

## **Water Quality Issues for Beef Cattle**

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Once again, many areas of Colorado are faced with excessively dry climate conditions in 2008 and the hot summer temperatures and minimal precipitation have dwindled the available forages for grazing beef cattle. The “drought-like” conditions are occurring as grazing lands are still recovering from past years of severely limited rainfall. Reports are arising of depleted summer grazing conditions, limited to no forage/hay production and drinking water for cattle is a major issue for cattlemen also. Decreased water availability and unsuitable water quality can contribute to significant losses of production during drought periods.

Concerns toward water intakes and quality are arising, particularly with water tests from some areas indicating high levels of Total Dissolved Solids (TDS, an estimate of total salts) and sulfates. Samples from both surface and subsurface water sources show highly variable levels from area to area and some levels are approaching dangerous sulfate levels. The availability and quality of water can have substantial impacts on cattle productivity and health. Water high in salt/sulfate content can compromise performance and health of cattle in three ways: 1) reduced water and feed intake; 2) toxic levels of sulfur ingestion; and 3) induced trace mineral deficiencies.

Although sulfur is a necessary mineral for rumen microorganisms, cattle are extremely sensitive to excessive sulfur intake through water and feed. The NRC (1996) gives the daily requirement for cattle to be 0.15% of diet dry matter and the maximum tolerable concentrations of dietary sulfur are estimated to be 0.4% of dry matter intake. Sodium sulfate is the primary salt causing elevated water TDS. Water sulfates should not exceed 500 mg/L or ppm (see the following table on water sulfate level interpretation). Water tests from some Colorado areas have reported sulfates at 1500 to over 4000 ppm. In surface water sources, such as ponds and dams, hot weather conditions can increase TDS concentrations through evaporation. These sources may become more unsuitable through the summer periods, concurrently as forage declines in nutritional value. Trace mineral imbalances and deficiencies are accentuated.

### Interpretation of water sulfate levels for cattle

Sulfate level (ppm)	Interpretation
<500	Safe for drinking
500 - 1500	Generally safe, trace mineral availability may be reduced, may decrease performance in confined cattle
1500 - 3000	Marginal, may be unsuitable for confined cattle during hot weather, performance may be reduced, sporadic cases of PEM may occur
3000 - 4000	Unsuitable, decreased performance of grazing cattle may occur and risks for PEM in confined cattle is increased
>4000	Dangerous, health problems expected and substantial reductions in cattle performance, secondary copper deficiency likely

Research in Nevada found the addition of sodium sulfate to heifer drinking water reduced water consumption by 35%, feed consumption by 30% and caused more weight loss in heifers compared to controls. South Dakota feeding trials revealed reduced performance of confined feeding cattle at sulfate levels as low as 1700 ppm and Colorado studies reported reduced average daily gains and feed conversions with finishing cattle. Steers grazing native range in South Dakota had reduced gains when drinking high sulfate waters. Cow-calf pairs have shown weight losses while drinking water with sulfate levels averaging 2600 ppm. Toxic ingestion of sulfur can occur with feeds or water sources (or both combined) that have elevated sulfates. Polioencephalomalacia (PEM) is a metabolic/neurological condition of cattle that is associated with high sulfur intakes in cattle. Symptoms include lethargy, reduced feed intake, blindness, muscle tremors, gut stasis, incoordination, staggering, weakness, convulsions, and death. Dietary sulfur levels of 0.7% have been associated with PEM and water sulfate will compound the incidence of this metabolic disease.

Certain mineral levels in diets and water can be antagonistic to other trace mineral availability, especially copper. Elevated molybdenum, iron and sulfur impairs copper utilization and can be associated with copper deficiency problems. In some Colorado grazing areas, the presence of high molybdenum in forages and high sulfates in water, creates the potential for impaired copper utilization and deficiency states. Copper status has been shown to be related to growth, reproduction, and immune function in cattle, thus, copper deficiency can impair performance and health of cattle. Diets that contain greater than 0.35% sulfur and water containing high sulfur concentration have been implicated in initiating copper deficiency in cattle. High levels of forage sulfur are likely when ammonium sulfate or other fertilizer sources high in sulfur are used. High levels of sulfates in water may exacerbate copper deficiency in cattle with high dietary levels of

antagonistic trace minerals. A frequent observation in beef herds with subclinical (asymptomatic) copper deficiency is increased health problems in calves at weaning and post-weaning.

In most areas of Colorado, it is advisable to have cattle water sources tested for TDS, sulfates and nitrates. Seasonal and annual testing will determine water quality and trends in quality changes. Awareness of the potential for adverse performance and health from poor quality water will direct the management practices to implement. A water management program may be implemented, including these recommendations:

1. The use of poor quality water should be minimized and should not be provided to cattle in confinement
2. Surface water that is marginal in quality should be used in spring or early summer before seasonal hot temperatures cause evaporative losses and further concentration of sulfates
3. Alternative water sources may be necessary if water quality is continually poor and unsuitable, especially during peak seasonal high temperatures when water intake is the highest
4. Early weaning strategies to decrease calf exposure to poor quality water and reduce cow water demands may be appropriate
5. In the face of high water sulfates, avoidance of feed sources with high sulfur levels is recommended (corn gluten and distillers grains, brewers by-products, soybean meal, and other highly processed grain by-products)

Additionally, producers should consult with their nutritionist and extension specialists to make adjustments in the mineral supplementation program utilized. Increased copper levels, especially with the inclusion of organic (chelated) copper may be warranted. Organic or chelated copper appears to have higher availability and intestinal utilization due to the avoidance of sulfur-binding in the rumen. Fortification of mineral supplements with copper should also include balancing other available trace minerals (Zn, Co, Mg, Se, etc.). Addition of feed ingredients (cottonseed hulls, soybean meal, molassas) to free-choice mineral supplements as palatability stimulators should be considered to increase intakes. Producers should be aware that high TDS water will decrease mineral supplement intake and reducing salt supplementation is often necessary to maintain mineral intakes. Protein supplements with suitable trace mineral additions may be used for dual purposes of increasing mineral intake and increasing forage intake and digestibility. Monitoring cattle for mineral intakes is essential as is early detection of sulfur-induced PEM cases. Unacceptable health problems with pre-weaning and weaning calves that may be associated with poor water quality and trace mineral imbalances should be investigated by your attending veterinarian. Copper deficient calves may require pre-weaning supplementation (creep feeding) to improve their health status and decrease disease incidence. Highly nutrient-dense diets with adequate trace minerals should be used in the weaning program.

Water quality is important to healthy and productive cattle production and cannot be ignored if high TDS/sulfates become an issue. Producers should consult with their extension livestock specialist for further information and management guidelines and their nutritionists for sound advice on feeding and supplementation programs. Veterinary service should be requested to investigate health problems that are directly related to water quality or indirectly to trace mineral deficiencies. Further information is available through contact with [CSU Beef Team extension specialists](#)