CHAPTER 2
Water during a drought

This chapter will help you determine stock water needs across a year and the options for managing on-farm water resources.

Key messages

- **Do water budgets early, based on your experience with water supplies, how much water you have available and how much your stock will need.**
- **Have a water plan that considers the worst case scenarios.**
- **Evaporation rates can be very high over dry summers and small dams are inefficient water storages.**
- **Consider water reticulation systems and transfer requirements between storages, particularly for containment areas.**
- **The major threat to water quality during drought is high levels of salt, although algae and animal manure can foul water following heavy summer rains or strong winds.**
- **Water can be tested for salinity and other minerals to check suitability for various classes of stock, as well as for toxicity of algal blooms.**
- **Cows will drink up to 100 litres of water a day.**

Water is essential for animal survival and performance. Poor water quality is a common cause of under-preforming animals. Cattle must be provided with access to good quality water (preferably from troughs) at all times.

Will you have enough water?

Knowing your property and how water supplies perform in times of drought is essential information for the planning phase.

Calculating the total water available and the total required by stock will tell you how many stock, and of what class, you can carry through a dry period.

To do a water budget, list all the dams by paddock and calculate the water available in each one. Add these quantities together to find out the total water available on your farm. Using this figure and the total water required by stock, based on Table 2.1, determine how many animals you can carry through.

Animal requirements

The amount of water an animal requires will depend on a number of factors, including:

- the class of animal (a lactating cow will require significantly more water than a dry cow or yearling steer)
- the temperature and season (cattle consume significantly more water in summer and during high temperatures)
- the feed on offer (grains are a dry feed, while pasture contains some moisture)
- the quality of the water (water with higher salt levels will increase consumption).

Periods of high temperatures (>38°C) will increase an animal's water requirements beyond the levels in Table 2.1.

Table 2.1: Water requirements litres/animal/day.

Stock type	Consumption (L/day)
Sheep	
Weaners	up to 4
Adult dry sheep	up to 6
Ewes with lambs	up to 10
Cattle	
Weaners (250-300 kg)	up to 55
Dry stock	up to 80
Lactating first calf heifers (350-400 kg)	up to 90
Lactating cows (500 kg)	up to 100
Horses	up to 50

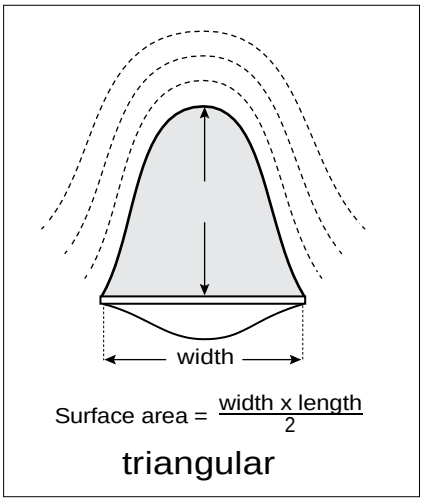
For daily average and yearly as well as winter and summer stock drinking requirements for cattle and other livestock types refer to 'Managing farm water supplies' agriculture.vic.gov.au/__data/assets/pdf_file/0003/319386/2016-DEDJTR-Farm-Water-Supplies-A5-web.pdf

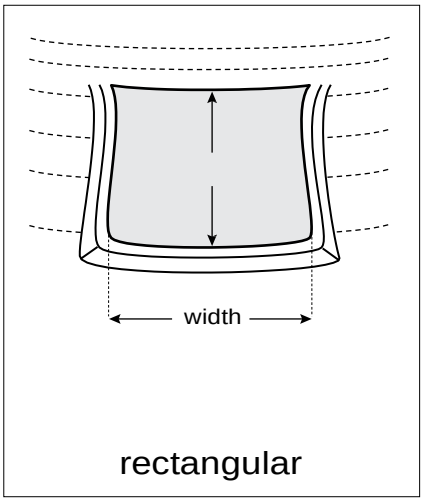
How to calculate how much water you have

