into stable larger 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 that 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 for 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.
Biochar	A manufactured product much like charcoal where all the gases in the wood are burnt out essentially leaving a high carbon structure containing a large surface area capable of increasing the soil's moisture, microbe and nutrient holding capacity. Biochar can be described as a soil conditioner.

Term	Description
Compost tea	There are different recipes and methods available to research and find which ones suits you best, but think of it as a giant tea bag of compost or manure that is steeping in a bucket of water. This allows the beneficial nutrients, microbes and fungi to be infused in the water – ready for application to your soil. Compost tea can be described as a soil conditioner. It's not a fertiliser but does reduce the need for fertilising.
Cycle and soak	A function that can be programmed into most automated irrigation controllers and repeats the run time on a specific zone. It is used to reduce surface run off and improve deeper soaking in of the water. A cycle and soak function is ideal for sloping and narrow surfaces such as road reserves.
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 in that if your sprinkler application rate is 15 mm/hr then to achieve 5 mm of depth you would 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 that is available for your irrigation system and is expressed in litres over minutes (l/min). Sprinkler types will often state the minimum amount of flow required for the sprinkler to operate.
Hydrozoning	This is a planting principle where you cluster plants together that have similar watering requirements and use the appropriate sprinkler and run time to ensure that the plants are collectively not being over or under watered.
Irrigation zone	Also referred to as an irrigation station, this is a section of area that is 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 that 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 that is pushing through your pipes. When your irrigation system is operating, it is under constant pressure and it's important that the pipes you use are rated for the pressure they will be put under. Pressure ratings are labelled on pipes for your reference.
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 and allows 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. Generally, soils in the Top End are slightly acidic and native plants are therefore more adapted to these conditions. 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 overtime. 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 surface. 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 then 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). This is often seen in early rains here in the Top End where water will sheet and run off surface as the soil has been dry for an extended period of time. 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 soils that are hydrophobic (water repellent) to absorb water.

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