

Manitoba Pasture Water Quality Summary



The importance of water for livestock

On a hot summer day, lactating cows can drink upwards of 60 litres of water. It is an essential nutrient for beef cattle which constitutes roughly 99 per cent of all molecules in the body and contributes to approximately 70 per cent of body mass. For livestock to maximize feed intake and production, they require access to palatable water of adequate quality and quantity. It is very important to test water regularly to determine if nutritional problems may arise before cattle have access to the watering source. Water quality does change from year to year. For example, the mineral composition of ground water is affected by the rock or soil type as the water passes through or the amount of time it spends in an aquifer. Surface water can be affected by many of the same factors as ground water. It may even have toxic substances which may or may not be harmful to animals.

Interpreting a water test

Water test results usually quantify the following parameters:

1. Total Dissolved Solids (TDS) – measured in mg/L or ppm

- Indicator of overall water quality, which is influenced by mineral levels, pH, sulphates, nitrates, salinity, algae, bacteria. TDS can reduce water intake and cause scours, dehydration and poor performance.
- Weather impacts (rainfall, flooding, drought) can change levels and evaporation increases concentration of salts, bacteria, and algae.

Water content mg/L or ppm	Usefulness for sheep, cattle, and horses
< 1,000	Excellent
1,001 – 3,000	Acceptable
3,001 – 5,000	Acceptable -reluctance to drink -mild diarrhea -reduced performance and affect health of calves
5,001 – 7,000	Poor -may cause diarrhea -avoid use in pregnant or lactating cows -test for sulphates

2. Alkalinity (pH)

- pH 7.0 = neutral; below 7 = acidic; above 7 = alkaline with an acceptable range for cattle: pH 6.0-8.5.
- pH < 5.5 may cause acidosis, reduced feed intake, and poor performance

3. Nitrates

- Converted to nitrites in the rumen, which can enter the bloodstream and impair oxygen transport.
- Toxicity from water is uncommon but worsens when feed also contains nitrates and runoff from fertilized fields can elevate water nitrate levels.
- Risk increases when water nitrate levels exceed **100 mg/L** as nitrogen.

4. Sulphates

- Measured as SO₄
- Common in Prairie groundwater, spring fed dugouts, and saline runoff areas.
- Interfere with copper, zinc, iron, and manganese metabolism → deficiencies affecting growth, fertility, skin, and immunity.
- Effects by level:
 - 500 ppm**: diarrhea; reduced water intake.
 - 500-1000 ppm**: mineral deficiencies; reduced growth and fertility.
 - >2000 ppm**: risk of polio encephalomalacia (PEM), causing blindness, ataxia, seizures.
- Can accumulate in drought stressed feeds; evaluate both feed and water sources.
- Research ongoing to refine sulphate recommendations

Sulphate Interpretation for Livestock Use

SULPHATES (SO₄) measured as SO₄ WATER CONTENT (mg/L or ppm)

GOOD  500-1000	• Diarrhea or refusal of water by animals not accustomed to it • 500 to 800 mg/L may affect calves, including a trace mineral deficiency • Trace mineral deficiencies can cause depressed growth rate, fertility and immune response • Decreased performance in feedlot cattle • 1,000 mg/L recommended maximum if feed level is high in sulphates or if ambient temperature is high	POOR  1500-2000	• Chelated or Hydroxy minerals may be required • High chance of trace mineral deficiency • Symptoms include: decreased gains, depressed immunity and reduced conception, etc. • Sporadic cases of polio possible • Can cause diarrhea and reduced milk production in dairy cows
ACCEPTABLE  1000-1500	• Laxative • Performance reduced • High level of sulphates can also contribute to copper and other trace mineral deficiencies	UNSUITABLE  2000+	• Sporadic cases of polio are highly probable • Performance reduced • Scours likely • Greater than 4,000 mg/L dangerous health problems expected

