

Healthy Soil & clean water =  
Healthy Crops & Pasture =  
Healthy Livestock & People



Water quality:

- ▶ Salts
- ▶ Sodium
- ▶ Magnesium

***Farm water quality is not always easy to assess. The same supply may be used for livestock, spray tanks and even irrigation.***

A test for the quality of water intended for fairly general use needs to cover only a few things, but the one set of results may need to cover many different uses.

The SWEP Farm Water test includes pH, EC, Calcium, Magnesium, Sodium, Potassium, Chloride, Carbonate, Bicarbonate, Copper, Zinc, Iron, Manganese. Due to the diverse uses, there are no desirable levels or comments included. Use the table here as a guide to how your water quality stacks up.

### Maximum Permissible Levels for Magnesium, Aluminium, Iron and Nitrate Nitrogen for livestock

	Horses ppm	Cattle ppm	Sheep ppm
Magnesium (Mg)	250	400	500
Aluminium (Al)	5	17	10
Iron (Fe)	1	1	1
Nitrate (NO <sub>3</sub> )	90	130	190

### Total Soluble Salt and Magnesium limits in water for livestock

Livestock	Total Soluble Salts (ppm)	Magnesium	
		ppm	me/litre
Poultry	3500		
Pigs	4500		
Horses	6000	250	21
Cows in milk	6000	250	21
Ewes with lambs	6000	250	21
Beef Cattle	10000	400	33
Adult sheep on dry feed	14000	500	42

**Note:** Magnesium Tolerance for Pigs and Poultry is unclear, but is likely to be less than 250 ppm.

### Guide to the number of irrigations with water of varying salinity levels, between leaching grains or irrigation with non-saline water

Total Soluble Salts (ppm)	Number of irrigations for crops of:		
	High Salt Tolerance	Medium Salt Tolerance	Low Salt Tolerance
640	no limit	15	7
1280	11	7	4
1920	7	5	2
2650	5	3	2
3200	4	2-3	1
3840	3	2	1
4480	2-3	1-2	Unsuitable
5120	2	1	Unsuitable

### More information:

**Water Fact Sheet #2a** – Water for Irrigation (Total soluble salts).

**Water Fact Sheet #2b** – Water for Irrigation (Dissolved sodium).

**Quality Aspects of Farm Water Supplies** . Government Printers Melbourne.

If you have any other questions, please contact us on (03) 9701 6007, or email: [services@swep.com.au](mailto:services@swep.com.au)

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Water quality:

- ▶ Salts
- ▶ Sodium
- ▶ Hardness

**Two important components of water quality (where suitability for irrigation is concerned) are salinity and Sodium levels. This Fact Sheet focuses on the Total Soluble Salt (salinity) level of the water.**

To assess the general suitability for irrigation use the result for Total Soluble Salt to look up the quality class in the table (right).

Water Fact Sheet #3 can then be used to match the outcome with an appropriate crop variety.

You should also read Water Fact Sheet #2 as this will give you a guide about the dissolved Sodium level and its likely affect on the soil.

## The classes of Water according to content of Total Soluble Salts

<p><b>Class 1:</b> Low salinity</p>	<p>Less than 175 ppm</p>	<p>This water can be used with most crops on most soils, and all methods of application. There is little likelihood that a salinity problem will develop. No special leaching procedures are required, except on extremely low permeability soils.</p>	<p><b>Class 4:</b> Very high salinity</p>	<p>1500 to 3500 ppm</p>	<p>This water is not suitable for irrigation unless soils are permeable, drainage is adequate and water is applied in excess to provide considerable leaching. Salt-tolerant crops should be selected.</p>
<p><b>Class 2:</b> Medium salinity</p>	<p>175 to 500 ppm</p>	<p>This water can be used with a moderate amount of leaching. It is suitable for plants with medium salt tolerance, usually without special practices for salinity control. Sprinkler irrigation with the more saline waters in this class may cause leaf scorch on sensitive crops, especially on hot days and low application rates.</p>	<p><b>Class 5:</b> Extreme salinity</p>	<p>Above 3500 ppm</p>	<p>This water may be used only on permeable, well-drained soils under good management (especially in relation to leaching) and for salt-tolerant crops only. It may be suitable for emergency use.</p>
<p><b>Class 3:</b> High salinity</p>	<p>500 to 1500 ppm</p>	<p>This water cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required, and the salt tolerance of the plants to be irrigated must be considered.</p>	<p><b>More information:</b></p> <p><b>Water Fact Sheet #1</b> – Using Farm Water.</p> <p><b>Water Fact Sheet #2b</b> – Water for Irrigation (Dissolved Sodium).</p> <p><b>Quality Aspects of Farm Water Supplies</b> . Government Printers Melbourne.</p> <p>If you have any other questions, please contact us on (03) 9701 6007, or email: <a href="mailto:services@swep.com.au">services@swep.com.au</a></p>		

