Interpretation of Water Analysis for Livestock Suitability

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Water is the most important nutrient to all livestock animals and is sometimes overlooked. Poor quality water can have a negative effect on growth, reproduction, and general productivity of the animal. In some cases, death could occur within days or hours after consumption of contaminated waters or water deprivation. Therefore, continuous monitoring of water quality and quantity are important to maintain a productive livestock program.

Water can be monitored though a "quick test" in the field with an electro-conductivity (EC) or total dissolved solids (TDS) meters available through testing supply companies. The quick test is a measurement of salinity providing an indication of livestock water quality (Table: General Guide to the Use of Saline Waters). Water samples can also be submitted to a laboratory to acquire a more detailed analysis for livestock suitability including sulfates, nitrate nitrogen, alkalinity, hardness, sodium, iron, magnesium, calcium etc. to explain why salinity is high.

Understanding the results are critical to make sound management decisions. Below are livestock water quality interpretations to help decipher both the results of a "quick test" and laboratory analysis.

General Guide to the Use of Saline Waters for Livestock and Poultry[1]

Total soluble salts (TDS) content of waters, mg/L or ppm[2]	Comments
___ Less than 1,000	Relatively low level of salinity. Excellent for all classes of livestock and poultry.
___ 1,000-2,999	Very satisfactory for all classes of livestock and poultry. May cause temporary and mild diarrhea in livestock not accustomed to the water or watery droppings in poultry.
___ 3,000-4,999	Satisfactory for livestock, but may cause temporary diarrhea or be refused at first by animals not accustomed to the water. Poor water for poultry, often causing watery feces, increased mortality, and decreased growth, especially in turkeys.
___ 5,000-6,999	Can be used with reasonable safety for dairy and beef cattle, for sheep, swine, and horses. Avoid use for pregnant or lactating animals. Not acceptable for poultry.
___ 7,000-10,000	Unfit for poultry and probably for swine. Considerable risk in using for pregnant or lactating cows, cattle in confinement, horses, or sheep or for the young of these species. In general, use should be avoided although older ruminants, horses, poultry, and swine may subsist on them under certain conditions.
___ Over 10,000	Risks with these highly saline waters are so great that they cannot be recommended for use under any conditions.

[1] Water Quality Criteria 1972, EPA, Washington, D.C.
[2] "Milligrams per liter" (mg/L) is the same as "parts per million" (ppm).

Guide to the Use of Waters Containing Alkalinity for Livestock

Total soluble salts (TDS) content of waters, mg/L or ppm[2]	Comments
___	Water with an alkalinity over 1000 mg/L (ppm)[3] is considered unsatisfactory for livestock.

[3] "Milligrams per liter" (mg/L) is the same as "parts per million" (ppm).

Guide to the Use of Waters Containing Nitrates for Livestock and Poultry[4]

Nitrate-nitrogen (NO_3N) content, mg/L or ppm[5]	Comments
___ Less than 100	Experimental evidence indicates that this water should not harm livestock or poultry.
___ 100 to 300	This water should not by itself harm livestock or poultry. If hays, forages, or silages contain high levels of nitrate, this water may contribute significantly to a nitrate problem in cattle, sheep, or horses.
___ Over 300	This water could cause typical nitrate poisoning in cattle, sheep, or horses, and its use for these animals is not recommended. Because this level of nitrate contributes to the salt content in a significant amount, the use of this water for swine or poultry should be avoided.

[4] Olson, O.E., R.J. Emerick, L. Lubinus. Nitrates in livestock waters. PS603, Cooperative Extension Service, SDSU, Brookings.
[5] "Milligrams per liter" (mg/L) is the same as "parts per million" (ppm).

Guide to the Use of Waters Containing Sulfates for Livestock and Poultry

Sulfate (SO_4) content mg/L or ppm[6]	Comments
___ Less than 1500	No harmful effects except some temporary very mild diarrhea near upper limit.
___ 1500-2500	No harmful effects except some temporary diarrhea. In cattle, this water may contribute significantly to the total dietary sulfur intake.7,8
___ 2500-3500	Poor water for poultry, especially turkeys. Very laxative, causing diarrhea in livestock that usually disappears after a few weeks. In cattle, this water may contribute significantly to total dietary sulfur intake.[7,8]
___ 3500-4500	Very laxative. Not recommended for use for pregnant or lactating cows, cattle in confinement, horses, or sheep. Unacceptable for poultry. In cattle, this water may contribute significantly to the total dietary sulfur intake.[7,8]
___ Over 4500	Not recommended for use under any conditions.

[6] "Milligrams per liter" (mg/L) is the same as "parts per million" (ppm).
[7] Note: The suggested maximum concentration of sulfur in the diet of cattle to prevent polioencephalomalacia is 0.4% (4000 mg/kg or 4000 ppm) on a dry matter basis. Divide sulfate content by 3 to convert to sulfur content, e.g., 3000 mg/L S04 = 1000 mg/L S.
[8] Loneragan, G.H., D.H. Gould, R.J. Callan, C.J. Sigurdson, D.W. Hamar. 12-1-98. Association of excess sulfur intake and an increase in hydrogen sulfide concentrations in the ruminal gas cap of recently weaned beef calves with polioencephalomalacia. JAVMA 213(11).

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