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Soil
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SUBJECT: ECS - RANGE - WATER FOR LIVESTOCK

Purpose. To transmit the above named Technical Note.

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Filing Instructions. File with other Range Technical Notes in the Technical Note binder under Range.

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Attachment

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TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE

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TN - RANGE - 51

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WATER FOR LIVESTOCK

Water for livestock is a very important part of developing grazing management components of conservation plans. Quality as well as quantity of water is a concern. Here are some facts on water for livestock and wildlife.

WATER QUALITY

There are no standards for livestock like there are for humans. Therefore, if you take water samples to a lab for analysis, be sure to get the analysis results, not just a comment that "this water is not drinkable." Water quality may be categorized in terms of suspended matter, organisms, mineralization, organic matter and specific compounds.

ORGANISMS AND ORGANIC MATTER

Most troughs, stock ponds and springs contain organisms and organic matter including algae. This material has the potential for causing contagious diseases and parasitic infections. There have not been widespread problems from algae. However, it is still desirable to fence ponds and springs or make spring boxes and run a pipe to a stock water trough.

MINERALS

The tolerance of livestock for saline waters is shown in Tables 1 and 2. Livestock may scour when first exposed to mineralized waters but later become adapted. Animals tolerate alkali salts (especially bicarbonates) less than neutral salts, and sulfates less than chlorides. Magnesium is less tolerable than calcium or sodium, and potassium is least tolerable.

High levels of phosphates or silicates can cause kidney stones, especially in horses. A change in the acid-base balance through proper nutrition will sometimes alleviate the problem.

Prepared by Joel Brown, State Range Conservationist, Ecological Sciences Staff, Soil Conservation Service, Davis CA. Adapted from UC Cooperative Extension Range Roundup, Glenn and Colusa Counties, March 1991 by Fremont Bell, Farm Advisor.

Waters containing less than 5000 ppm Total Dissolved Solids (0.5% TDS) have been used continuously by all classes of livestock without apparent adverse effect on health or length of life. However, threshold levels for efficient production may be lower and will vary by species, age, diet, environmental temperature and any type of metabolic stress.

TRACE ELEMENTS AND TOXIC COMPOUNDS

Apart from the total salt concentration, some salts are specifically toxic to animals even in very low concentration. Among such substances causing concern for livestock production are nitrates, fluorides, and the salts of selenium and molybdenum. Other substances worthy of mention are: arsenic, cadmium, copper, cyanide, lead, manganese, mercury, sulfide, and zinc (Table 3).

WATER QUANTITY

Livestock (all animals) receive their water from three sources:

1. Drinking water.
2. Water in and on feed - 5% to 90% depending upon growth stage and dew.
3. Metabolic water - the water gained by body weight loss.

One pound of body fat "burned up" yields one pint of water.

One pound of carbohydrate reserve yields 1/2 pint.

One pound of protein loss yields 1/3 pint of water.

Water is related to the amount of dry matter eaten. The higher the intake the higher the water requirement. To illustrate, if you are in the middle of a desert and have dehydrated food, but no water, you will live longer if you throw the food away! (Food requires water whereas body weight loss supplies water.)

Water consumption does not vary much between 40 and 80 degrees Fahrenheit, but increases rapidly above that (Table 4). Brahman type cattle require about a gallon less water per 10 lb. of feed compared to European breeds at the higher temperatures.

Protein, and especially salt consumption, greatly increase water intake. Livestock fed salt-meal mixes or blocks need more water. Cattle or sheep may die within 48 hours after eating high (30%+) salt supplements if water is not available. This can happen when troughs freeze or pipes break.

