Water Quality For Georgia Livestock

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NEED / GOAL

Livestock production relies on good quality water sources for animal health and adequate consumption. To inspire farmers to consider the water quality they provide to livestock, a multi-county water sampling effort was conducted to test for parameters known to cause health issues. Participating farms received free water tests and consultations on water supply improvements. Ponds, streams, and troughs each had positive and negative aspects of water quality. Due to variation in water sources, we recommend livestock drinking water should be tested for quality and maintained appropriately to provide the healthiest water possible.

METHODS

Fifty-three different livestock water sources were sampled from 30 farms in northeast Georgia. Sources included well-water troughs, ponds, and streams. All samples were analyzed for iron, manganese, sulfate, molybdenum, chromium, calcium, copper, sodium, fluoride, chloride, phosphate, soluble salts, total dissolved solids, turbidity, nitrate and nitrite, pH, and fecal coliform bacteria. Seven of the samples were also analyzed for arsenic, selenium, cadmium, and lead. All samples were analyzed by the University of Georgia Agriculture and Environmental Services Laboratory. In 30 of the watering sources, temperature data loggers were deployed for 90 days (August-October). Water temperature was recorded every 15 minutes for 24 hours a day. Individual water test results were shared with the participating farms. Based on the drinking water quality parameters acceptable for livestock health (Table 1.), consultation for improvements were provided to farmers.

Table 1. Livestock Drinking Water Quality Recommended Limits

Element	Recommended Limit	Units
pH	6 to 9 (8 Dairy)	
Calcium, Ca	200	ppm
Copper, Cu	0.5	ppm
Iron, Fe	0.3	ppm
Manganese, Mn	0.05	ppm
Molybdenum, Mo	0.5	ppm
Sodium, Na	1000	ppm
Phosphorus, P	1	ppm
Total Dissolved Solids, TDS	1000	ppm
Fluoride, F	2	ppm
Nitrate - Nitrogen, NO^3-N	25	ppm
Sulfate, SO^4	250	ppm
Nitrite – Nitrogen, NO^2-N	10	ppm
Arsenic, As	200	ppb
Cadmium, Cd	50	ppb
Chromium, Cr	1000	ppb
Lead, Pb	100	ppb
Selenium, Se	50	ppb
Conductivity	1560	uS/cm
Turbidity	30	NTU
Fecal Coliform	10 (1 calves)	MPN/100ml
Temperature	40° – 80°	°F

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RESULTS

Physical Elements

- Well-water troughs had the greatest percentage of samples that met all physical element limits for acceptable water quality (77% of samples). Only 25% of ponds and 18% of stream samples were free of all physical contaminants. The most common physical and elemental contaminants above the limit were iron (32% of all samples), manganese (26%), and pH (13%).
- **Iron** occurred more often in ponds (8/17) and streams(7/17); **Manganese** levels were more evenly distributed amongst types of water sources (5 ponds, 4 streams, and 5 troughs). ***Concern: High iron and manganese levels affect water palatability, possibly decreasing water intake.***
- Four troughs and three streams had unacceptable **pH** levels. ***Concern: Unusually high or low pH may dissolve materials from pipes, ditches, or soils, which can be toxic or impart an unpleasant taste to the water. Nonspecific effects related to digestive upset, diarrhea, poor feed conversion and reduced water and feed intake can also occur.***
- Two trough samples from shallow drilled wells had high **nitrate-nitrogen** levels. ***Concern: Nitrate or nitrite may contaminate water as a result of contact with natural minerals, agricultural runoff (fertilizer, manure) or industrial processes. This can contribute to nitrate poisoning.***
- **Copper** was higher than recommended in one sample from a municipal water supply**.** ***Concern: Copper can affect taste and odor. It may also add color to the water. Short-term exposure causes gastro-intestinal distress; long-term exposure causes liver and/or kidney failure.***
- **Phosphorous** was higher than recommended in one trough sample from a pasture surrounded by chicken houses. ***Concern: Specific disorders caused by phosphorus toxicity include urinary calculi from excess phosphorus or inadequate calcium to phosphorus ratio.***
- **Turbidity levels** were unacceptable in one stream and one pond. ***Concern: High turbidity water can deter livestock water intake and affect weight gain.***
- **All other physical elements** were within the recommended limits for all samples.

Temperature

- Water temperatures were above the 80°F recommended limit 0% of the time for streams, 16% for troughs, and 38% for ponds. ***Concern: Higher than recommended water temperatures can deter livestock from drinking more often.***

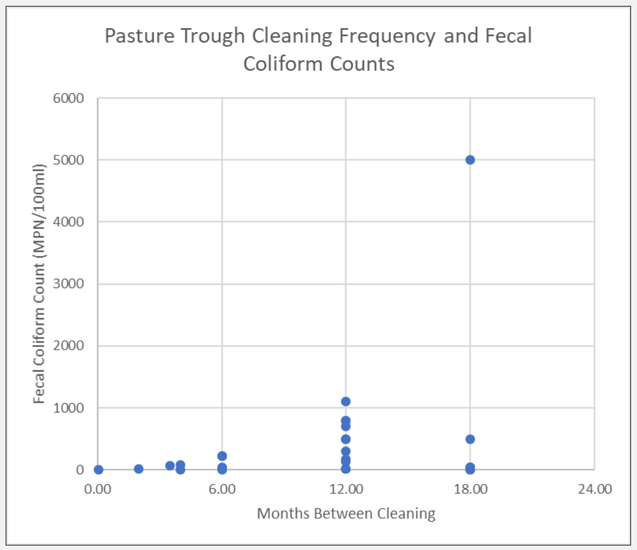
Bacterial

- **Fecal coliform** levels were higher than recommended in 85% of the samples. The highest counts were from troughs in high animal density corrals (5000 to 9000 MPN/100ml). Fecal coliform counts were higher and more variable in pasture troughs and streams (Table 2). Troughs with more frequent cleaning showed lower fecal coliform levels (Figure 1). ***Concern: Fecal coliform bacteria presence indicates animal waste contamination and possible occurrence of other biological pathogens that may cause chronic or intermittent diarrhea and off feed problems.***

Table 2. Fecal coliform analysis for different watering methods. (All values MPN/100ml)

Median	Average	Minimum	Maximum	Water Source
30	118	10	500	Ponds
170	354	20	1700	Streams
110	436	10	5000	Pasture Troughs
5000	6333	5000	9000	Corral Troughs

Figure 1. Fecal coliform counts for different trough cleaning frequencies in pasture.



CONCLUSIONS

- Troughs with well-water had the least amount of physical contaminants above safe limits, followed by ponds and streams.
- Streams provide the coolest water, followed by troughs and ponds.
- Fecal coliform contamination was highest in corral settings and lowest in ponds.
- Cleaning pasture troughs at least 2 times a year is most beneficial.
- Pond and stream waters will change with environmental conditions and are more susceptible to land activity.

Fecal coliform contamination appears to be the greatest concern for livestock water quality in northeast Georgia, followed by iron and manganese palatability issues, and water temperature. Each water source can prove to be beneficial to your operation, but water quality can vary by location, delivery, and maintenance. Producers were able to use the water test results to determine the best management actions to provide the safest water possible for livestock on their farm.