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Water quality:

- ▶ Salts
- ▶ Sodium
- ▶ Hardness

**Two important components of water quality (where suitability for irrigation is concerned) are salinity and Sodium levels. This Fact Sheet focuses on the Dissolved Sodium level of the water.**

Irrigation water that is high in Sodium can have a significant impact on the Exchangeable Sodium Percentage (ESP) of the soil. Over time, this can lead to reduced moisture infiltration, poor drainage and a tendency for the soil to form a hard surface crust. Together, these changes can have serious consequences for the long-term sustainability of the farming system.

From the level of Sodium in the test results (together with the quantity of Ca+Mg), use the diagram opposite to check whether the water fits within either the S1, S2, S3 or S4 area.

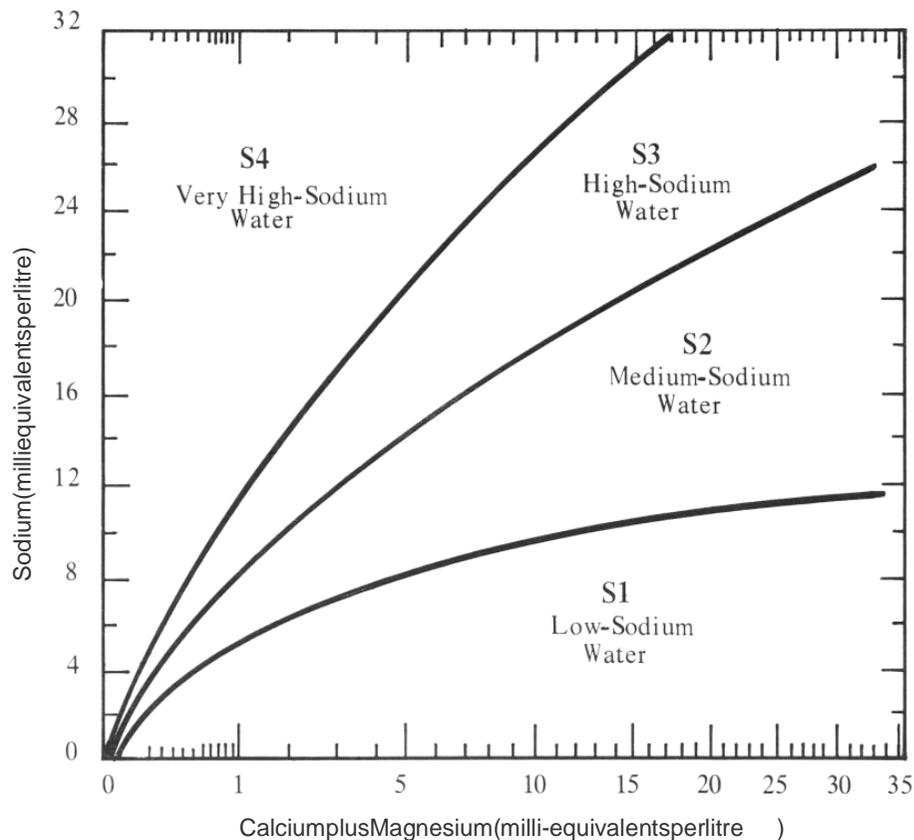
The descriptions of each category (below) can then give an indication of how the water may affect Sodium levels in the soil.

**Low sodium water** – S1 water can be used for irrigation of almost all soils, with little danger of developing a problem. However, sodium sensitive crops such as stone fruit and avocados, may accumulate sodium in the leaves.

**Moderate Sodium Water** – S2 water may present a moderate sodium problem in some clay soils. This water can be used on coarse-textured (sandy) or permeable organic soils.

**High sodium water** – S3 water can produce sodium problems in most soils and will require special management, good drainage, high leaching, and addition of organic matter.

