SDSU Extension

BEEF

Chapter 55

Pasture Water: Basics

Pete Bauman

Chapter 55:

Pasture Water: Basics

Introduction

Understanding the value of water quality for livestock health is a major concern of today's advanced producers. To put the value of water quantity and quality in perspective, Dave George of the Nebraska Natural Resources Conservation Service explains it this way, "If lack of water or poor water costs you weight gain for a couple of days, even if it's only a pound, can you afford it? If you have a herd of 500 animals and this happens more than once, say three times, can you afford to lose 1500 lbs of potential weight gains?". The answer is fairly straightforward. Investments into water quality equate to improved animal health and performance.

Water delivery may be the biggest challenge in pasture management. Negative impacts of cattle on their own water sources can decrease water quality for livestock and wildlife, and increased public awareness of livestock impacts on human water resources for both consumption and recreation has created both challenges and opportunities for the livestock industry (Figure 1).

Figure 1: Livestock access to larger rivers with multiple uses, such as the Big Sioux River shown here, can create conflicts with various user groups that may rely on the water source for drinking water, industry, or recreation. Photos by Pete Bauman

Key Points

- Water quality is a major concern to livestock health and performance.
- Negative impacts of cattle on water sources, and increased public awareness of livestock impacts on human water resources has created both challenges and opportunities for the livestock industry.
- Successful producers will take time to understand water development regulations in their area.
- Water can be supplied by several methods, including natural flowing waters, natural closed basins, and constructed non-flowing water.

Along with innovations in fencing, evolution in grazing schemes requires innovations in pasture water delivery systems as well. Depending on local conditions, breed, and other factors, a lactating cow requires between 20 and 35 gallons of water per day. If that cow is not supplied with a constant and reliable water source, her water intake needs may be higher because she will over compensate and consume more water than required, creating inefficient use of resources. Therefore, consistent, high-quality water availability is a concern shared by all livestock producers. This chapter includes information on:

- General Water Law
- General Water Quality
- Flowing Water Sources (creeks, rivers, springs/fens)
  - Flowing water quality
  - Flowing water law
- Non-flowing Water Sources (wetlands, lakes, dams, dugouts)
  - Non-flowing water quality
  - Dams and dugouts
  - Dam and dugout law

General Water Law

Water rights laws are unique to each state; such is the case in South Dakota. While it is beyond the scope of this section to summarize or interpret all laws pertaining to development and use of water resources in South Dakota, this chapter highlights a few basic laws associated with various water sources that every livestock producer should know. Producers are encouraged to consult appropriately qualified individuals and agencies for interpretation of South Dakota water law.

Laws pertaining to water rights in South Dakota can generally be found under Title 46 Water Rights of SD Codified law. However, because water is such a broad topic with fairly complicated laws that may pertain to livestock, producers should review the South Dakota Department of Environment and Natural Resources website http://denr.sd.gov/des/wr/summary.aspx for guidance on specific situations. This site contains simple categorically arranged information regarding administration, water use, permitting, wells, dams/dugouts, and high/low water. Within this site are links to SD Codified law relevant to each topic.

General Water Quality

Water quality and quantity are important considerations for any livestock producer, and research on the role of water temperature and quality dates back to at least the 1950s (Ittner et al. 1954). The topic of water temperature is often debated, with some believing cool or cold water is preferred by livestock. However, water supplied at air temperature is generally adequate as long as extremes of hot and cold are avoided. Of greater importance is overall water quality. SDSU Extension has developed the following table as a quick reference guide to water quality for various livestock (Table 1).

Flowing Water Sources (creeks, rivers, springs/fens)

Flowing water quality: The use of natural flowing water sources for livestock on pasture is still fairly common in South Dakota. In most cases, these water sources are available in conjunction with enhanced or constructed water delivery systems (see following sections). Natural flowing water systems primarily include creeks and rivers, but may include free-flowing fens and springs. Natural flowing water sources can diminish in water quantity and quality over the course of a typical South Dakota grazing season. Feces, urine, and pooling of stagnant water can cause water quality to degrade rapidly in low-flow periods. Riparian area degradation through erosion, compaction, invasive species infestation, and a decrease in wildlife value can occur (Figure 2).