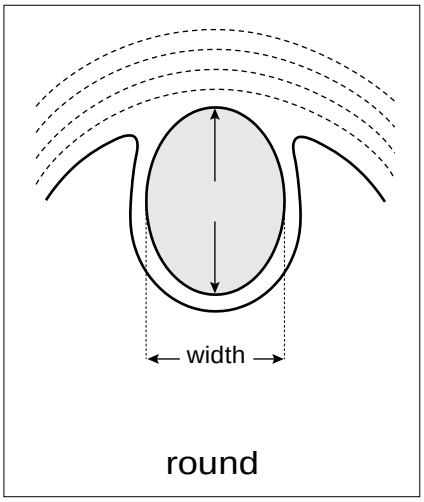
Step 1

Calculate the surface area of the dam. For both rectangular and round dams, surface area can be estimated by multiplying the length by the width of the dam. Example: 40 m wide x 20 m long = 800 m^2. For triangular-shaped dams, surface area can be estimated by (width x length) ÷ 2.

Picture source – www.water.nsw.gov.au/__data/assets/pdf_file/0010/547237/licensing_rights_harvest_dams_what_size_are_your_existing_dams.pdf







Step 2

Use the following formula to calculate the volume of the dam in cubic metres.

Volume (m^3) = 0.4 x Surface area x Depth

The 0.4 conversion factor takes into account the slope of the sides of the water storage.

Example: Volume = 0.4 x 800 m^2 x 5 m = 1,600 m^3

To convert this to megalitres (ML) divide by 1,000 = 1.6 ML

Step 3

Evaporation can be one of the biggest losses from farm dams, especially small or shallow dams. For example, average annual evaporation figures for farm dams based on Ballarat evaporation data are:

- a small farm dam 3 m deep would lose around 60%
- a small to medium-sized dam 4 m deep would lose around 43%
- a medium dam 5 m deep would lose around 37%
- a large dam 7 m deep would lose around 27%

In the hotter northern parts of the state, these figures could be higher. Although these are annual estimates, most evaporation will occur between October and April. Seepage into the water table may also need to be taken into account. Variation between dams can be significant; experience will guide you as to which dams cannot be relied on to hold water for long and it may be worthwhile to graze paddocks with unreliable water storage early. Regular monitoring or prior knowledge of a dam's capacity to hold water is necessary to accurately estimate how long your dam water will last. More depth may need to be taken off to account for this seepage.

Example: 1.6 ML dam less 43% in evaporation (not including seepage) as 688,000 litres (0.69 ML) lost = 912,000 litres (0.91 ML) available.

Step 4

Use Table 2.1 to calculate the daily requirements of all animals that rely on the dam for their water.

Example: 200 spring-calving cows consuming 100 litres a day will consume 20,000 litres/day.

Divide the total dam capacity by the daily water usage.

Example: 912,000 litres/20,000 litres = 46 days of water available.

An online farm water calculator can be used to calculate stock water requirements and water available on farm. See www.agriculture.vic.gov.au/watercalculator

Water quality

Having water of a quality that is 'fit for purpose' is important. Water quality can affect plant growth, livestock health, soil quality, farm equipment and infrastructure and domestic use.

The quality of a water source depends on the season and weather conditions. Evaporation increases the concentration of salts while a flush of water dilutes salts but may increase sediment, and runoff of fertilisers, manure or nutrients.

Water quality should generally be visually monitored weekly to check for any algal blooms, clarity of the water (how cloudy or muddy the water appears) and dead wildlife (such as ducks) or livestock that may have become stuck in unfenced water sources. In hotter weather or periods of prolonged moisture stress, daily visual checks are preferable.

The major threat to water quality during drought is high levels of salt, although algae and animal manure can foul water following heavy summer rains or strong winds.

Salt content

Salinity is a major water quality issue in areas where accumulated salts are mobilised in the landscape and make their way into waterways and dams. Salinity refers to all the mineral salts present in the water, including sodium, calcium, magnesium, chloride, sulphate and carbonate. Evaporation of water sources increases the concentrations of salts and the problems associated with them. During a drought year, low water levels can result in doubling of salt concentrations over summer.