**Very high-sodium water** – S4 water is generally unsatisfactory for use in regular irrigation.



### More information:

**Water Fact Sheet #1** – Using Farm Water.

**Water Fact Sheet #2a** – Water for Irrigation (Total dissolved salts).

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- ▶ Magnesium

**The relative salt tolerance of various crops is listed in the following tables. In each group the most salt tolerant is listed at the top, with others following in descending order of tolerance.**

To use these tables, first look up the water quality class according to the Total Soluble Salts on your test results (ref: Water Fact Sheet #2a) and then check the appropriate list of crops.

**More information:**

**Water Fact Sheet #1** – Using Farm Water.

**Water Fact Sheet #2a** – Water for Irrigation (Total dissolved salts).

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**Fruit Crops:**

High salt tolerance	Medium salt tolerance	Low salt tolerance
Date palm	Pomegranate	Citrus
	Fig	Pomefruit
	Olive	Stonefruit
	Grape	Almond
	Cantaloupe	Brambleberries
		Raspberry
		Avocado
		Strawberry

**Vegetables**

High salt tolerance	Medium salt tolerance	Low salt tolerance
Beet	Tomato	Radish
Kale	Broccoli	Celery
Asparagus	Cabbage	Green Beans
Spinach	Cauliflower	
	Lettuce	
	Sweetcorn	
	Potato	
	Sweet potato	
	Yam	
	Capsicum	
	Carrot	
	Onion	
	Pea	
	Cucurbits	

**Broad Acre Crops**

High salt tolerance	Medium salt tolerance	Low salt tolerance
Barley (grain)	Rye (grain)	Field beans
Sugarbeet	Wheat	
Cotton	Oats	
	Rice	
	Sorghum	
	Soybean	
	Broadbean	
	Corn (Zeamays)	
	Flax	
	Sunflower	

**Pasture & Forage**

High salt tolerance	Medium salt tolerance	Low salt tolerance
Saltgrass	Perennial rye	Annual rye
<i>Puccinellia</i>	Phalaris tuberosa	White clover
<i>Nuttalliana</i>	Strawberry clover	Red clover
Bermudagrass	Paspalum	
Wheatgrass	Sudangrass	
Rhodesgrass	Lucerne	
Birdsfoot trefoil	Tall fescue	
	Cocksfoot	

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Water quality:

- ▶ Minerals
- ▶ Microbes
- ▶ Contaminants

**The World Health Organisation has published international standards for drinking water, although it emphasises that rigid standards cannot be set, the criteria here should give you a useful guide.**

In reading the table opposite, it should also be remembered that many of these maximum levels relate to the effects of various constituents on attributes such as colour or taste. For example, Magnesium levels of greater than 150ppm may impart a 'Flat' taste to the water, but (except in the case of

extremely high levels) should not cause any health concerns.

Iron, Copper and Zinc may be derived from metals in the plumbing used to carry the water.

The level of Calcium and Magnesium (together with carbonate levels) are an indication of the degree of water hardness.

Nitrate is an important indicator of potential health risks as high levels may be an indication of contamination. If the sample is likely to have any biological contamination, Nitrate tests should be combined with those for *E.coli* and Total Coliforms.

	Guideline Concentration
Calcium	100ppm
Chloride	<250ppm
Copper	1ppm
Iron	0.3ppm
Magnesium	30-50ppm
Manganese	0.05ppm
Nitrate	<10ppm
Phosphorus	0.5ppm
Potassium	10ppm
Sodium	30ppm
Sulphate	250ppm
Totalsolublesalts	500ppm
Zinc	<5ppm

If the water is intended for bottling and sale to the public, biological and heavy metal tests are also strongly recommended. The table opposite may provide some guidelines for potential contaminant items.

	Maximum Concentration
Mercury	0.001ppm
Cadmium	0.005ppm
Selenium	0.01ppm
Arsenic	0.05ppm
Chromium	0.05ppm
Lead	0.05ppm
Molybdenum	0.07ppm
Fluoride	1.5ppm
Antimony	10ppm
Nickel	50ppm
<i>E.coli</i>	0 per 100ml
Total Coliforms	<10 per 100ml

**Note:** The guideline and maximum concentrations given here are taken from information provided by the World Health Organisation and other international sources. They relate to either health or acceptability (taste, odour, colour, staining, etc.) thresholds – whichever ever is the lowest.

**More information:**

**Water Fact Sheet #2a** – Water for Irrigation (Total dissolved salts).

**Water Fact Sheet #2b** – Water for Irrigation (Dissolved Sodium).

**Guidelines for Drinking-water Quality**, 3<sup>rd</sup> Edition. [www.who.int/](http://www.who.int/)

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