Flowing water law: It is imperative to be familiar with water law when considering use of flowing, navigable, or public water resources for livestock. SD flowing water law addresses everything from navigable waters to beaver dams and the rights of all parties involved, but many producers either are unaware or misunderstand the rules related to navigable streams. For example, in South Dakota, navigable streams are considered public highways and it is illegal to restrict public access (Figure 3). In 1990, legislation was enacted to allow fencing of navigable streams provided that a gate is installed

Table 1: Some water quality measures and their effects on livestock. *Modified from Thiex and German, 2004; 2013.*

Total soluble salts (TDS) content of water							
mg/L or ppm	**beef**	**dairy**	**sheep**	**swine**	**horse**	**poultry**	**potential use concerns**
< 1,000	excellent for all classes	excellent for all classes	excellent for all classes	excellent for all classes	excellent for all classes	excellent for all classes	none
1,000 - 2,999	very satisfactory for all classes	very satisfactory for all classes	very satisfactory for all classes	very satisfactory for all classes	very satisfactory for all classes	very satisfactory for all classes	initial mild diarrhea in livestock or watery droppings in poultry
3,000 - 4,999	satisfactory	satisfactory	satisfactory	satisfactory	satisfactory	poor	temporary diarrhea in livestock, poor performance/mortality in poultry
5,000 - 6,999	reasonably safe	reasonably safe	reasonably safe	reasonably safe	reasonably safe	not acceptable	avoid use for pregnant/ lactating animals
7,000 - 10,000	considerable risk	considerable risk	considerable risk	likely unacceptable	considerable risk	not acceptable	pregnant/lactating, confinements, young animals
> 10,000	do not use	do not use	do not use	do not use	do not use	do not use	not recommended under any conditions
Alkalinity content of water							
mg/L or ppm	**beef**	**dairy**	**sheep**	**swine**	**horse**	**poultry**	**potential use concerns**
< 1,000	do not use	do not use	do not use	do not use	do not use	do not use	not recommended under any conditions
Nitrate-nitrogen (NO_3N) content of water							
mg/L or ppm	**beef**	**dairy**	**sheep**	**swine**	**horse**	**poultry**	**potential use concerns**
< 100	satisfactory	satisfactory	satisfactory	satisfactory	satisfactory	satisfactory	experimental evidence indicates water should not harm livestock or poultry
100 - 300	use with caution	use with caution	use with caution	use with caution	use with caution	use with caution	water alone should cause no harm, but high-nitrate feedstuffs in combination with water may create nitrate issues in cattle, sheep, or horses
> 300	not recommended	not recommended	not recommended	do not use	not recommended	do not use	
Sulfate (SO_4) content of water							
mg/L or ppm	**beef**	**dairy**	**sheep**	**swine**	**horse**	**poultry**	**potential use concerns**
< 1,500	no harmful effects	no harmful effects	no harmful effects	no harmful effects	no harmful effects	no harmful effects	very mild diarrhea toward 1,500 ppm
1,500 - 2,500	no harmful effects	no harmful effects	no harmful effects	no harmful effects	no harmful effects	no harmful effects	temporary diarrhea, may contribute to total dietary sulfur in cattle
2,500 - 3,500	very laxative	very laxative	very laxative	very laxative	very laxative	poor	diarrhea in livestock up to 2 weeks, may contribute significantly to total dietary sulfur in cattle
3,500 - 4,500	very laxative	very laxative	very laxative	very laxative	very laxative	do not use	Avoid for pregnant/lactating cattle, horses, sheep or confinements
> 4,500	do not use	do not use	do not use	do not use	do not use	do not use	not recommended under any conditions

Figure 2: Natural flowing water sources are commonly utilized by livestock producers in South Dakota when available. Short-term or temporary sources like a beaver pond (upper right) can provide adequate water, especially early in the grazing season, but degradation of the pond and dam can occur easily, especially if it is the sole source of water. Large perennial flowing creeks (upper left) or small perennial flowing springs/fens (lower left) often provide adequate water; however, issues with riparian area degradation, erosion, and nutrient loading from feces and urine can be a concern (lower right). *Photos by Pete Bauman*

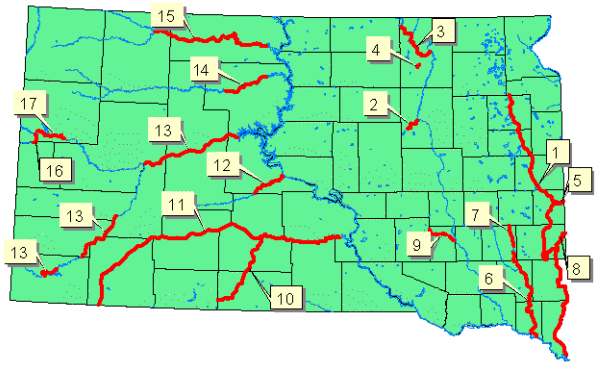

Figure 3: Navigable river and stream segments in SD subject to installation of public access gates when fencing across the channel for livestock use. *Map copied from SD DENR web page* http://denr.sd.gov/des/wr/fencemap.aspx

Figure 4: Example of authorized gate on the Big Sioux River. *Photo taken from the SD DENR Landowner and Recreationist Guide to Fencing of Navigable Streams*

to allow public use. Law dictates the size, location, marking, and registration of these gates (Figure 4). Information on fencing navigable waterways can be found at the South Dakota Department of Environment and Natural Resources web page on stream fencing at http://denr.sd.gov/des/wr/fence.aspx. More information can also be found by viewing the DENR pamphlet available at http://denr.sd.gov/des/wr/StreamFencingGuide.pdf.