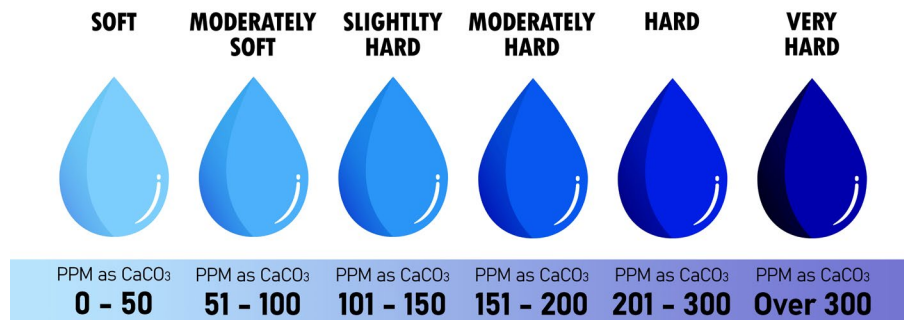
Adapted from: Saskatchewan Ministry of Agriculture

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5. Hardness

- Water hardness measures the amount of dissolved minerals in the water. Water that is too hard causes limescale build-up on pipes, water heaters and fixtures.

WATER HARDNESS SCALE



6. Other parameters:

- Mineral interactions
 - Evaluate mineral content in water with the context of mineral content in feed sources.
 - Some mineral issues are compounded when both feed and water contain problematic levels.
- Blue Green Algae (Cyanobacteria)
 - Actual bacteria, not true algae which can produce toxins causing liver damage, gastroenteritis, lack of coordination, paralysis, or rapid death and is often mistaken for duckweed; heavy blooms appear solid green, pea soup like, or like grass clippings.
 - Treatment: dyes, aeration, approved copper sulphate products, however, restrict livestock access for 12-14 days after treatment due to increased toxin release during die off.
- Salinity
 - Refers to dissolved salts (e.g., calcium, magnesium, sodium chloride).
 - Levels can rise with evaporation during hot weather.
 - Young and lactating animals are more sensitive. Cattle adapt gradually but abrupt exposure to high salinity is dangerous.
 - High salty water may be avoided initially, but desperate consumption can lead to poisoning and death.

Manitoba Pasture Water Testing Results

Manitoba pasture water sources were tested for two consecutive years across the province and tested at a Winnipeg lab.

Year 1: The water samples came from:

- 17 dugouts with direct livestock access
- 4 fenced dugouts
- 18 wells

Year 2: The water samples came from:

- 20 dugouts with direct livestock access
- 2 fenced dugouts
- 25 wells
- creek and 1 slough



What had the highest quality?

Dugouts had the best water quality. The fact most dugouts are recharged with freshwater either as snow or rain may explain their higher quality. Above average levels of precipitation were experienced throughout the summer of year 1, and dugouts were in good condition going into fall. Year 2 of sampling was a dry year however water samples were obtained from dugouts earlier in the summer before water availability/quality became an issue.

Manitoba Results and Evaluation

	Year 1		
	Direct Access Dugout	Fenced Dugout	Well
Number of Samples	17	4	18
Average TDS	599.5 mg/L	374.3 mg/L	990.0 mg/L
Alkalinity	8.2	8.1	8
Hardness	375.2 mg/L	274.8 mg/L	497.9 mg/L
Nitrates	0.09 mg/L	0.02 mg/L	1.34 mg/L
Sulphates	164.5 mg/L	9.5 mg/L	345.6 mg/L
Iron	0.78 mg/L	0.87 mg/L	0.96 mg/L
Copper	.002 mg/L	.002 mg/L	.006 mg/L
Molybdenum	0.003 mg/L	0.001 mg/L	0.004 mg/L

	Year 2			
	Direct Access Dugout	Fenced Dugout	Well	Creek
Number of Samples	20	2	25	1
Average TDS	463.9 mg/L	533.5 mg/L	960.8 mg/L	372 mg/L
Alkalinity	8.6	8.1	8.1	8.4
Hardness	396.6 mg/L	196 mg/L	479.5 mg/L	346 mg/L
Nitrates	0.05 mg/L	0.17 mg/L	0.87 mg/L	0.06 mg/L
Sulphates	63.6 mg/L	75.1 mg/L	257.9 mg/L	8.9 mg/L
Iron	1.57 mg/L	0.31 mg/L	1.03 mg/L	0.98 mg/L
Copper	0.003 mg/L	0.001 mg/L	0.01 mg/L	0.0009 mg/L
Molybdenum	0.003 mg/L	0.003 mg/L	0.004 mg/L	0.003 mg/L

Copper levels in all samples fell below the recommended maximum level of **0.5 mg/L**. Molybdenum levels also were well below the recommended level of 0.5 mg/L. Seven water samples exceeded **500 mg/L** of sulphates. Where water sources are high in sulphates (which tie up copper) producers need to ensure micro-mineral supplementation is adequate.

