NRCS	**Michigan Technical Note** **USDA-Natural Resources Conservation Service**

Grazing # 4
Subject: Planning Livestock Water Intake
Date: July 2009

Water intake by livestock has been the focus of research by only a few scientists over the last 150 years, not only in the U.S. but throughout the world. Once research was completed many years ago, this information was confirmed by observation from farmers and ranchers and then handed down to following generations. This included observational data recorded during hot and humid weather when livestock water intake was much higher than their normal or average intake. This has led to farmers/ranchers wanting to wisely choose the most conservative approach, which will also be the safest approach, of making sure that their livestock did not come close to lacking water or dehydrating. Naturally, the safe thing to do would be to supply a large amount of water at all times, so when the need by the livestock was for very high water intake in the worst case scenarios (high humidity and hot temperatures), the farmer was prepared.
Many conditions during both the past research and observations varied from one part of the United States to another. The unique details affecting these water intake observations were different when compared across management systems of farmers and ranchers. Differences may be found in the feeding of grain or no grain, livestock confined inside a building structure versus never confined, managed grazing system and free roaming from one farm or ranch property line to the other, some livestock were on a slow rotation on larger pastures and some were on a ½ day rotation on very small pastures (paddocks) during these research studies and observations. All of these variables have a tremendous affect on livestock water intake.

In recent years, a few research studies in the United States and Canada began to address these many variables and resulting water intake. Since we are particularly interested in

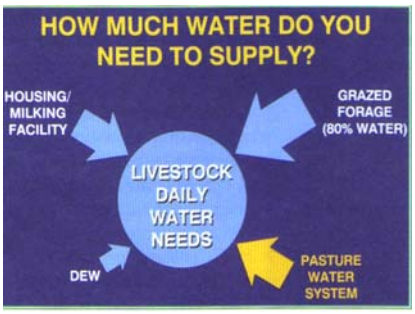
managed grazing as a conservation practice (NRCS Prescribed Grazing, Code 528), we will concentrate on that variable. We will use the water intake research on beef cattle, especially cows and heifers, as there is more information on this species and class of livestock than any other when it comes to water intake.

We will use the results of this research to build a foundation for our recommendations. Research tells us these facts:

- **A water deficiency will reduce animal performance <u>more quickly</u> and <u>more severely</u> than will any feed or mineral deficiency.** Lower water intake means lower dry matter intake.
- If water quality is poor, the affects on the livestock cannot be nullified by supplying a large water quantity.
- The quality of the water that consumed can affect milk production and weight gain positively and negatively in cattle.
- The more severe the Heat Stress on cattle, the larger the water intake per animal will be.
- The Thermonuetral Zone (TNZ) for cattle is when the climatic conditions are ideal for their bodies to function and/or grow, with the least amount of inhibitors. Research results show the range of air temperatures to be about 40 degrees F to about 75 degrees F with relative humidity range of 99% to 55%, respectively, and no wind (calm) to moderate wind respectively. Shade, wind breaks, and a developed thick hair coat can increase this range at the top and bottom ends.
- Heat stress in livestock is a combination of air temperature, relative humidity, and wind speed above the TNZ.
- A Thermal Heat Index (THI) was developed from research data but appeared to only use air temperature and relative humidity. Therefore, it did not account for the affect of wind.
- Cattle travel together to drink water with the 'herd instinct' when they have to walk more than about 900 feet to water or if they cannot see the water source.
- Cattle will travel individually or with small family groups to water when the water source is within their sight and within about 800 feet of where they are grazing.
- Water within the plants grazed by livestock greatly affects the amount of water they take in by drinking. One research study has shown that the plants in a daily rotational grazing system averaged almost 80% water (average annual 5 ton yield+ per acre of cool season grasses). In that particular research study plant moisture accounted for over 12 gallons of water per head per day. There were several days during the study where measurements showed that the cattle drank less than 1 gallon of water per head per day from the water tank.
- Beef Cattle water intake generally increases with increased body weight. However, research has shown that breeding age beef heifers have a higher water intake than non-lactating mature beef cows, even though they weigh less.

- Beef and Dairy cattle generally increase water intake when lactating as milk production increases.
- In a well managed livestock grazing system (following NRCS conservation practice standard Prescribed Grazing, Code 528) where 'cool season' grasses and legumes are the main forage, all plants grazed should contain 70% to 80% water. This was measured monthly during the entire grazing season two consecutive years of research.

When NRCS planners create conservation plans with customers who are strongly considering adopting the NRCS Prescribed Grazing conservation practice, we can keep the essence of all these facts by considering:



1. Animal individuality – some animals will drink more than others so we use an average.
2. The forage that is being grazed should be succulent – 75% + water during much of the grazing season.
3. Other on-farm water sources the livestock use – Is there a tank outside the milking parlor on a dairy farm or do the beef cattle have access to a water tank, stream, pond, etc. besides the tank in any given paddock, such as near the feed bunk, hay bunk, etc?
4. Instinctive herd behavior – is water proximity adequate to avoid this when optimizing pasture use is the customer's objective?
5. Quick recharge water system design – has the system allowed for proper tank, valves, pipes, pumps, etc. sizes that will allow fresh high quality water to keep the tank quickly refilled and not allow water to sit in the tank stagnant for long periods of time and degrade in quality?

So what does Michigan weather data tell us? An analysis of 50 years of weather records indicate that less than 10 % of the grazing season days per year show cattle would be in mild heat stress in the Upper Peninsula and Northern Lower Peninsula of Michigan. Only 5% of the grazing season days are at the extreme low end of the moderate heat stress zone. The animals are definitely in their Thermoneutral Zone (TNZ) during the rest of the grazing season. In Central and Southern Michigan, less than 20% of the days are in mild heat stress with less than 10% in the moderate heat stress zone. Only extreme southern Michigan shows an average of 2 days that are at the top of the moderate heat stress zone for livestock.

We would not plan the whole livestock water system for these few days that the livestock would consume larger than normal amounts of water. It would not be economical for the

farmers/ranchers to do so, or for the government's use of tax dollars to do so. Instead, after following the 5 recommendations above, we should have an **emergency contingency plan** for the increased water intake that takes place when the animals are in 'Moderate Heat Stress' or higher conditions. This may simply be putting livestock in a shady pasture, hauling extra water to pastures, bringing livestock into an open-air barn with fans and/or misters, or opening the fence/gate to a pond or stream from which they have been excluded.

If we take into account all of these things, especially the amount of water held in the forage that the research and highly measured observations tell us, then the daily water intake need per head per day in gallons that the livestock actually need to drink from a water facility or surface water access would be:

Water Consumption of Livestock in a Prescribed Grazing System on cool season mixed grass-legume pasture averaging 70% water.

Species	Conditions With no Wind or Shade Per Head Per Day in U.S. Gallons		
	In TNZ, THI of 70-79	Slight Heat Stress	Moderate Heat Stress Or Higher(+)
Lactating Dairy Cow	7 to 23	10 to 30	20 to 40+
Beef Cow/Calf pairs, Pregnant Heifers, Near Mature Wt. Steers	5 to 8	8 to 12	9 to 16+
*Horses – General	8	10	12+
*Mature Sheep	0.5 to 1	2 to 3	3 to 4+
*Land Grant Univ. recommendations No research data support found or cited.			

Water consumption will vary daily relative to the animal's weight and production status. The MI Conservation Practice 614 for Watering Facility uses a design capacity based on 1-2 gallons of water per 100 pounds animal body weight.