Non-Flowing Water Sources (wetlands, lakes, dams, dugouts)

Non-flowing water quality: Use of natural non-flowing water such as wetlands and stock dugouts or dams is very common. In many cases, these water sources are relied upon as the sole source of water in a given pasture. As with flowing water, non-flowing water sources can diminish in water quantity and quality over the course of a typical South Dakota grazing season. This can occur more quickly than flowing water as any additional fresh water is generally only supplied by rainfall and/or runoff from the surrounding watershed. Feces, urine, stagnant water, potentially harmful algae blooms, and degradation of the shoreline or riparian areas in and near these water sources can occur when livestock are permitted free access for extended periods of time or over multiple grazing seasons. As with flowing water riparian zones, closed basins can suffer from erosion, compaction, and invasive species infestation. These water sources require monitoring and management, especially if they are poorly distributed in the pasture, and it may be necessary to control livestock access to only portions of the water source (Figure 5).

On occasion, short duration disturbance by livestock in cattail sloughs or other dense vegetation stands can enhance the wetland through suppression of the vegetation, creating a hemi-marsh situation (Figure 5). This practice is often utilized on conservation lands and requires a management plan that avoids the long-term degradation of the water resource. Overall, it is recommended that producers develop alternative water sources in pastures with limited non-flowing water resources.

Dams and dugouts: Construction of enhanced non-flowing water sources, such as dugouts and stock dams, is perhaps the most popular method of pasture water source enhancement for livestock currently used on South Dakota grasslands. Stock dams are typically installed within a natural watershed. An earthen dam is constructed to block the flow of water, and an overflow pipe is generally installed to maintain the level of the dam and prevent the water from over-topping the dam.

A dugout is generally a basin that is dug in or near an existing wetland, spring, or seep in order to hold water. Dugouts are occasionally constructed near a flowing stream where a shallow channel is dug to connect the dugout to the stream. Although some dams can be quite large, most dams and dugouts are relatively small and can suffer from water quality and erosion issues previously mentioned. In most cases, dams are preferred over dugouts for maintenance

Figure 5: Livestock access to closed basin or non-flowing natural water sources, like a cattail slough (left), can have short-term positive effects for waterfowl in regard to removal/thinning of vegetation. However, shoreline degradation can occur quickly and should be monitored (center). Use of large water bodies, such as lakes, may require innovative installation of barriers. In this case, Minnesota managers install buoys and electric wire to allow access to water while keeping the cattle in the pre-determined area (right). *Photos by Pete Bauman and Joe Blastick.*

and water quality. In both instances, livestock should be restricted from access to the dam or the dugout, and water should be delivered from the dam or dugout to a livestock tank in order to minimize water quality and erosion issues and to extend the life of the constructed basin (Figure 6).

Figure 6: Typical 'new' livestock dugout near a Deuel County wetland. Non-vegetated barrow piles often erode over time if livestock are allowed free access, compromising the life span of the dugout. Photo by Pete Bauman.

Dam and dugout law: South Dakota does have codified law pertaining to dugouts and dams in regard to size (measured in acre-feet), permitting, water rights, and interference with existing water courses. Although several laws apply to all dams and dugouts, those that store 25 or 50 acre-feet may have additional rules. See http://denr.sd.gov/des/wr/summary.aspx#Dams for more details.

References

Ittner, N.R., T.E Bond, and C.F. Kelly. 1954. Increasing summer gains of livestock: with cool water, concentrate roughage, wire corrals, and adequate shades. Journal of Animal Science. 13:867-877.

South Dakota Department of Environment and Natural Resources. Navigable stream fencing in South Dakota. http://denr.sd.gov/des/wr/fence.aspx

South Dakota Department of Environment and Natural Resources. River and creek segments requiring gates in fence. http://denr.sd.gov/des/wr/fencemap.aspx

South Dakota Department of Environment and Natural Resources. Summary of SD water laws and rules. http://denr.sd.gov/des/wr/summary.aspx, http://denr.sd.gov/des/wr/summary.aspx#Dams

South Dakota Landowner and Recreationist Guide to Fencing of Navigable Streams. http://denr.sd.gov/des/wr/StreamFencingGuide.pdf

Thiex, N. and D. German. 2004. Interpretation of water analysis for livestock suitability. South Dakota State University Cooperative Extension Service. Ex 2042. 2 pp. Updated 2013.