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## Water Quality: An Often Overlooked Factor During Dry Weather

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Water quality in farm ponds deteriorates during drought because many of the nutrients and pollutants are concentrated. Water is the cheapest but most important nutrient in any animal's diet.

Factors that can influence an animal's water intake are:

1. Total feed dry matter intake
2. Moisture content of the feed consumed
3. Salt consumption
4. Temperature and humidity of the environment
5. Production level
6. Temperature of the drinking water
7. Quality of available water

As shown in Table 1, a lactating dairy cow producing 80 lbs. of milk on a warm day requires more than 40 gallons of water. As temperature and/or humidity increase, water requirement also increases.

Water may contain an endless number of chemicals, microorganisms, or dissolved or suspended particles that can impair cattle performance.

Common water analyses include:

1. Total dissolved solids
2. Total soluble salt
3. Salinity
4. Hardness
5. Nitrates
6. Sulfate
7. Other factors such as toxicity problems with specific minerals or pesticides or occasionally heavy algae growth.

Table 1. Estimated daily water intake of beef and dairy cattle<sup>1</sup>

Animal	Air temperature, degree F <sup>2</sup>			
	40	60	80	90
	gallons/day			
<u>Dairy</u>				
Dry, pregnant cows 1,400 lb.	9.7	12.0	16.2	22.9
Lactating cows - maintenance intake				
1,000 lb.	5.3	6.6	8.1	7.2
1,400 lb.	7.0	8.7	10.7	9.5
Lactation requirement/lb. of milk - add to maintenance				
3 percent fat	0.23	0.26	0.32	0.41
4 percent fat	0.25	0.29	0.35	0.46
5 percent fat	0.27	0.32	0.39	0.51
<u>Beef</u>				
Feedlot cattle				
600 lb.	6.0	7.4	10.0	14.3
1,000 lb.	8.7	10.8	14.5	20.6
Cows - pregnant				
1,000 lb.	6.4	7.9	---	---
Cows - lactating				
900 lb.	11.4	14.5	17.9	16.2
Beef and dairy heifers				
300 lb.	2.9	3.6	5.2	6.8
600 lb.	5.0	6.2	8.4	11.9
900 lb.	6.8	8.5	11.5	16.7

<sup>1</sup> Winchester, C.F. and M.J. Morris, 1956 (34).

<sup>2</sup> For water intakes below 40 degrees F, use intake amounts at 40 degrees F.

Generally accepted levels of potentially toxic nutrients and contaminants in water and cattle are listed in Table 2.

Alkalinity is expressed either as a pH or titratable alkalinity in the form of bicarbonates. A pH of 7.0 is neutral, between 7.0 and 8.0 is mildly alkaline, and a pH of 10 is very alkaline. Excessive alkalinity can cause physiological and digestive upsets in livestock.

Nitrates can cause toxicity to animals in which nitrate is converted to nitrites and tie up the oxygen carrying component of the red blood cells, hemoglobin, to form methemoglobin. Animals with nitrate toxicity will show signs of distress such as a shortage of breath and the blood tends to be a dark chocolate brown. Ruminants have an ability to convert some nitrate to usable product whereas nonruminants are much more sensitive. Baby pigs are very susceptible to the hazards of nitrate.

Water hardness is measured in terms of grains or parts per million. As a rough guideline one grain per gallon is equal to 17 parts per million. Normally hard water does not interfere with livestock performance; however, hard waters can cause difficulty in the washing of milking equipment and causes hot water heaters to "lime up".

There are no legal limits for the number of microorganisms or bacteria in water used for livestock production except if the farm is a Grade A dairy. In this case the water must be from a supply which provides water of safe and sanitary quality with no fecal coliform bacteria present. Within the state of Missouri there exists a Grade A milk law requirement which describes appropriate well construction guidelines for a Grade A dairy. Water must be tested after any repairs or modifications of the water supply system. In addition, specific requirements describe outside livestock water tanks prohibiting backsiphoning.

Farm pond water quality needs to be observed for the presence of algae and other harmful organisms during dry weather. Please keep in mind that if livestock are able to walk into the pond and urinate and defecate this greatly increases the chance of spreading of diseases such as leptospirosis. It is highly recommended that livestock be fenced out of the pond and an appropriate livestock watering tank be made available at the lower end of the pond.

Table 2. Generally considered safe levels for cattle of some potentially toxic nutrients and contaminants in water<sup>1</sup>

Item	Maximum safe concentration (ppm)
Aluminum	5.00
Arsenic	0.20
Boron	5.00
Cadmium	0.05
Chromium	1.00
Cobalt	1.00
Copper	0.50
Fluorine	2.00
Lead	0.10
Mercury	0.01
Nickel	1.00
Nitrate-nitrogen	100.00
Nitrite-nitrogen	10.00
Selenium	0.05
Sulfate*	1000.00
Vanadium	0.10
Zinc	25.00

<sup>1</sup> Herrick, J.B., 1982(9); Natl. Acad, Science. Washington, D.C., 1974(19).

\*Note -- Recent research suggests cattle are affected at 600 ppm.

