



WATER REQUIREMENTS FOR PASTURED LIVESTOCK

Like most things, pastured livestock require water in sufficient quantities and quality for optimum health and growth. This fact sheet provides an overview of the water quality and quantity requirements for pastured livestock. While the required quality and quantity are somewhat interrelated, the two aspects will be discussed separately.

What factors affect water consumption?

The total water needs of livestock are met through water contained in feed supplies, as well as additional water that must be supplied separately from feed. This so-called “voluntary consumption” depends on several physiological and environmental factors:

- ◆ Size and type of animal
- ◆ Physiological state (pregnant, lactating, growing) - lactating cows require about an extra 0.86 kg of water for every kg of milk produced, and water intake during the latter stages of pregnancy can be 30-50% higher than normal
- ◆ Activity level - more active animals consume more water
- ◆ Type and amount of diet - animals fed on dry feed will require more voluntary water than those fed on silage or lush grass
- ◆ Weather conditions - water consumption increases as air temperature increases
- ◆ Water quality - more palatable water or greater total salt intake will result in increased water consumption
- ◆ Ease of access - animals will consume less water if they have to travel further to the source, or if access to the source is awkward and uncomfortable.

What is a typical daily water requirement for range livestock?

As noted previously, volumetric water requirements are highly variable. The following table lists typical water-consumption values for various kinds of livestock on the Canadian Prairies. All other factors being equal, the primary variable affecting water consumption is temperature, so the following table is divided into winter and summer.

Type of Livestock	Winter		Summer	
	Imp. Gal./day	L/day	Imp. Gal./day	L/day
Milking Cows	17	77	21	95
Cow-calf Pairs	11	50	15	68
Dry Cows	8	36	12	55
Calves	5	23	8	36
Growing Cattle (400-800 lb. or 180-360 kg.)	5-8	23-36	8-12	36-55
Finishing Cattle (600-1200 lb. or 270-540 kg.)	12	55	19	86
Bulls	8	36	12	55
Horses	8	36	12	55
Sheep	0.8	3.6	3	14

Source - *The Stockman's Guide to Range Livestock Watering From Surface Water Sources*

How does water quality affect livestock?

Water quality can affect both total water consumption and the general health of the livestock. Elevated water temperatures and objectionable taste and odour will discourage consumption, and reduced water consumption will, in turn, result in a reduction of feed intake, with the net result being decreased weight gain.

The most common water quality considerations that make water unsuitable for livestock consumption are *salinity* (the concentration of various kinds of dissolved salts), *nitrites*, *algae*, and on rare occasions, other factors such as *alkalinity* or *pesticides*.

Salinity

Dissolved salts can consist of any combination of calcium, magnesium, and sodium chlorides, sulfates and bicarbonates. While all have slightly different effects on animal metabolism, none are particularly worse than any other. Also, the effects of various salts seem to be additive, meaning that a mixture seems to cause the same degree of harm as an equivalent concentration of a single salt. Animals seem to have an ability to adapt to saline water to some extent, but abrupt changes may cause harm. Animals may avoid drinking highly saline water for a number of days, followed

by a period of high consumption which causes illness or even death.

Nitrates

Water analyses generally report nitrates and nitrites together. Nitrate toxicity resulting exclusively from water is rare, but is primarily of concern when combined with forages having high nitrate levels. Nitrates themselves are not very toxic, but bacteria in ruminant animals (dairy and beef cattle) will convert the nitrates to nitrite which reduces the blood's ability to metabolise oxygen and effectively causes shortness of breath and eventual suffocation.

Sulfates

Although sulfates can have a laxative effect, there is limited data available regarding their overall effect on livestock health and productivity. It is generally felt that the presence of sulfates should seldom be a problem in livestock water. However, in some rare cases involving very saline water, producers have lost cattle due to a sulfate-related problem.

Alkalinity

Excessive alkalinity can cause physiological and digestive upset in livestock, but the level at which it becomes troublesome and its precise effects have not been thoroughly studied. Most waters are alkaline in nature, but fortunately, in only a few instances has it been found that a water source has been too alkaline for livestock. Alkalinity is usually expressed as a concentration of Calcium Carbonate (CaCO₃), in parts per million (ppm) or milligrams per litre (mg/L).

Bacterial Contamination

Most water has varying levels of bacterial contamination, but such contamination does not generally cause problems for livestock. Calves can sometimes suffer from Coccidiosis, which can lead to bloody diarrhea, dehydration, weight loss, depression, and sometimes death. Elevated water sources and a reasonable effort at maintaining cleanliness of watering facilities can reduce the potential for problem-causing bacterial contamination.