TABLE 1. THE USE OF SALINE WATERS FOR LIVESTOCK AND POULTRY

Total Soluble Salts Content of Waters (mg/liter) PPM	Comment
Less than 1,000	These waters have a relatively low level of salinity and should present no serious burden to any class of livestock or poultry.
1,000-2,999	These waters should be satisfactory for all classes of livestock and poultry. They may cause temporary and mild diarrhea in livestock not accustomed to them or watery droppings in poultry (especially at the higher levels), but should not affect their health or performance.
3,000-4,999	These waters should be satisfactory for livestock, although they might very possibly cause temporary diarrhea or be refused at first by animals not accustomed to them. They are poor waters for poultry, often causing watery feces and (at the higher levels of salinity) increased mortality and decreased growth, especially in turkeys.
5,000-6,999	These waters can be used with reasonable safety for dairy and beef cattle, sheep, swine, and horses. It may be well to avoid the use of those approaching the higher levels for pregnant or lactating animals. They are not acceptable waters for poultry, almost always causing some type of problem, especially near the upper limit, where reduced growth and production or increased mortality will probably occur.
7,000-10,000	These waters are unfit for poultry and probably for swine. Considerable risk may exist in using them for pregnant or lactating cows, horses, sheep, the young of these species, or for any animals subjected to heavy heat stress or water loss. In general, their use should be avoided, although older ruminants, horses, and even poultry and swine may subsist on them for long periods of time under conditions of low stress.
More than 10,000	The risks with these highly saline waters are so great that they cannot be recommended for use under any conditions.

From: NAS, Nutrients and Toxic Substances in Water for Livestock

TABLE 2. WATER QUALITY CRITERIA FOR LIVESTOCK CONSUMPTION

Element	Recommended Limit for Livestock
Arsenic	0.05 mg/liter (ppm)
Cadmium	0.01
Chromium	0.05
Fluorine	2.40
Lead	0.05
Selenium	0.01
Nitrates (3000ppm lethal)	less than 100.00
Algae	avoid heavy growth of blue green algae
Dissolved organic compounds	Total from environmental sources shall not exceed livestock products limits.

TABLE 3. TOLERANCE OF ANIMALS TO SALINE WATERS

Species	Total Soluble Salt mg/liter (ppm)
Poultry	2860 mg/l upper safe limit 4000 mg/l -- watery droppings, decreased growth in young poults
Swine	4300 mg/l upper safe limit 7000 should be avoided
Horses	6500 upper limit for working horses (water must be given slowly) 9000 mg/l NaCl upper limit for horses at maintenance
Cattle	7000 upper safe limit for lactating cows 10,000 upper limit for mature animals at maintenance
Sheep	10,000 exceeds upper limit for ewes grazing pasture and nursing lambs 13,000 upper limit for NaCl; at 13,000 total salts, 5000 NaHCO ₃ or 2000 MgCl ₂ , reduced feed intake or wool production

^aUnless otherwise stated, major salt source is NaCl. Alkaline waters (NaOH), carbonate and bicarbonate are more toxic than NaCl. Sulfates and magnesium are more toxic than NaCl.

^bSalty feeds, limited water supply forcing animals to drink large amounts at one time and heat stress will lower animals' tolerance. Adults are more tolerant than young.

Taken from: Livestock Fact Sheet, "Quality of Water for Livestock," by G.F. Smith, Dept. of Animal, Range, and Wildlife Sciences, Agricultural Experiment Station, New Mexico State University, No. 15, July 1973.

TABLE 4. GALLONS WATER PER DAY FOR CATTLE

Degrees Fahrenheit	Daily Dry Matter Feed Intake (lbs)				
	1	10	15	20	30
10	.438	4	7	9	13
20	.467	5	7	9	14
40	.526	5	8	11	16
60	.585	6	9	12	18
80	.665	6	10	13	19
90	.900	9	14	18	27
100	1.200	12	18	24	36
110	1.600	16	24	32	48

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- Add 30% for cows during the last four months of pregnancy
 - Add one gallon water/gal milk produced (3-6 gal. beef cow)
 - Add 30% for young calves
 - Add 2 gallons (winter) to 20 gallons (summer) per day per 100 square foot water surface for evaporation loss.
 - Dry ewes require 40% less water per lb. of dry feed than cattle. Lactating and late pregnancy ewes need the same amount of water per pound dry feed as cattle.