Table 2.2 lists salt levels in drinking water that can be tolerated by various classes of stock. In general, the salt content of water should not exceed 9,600 ppm and the magnesium level should not exceed 600 ppm.

Pollution

During the 1982-83 and 2015-16 droughts, many dams in Victoria were severely polluted by manure and dried vegetation blowing from bare paddocks or by summer rainfall run-off. The water turned black and gave off a putrid smell. Stock stopped drinking it.

Retention of ground cover on paddocks adjacent to dams will help avoid this problem developing.

Algal blooms

Algal blooms are common over summer months when water temperatures rise as dams become shallow and the levels of phosphorus and nitrogen in the water build up.

Most algal blooms are not toxic. Some blue-green algae, however, produce toxins that can have serious health implications for humans, animals and birds drinking or coming in contact with the water. It can kill animals within a few hours of ingestion.

Blue-green algae forms a scum that looks like green acrylic paint and leaves sky blue marks on rocks or plants around the edge of the dam.

If you suspect you have a blue-green algal bloom:

- Isolate all stock from the dam or water supply.
- Collect a sample for testing by a water laboratory (use gloves – don't allow the water to come in contact with skin).
- Contact a veterinarian if animals show symptoms of poisoning (sudden death, loss of appetite, breathing difficulties, muscle twitches, weakness, scours, photosensitisation – any white areas of skin become swollen and reddish). In cases of blue-green algal poisoning, green staining may be seen on the muzzle, feet or legs of poisoned stock.

Table 2.2 Salt tolerance in drinking water for various classes of cattle presented as parts per million (ppm) and units of electrical conductivity (EC units).

Water Category	Classes of stock	EC Units (µs/cm)	Total soluble salts (ppm)	Magnesium (ppm)
1	Suitable for cattle of all ages	<5,000	<3,200	<400
2	Generally unsuitable for calves and weaner stock if they are unaccustomed to the water. Suitable for dry, mature cattle.	5,000–10,000	3,200–6,400	<600
3	Caution needed with cattle if they are unaccustomed to the water.	10,000–15,000	6,400–9,600	<600
4	Generally unsuitable for all cattle.	>15,000	>9,600	Any level
5	Generally unsuitable for all cattle.	Any level	>9,600	>600

- Contact Agriculture Victoria for further advice on controlling the algal bloom. See agriculture.vic.gov.au/agriculture/farm-management/blue-green-algae-issues/managing-blue-green-algae-in-farm-water-supplies for further information.

Options to reduce water requirements

Reducing stock numbers

- What are your core stock numbers?
- How many do you want to keep?
- How many do you need to keep?
- How many can you afford to keep?
- Can you agist some?

Relocating stock

Reducing the energy stock expend accessing feed can reduce their water requirements. To reduce this energy expenditure, it may be necessary to relocate the stock to a smaller paddock or a stock containment area where movement is more restricted and deliver the herd's daily feed requirements to them. If water is not troughed to this area, you will need to provide enough water daily for stock requirements – use Table 2.1 to calculate stock water requirements.

Minimising evaporation

To conserve water and maintain good water quality, one large deep dam is better than numerous shallow dams.

It may be advantageous to pump the contents of a number of smaller dams into a single larger dam to minimise evaporative loss and save water.

Reticulating from dams rather than allowing animals direct access

Reticulating from dams avoids pugging and bogging problems and allows a more efficient use of the water. Reticulation systems must be simple, reliable and have sufficient capacity to meet peak demands.

Site new troughs, tanks and pipes to suit future needs.

Protecting dams from wind-borne contamination

If possible, keep adequate ground cover on adjacent paddocks to prevent material blowing into the dam.

If ground cover is already low, fencing can be used to trap blowing material before it reaches the water. A close-wired fence on the windward side is a worthwhile investment.

Once material is in the dam, aeration of the water is necessary to improve its condition and make it more acceptable to stock. This is best done by pumping to a tank and reticulating to a trough. If aerated water is returned to the dam, the organisms growing on the organic material will quickly use all the oxygen again.

Actions to address a water shortage

Carting water

Due to the volumes of water required and the frequency it needs to be supplied (usually daily), carting water is a labour-intensive operation. Consider whether you have the labour, equipment and time available to commit to this option.