Algae

Certain species of algae (blue-green algae) can, under some circumstances, be toxic. At present, there is no test available for these toxins. Other than possible toxicity, the presence of algae in livestock water supplies will affect livestock indirectly by discouraging consumption due to reduced palatability (taste and odour). Algae blooms can be prevented from occurring in a water supply by aerating the water and by preventing excess nutrients (phosphorus, nitrogen) from entering the water. The primary source of nutrients that contribute to aquatic plant growth are animal excrement, fertilizers and organic matter like grass, hay, leaves and topsoil.

Other Factors

Generally speaking, any surface water that can support a population of fish should not have dangerous levels of pesticides or naturally-occurring toxic elements like heavy metals. However, there is growing evidence that toxic compounds are present in many surface waters across the prairies. If there is any reason to believe that a water source may have elevated levels of toxic compounds, they can be tested for.

It is recommended that water samples from the intended source be analysed to ensure that any problems relating to water-quality can be avoided.

How should water analyses be interpreted?

Salinity

A water analysis will generally report salinity as a concentration of Total Dissolved Solids (TDS). The following table presents a guide to the use of saline water for livestock:

Table 1 - A Guide to the Use of Saline Water For Livestock

TDS (mg/L)	Comments
<1,000	Excellent for all livestock.
1,000 to 3,000	Generally suitable for all livestock. May cause some loss of productivity, and mild diarrhea in animals not accustomed to it.
3,000 to 5,000	Should be suitable, but may initially cause reluctance to drink. Can cause diarrhea in animals not accustomed to it.
5,000 to 7,000	Suitable for livestock, except those that are pregnant or lactating, without affecting health or productivity. May have some laxative effects and be refused by animals until they become used to it. Unsuitable for poultry.

7,000 to 10,000	Poor livestock water - should not be used for poultry or swine. Can be used for older, low-producing ruminants or horses that are not pregnant or lactating with reasonable safety.
>10,000	Unsuitable for all classes of livestock

Nitrates

For waters having a total dissolved solids concentration less than 1,000 mg/L, there is no need to make a nitrate determination. In cases where nitrate levels are determined, some water analyses report nitrate content as parts per million (ppm) of nitrate nitrogen ($\text{NO}_3\text{-N}$), while others express it as parts per million of nitrate (NO_3) or of sodium nitrate (NaNO_3). These quantities are related in the following manner:

$$1 \text{ ppm } \text{NO}_3\text{-N} = 4.43 \text{ ppm } \text{NO}_3 = 6.07 \text{ ppm } \text{NaNO}_3$$

Comments relating to the use of waters containing nitrates are shown in the following table:

Table 2 - Guide to the Use of Waters Containing Nitrate for Livestock

Nitrate Concentration* (ppm $\text{NO}_3\text{-N}$)	Comments
<100	Should not harm livestock.
100 to 300	Should not harm livestock by itself, but may cause problems when combined with feeds containing nitrates. Cause for concern increases at higher levels, especially during periods of drought.
>300	Could cause typical nitrate poisoning.

*Includes nitrite nitrogen.

Alkalinity

Waters with alkalinity levels lower than 1,000 ppm are considered satisfactory. Greater concentrations should probably be considered unsatisfactory, although for mature livestock, they may do little harm at concentrations less than 2,500 ppm unless carbonates exceed bicarbonates.

What other considerations are there in the interpretation of water quality analyses?

The results of water analyses are expressed in a number of ways. Some of these ways, and the manner in which they are related, are as follows: one *part* per million means one gram per thousand kilograms of water, which, for all practical purposes, is the same as one milligram per litre (mg/L) or one milligram per kilogram (mg/kg).

Waters may, in some instances, supply a portion or even all of an animal's requirements for certain minerals. As a general rule, however, the contribution of the constituents naturally present in water is of no practical nutritional significance. Hard waters have been suggested as contributing to the development of urinary calculi (kidney stones or water belly), but experimental evidence shows that this is not true, and that hard waters may actually contribute to the prevention of certain kinds of calculi. Highly saline waters are often referred to as "alkali" water. They may or may not be highly alkaline, but are usually not. Such waters are also sometimes referred to as hard waters. If most of their salinity is in the form of sodium salts, such waters may actually be soft, since hardness is largely due to the presence of calcium and magnesium salts.

The Bigger Picture

The quantity and quality of water required for livestock production are only two factors to be considered when planning water supply and development for livestock. For other information relating to the planning and development of water supply systems for livestock production, as well as for additional information on range livestock water requirements, contact your local PFRA office.

Sources of information for this Fact Sheet included: *The Stockman's Guide to Range Livestock Watering From Surface Water Sources*, available from the Prairie Agricultural Machinery Institute, P.O. Box 1060, 390 River Road, Portage la Prairie, Manitoba, R1N 3C5; *Livestock Water Quality*, Co-operative Extension, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, <http://www.ianr.unl.edu/pubs/beef/g467.htm>; BC Livestock Watering Manual, BC Ministry of Agriculture and Fisheries - Soils and Engineering Branch, 1990.