Study highlights and conclusions

Water should be tested at least once a year. It is recommended to test all water sources that cattle have access to. Additional testing may also be required after extreme weather (drought, flooding, etc.); when changes are noticed in animals (signs of dehydration, health issues, etc.); when water quality issues are suspected; or when moving cattle to a new or seasonal water source.

- Although E.Coli and coliforms were not tested in Year 1 or Year 2, past work has shown that they are higher in direct access dugouts vs those fenced-off.
 - E. coli can be found in troughs, indicating alternative watering systems (fenced dugouts) won't eliminate this problem. Periodic chlorination of the trough may be required.
- By excluding livestock from the water source quality can be improved.
- Dugouts that are designed properly with a hard bottom (gravel) and vegetation to act as a buffer can provide good quality drinking water to grazing livestock.

Water quality can change from year to year and even over the course of a season.

Conduct water tests regularly and do not rely on past analysis.

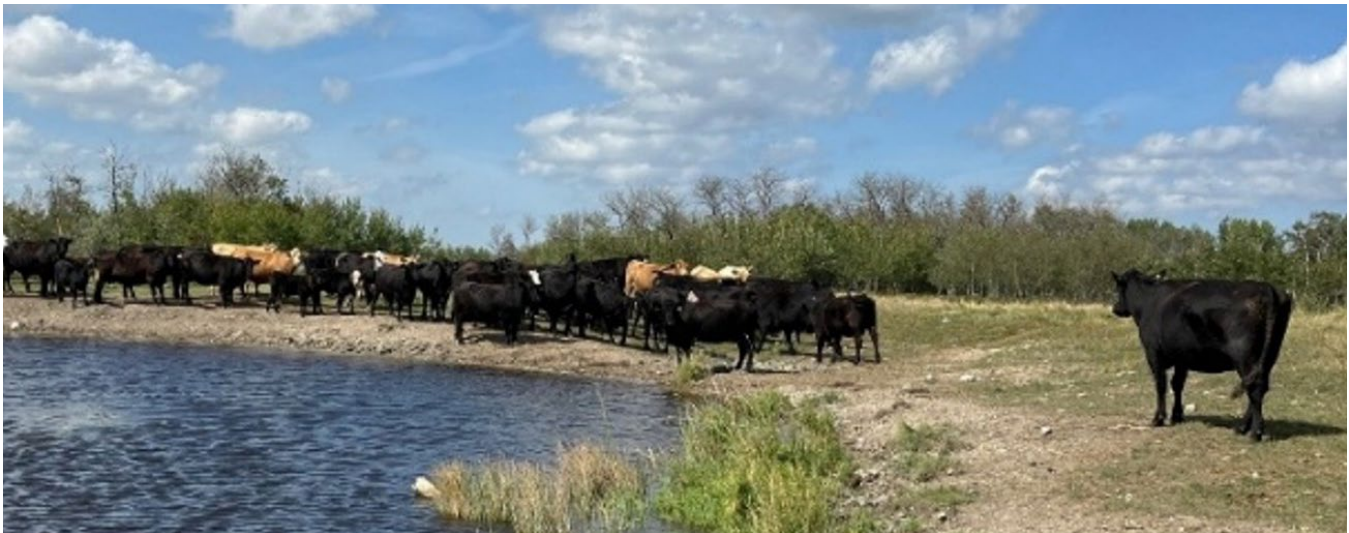
Re-test immediately if there are changes in:

Taste

Smell

Clarity

Animal performance or eating and drinking habits.



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