Seepage and evaporation from earthen dams during extended dry periods means it is not generally feasible to put carted water into these dams. It is best to put carted water into a tank system and reticulate the water to troughs for the stock to access.

Be aware of the quality of the water source the water is being carted from. During droughts, water sources such as bores and streams may become quite salty, affecting the stock's willingness to drink the water. Stream sources may also become quite stagnant resulting in contamination from algae and animal manures, particularly following heavy summer rains.

A dam that cannot provide enough drinkable stock water five or more years out of 10 is not considered a reliable water source.

Sinking bores

Investigate likely water yields and quality before drilling emergency bores. Consult your relevant water authority if you are considering sinking a bore as you will need a bore construction licence. For more information and to apply for a licence and permission to take and use ground water, visit waterregister.vic.gov.au/water-trading/my-water or contact your relevant Rural Water Corporation.

Digging new dams

Do not dig a new dam when soil moisture is low.

Only build earth dams when soil is moist enough for maximum compaction. A permit is required to dig a new dam on a waterway.

Seek advice and permission before construction from your Catchment Management Authority.

When seasonal conditions improve

Build a contingency plan for the next dry period so you don't get caught unprepared. Take steps to drought-proof your property and its enterprises.

Farmer tips from past droughts

- Have a water plan and undertake a water audit, taking into consideration the worst case scenario.
- Calculate stock water requirements and water available using the online farm water calculator www.agriculture.vic.gov.au/watercalculator
- Assess reliability of all your water sources. A dam that cannot provide enough drinkable stock water five or more years out of 10 is not considered reliable.
- Have a large, fenced catchment dam on your property and reticulate from this to troughs.
- Set up your reticulation system properly from the start. Do it in stages if necessary.
- Prepare early and ensure you have any necessary permits in place well before summer.
- Plant trees strategically to reduce evaporation from dams.

Water testing

The best way to be certain about the quality of your water is to have it tested. The following laboratories test water, but there may be others. Check that the laboratory you use is accredited by the National Association of Testing Authorities (NATA) for the test you are requesting. NATA is the authority that provides independent assurance of technical competence through a network of best practice industry experts.

SGS

(NATA accredited)

10/585 Blackburn Road, Notting Hill

(03) 9574 3200

Irrigation and stock water analysis available (salinity (EC), calcium, magnesium, sodium, iron, total oxidised nitrogen, pH, chloride, total hardness and other chemistry). Blue-green algae testing is also available at an additional cost. Microbiological testing for human consumption is available in Shepparton (03) 5821 1708 and Mitcham (03) 9874 1988.

Water Quality Laboratory

(NATA accredited)

Deakin University, Warrnambool

(03) 5563 3481

Email: wql-info@deakin.edu.au

Water testing service – Water chemistry (NATA accredited) and blue-green algae (not NATA accredited).

ALS Water Resources Group

(NATA accredited)

22 Dalmore Drive, Caribbean Business Park, Scoresby

(03) 8756 8000

Email: melbournewrg@alsglobal.com

(Regional laboratories in Wangaratta, Bendigo, Traralgon and Geelong – basic water testing only).

Domestic, stock and irrigation packages available (includes pH, electrical conductivity, turbidity, calcium, potassium, magnesium, hardness, sodium, iron, manganese, nitrate, chloride, sodium absorption ration) and blue-green algae.

Online resources

Water

Farm Water Solutions (Package) at www.agriculture.vic.gov.au/farmwater

Dams

agriculture.vic.gov.au/agriculture/farm-management/managing-dams/how-long-will-my-dam-water-last

agriculture.vic.gov.au/agriculture/farm-management/managing-dams/organic-pollution-in-farm-dams

Farm water calculator

www.agriculture.vic.gov.au/watercalculator

Water quality

agriculture.vic.gov.au/agriculture/farm-management/soil-and-water/water/farm-water-solutions/technical-resources/managing-farm-water-supplies-in-drought

Water supply for stock containment areas

agriculture.vic.gov.au/agriculture/farm-management/managing-dams/water-supply-for-stock-containment-areas