Kansas State University

Bressner Pasture Field Day

PATCH BURNING

Proceedings

Thursday August 30th, 2012

Yates Center, KS

K·STATE
Research and Extension

Knowledge for Life

K-State Research & Extension is an equal opportunity provider and employer.

Program:

4-H Building Woodson County Fair Grounds

8:00 am Registration, Poster Session, Vendor Exhibits

8:30-9:15 am Load Buses to pasture

*Effect of Patch Burning on Forage Composition....... Dr. Walt Fick / Cade Rensink

*Limited Pond Access and Tire Tank .... Herschel George / Jeff Davidson

*Bressner Pasture Weather Station .... Mary Knapp

*Erosion Control for Cattle Trails .... Dr. Dale Kirkham

*Blue-Green Algae.. Deon van der Merwe

Return to air conditioned 4-H Building

*Cattle Gains on 6 years of Patch Burn Research....... Dave Kehler

*Program will conclude by 2:00 p.m.

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Bressner Pasture History

Dale Lanham, Woodson County Extension Agent

The KSU Bressner Range Unit includes two adjacent half-sections of native grass near Yates Center, KS. The KSU Foundation received this land through the Willie J. Bressner estate in 1988. This property was donated without restrictions, however Mr. Bressner requested that it be utilized as an experimental project to study the preservation and use of native grasses.

The past seven year's research project has been focused on "patch-burn" vs. full-burn pastures each spring and subsequent cattle performance and plant composition changes. Stocker cattle graze each year from late April until August 15th. Native grass patch-burn treatments are implemented on 1/3 of each pasture each year. Within each patch-burn pasture, the east 1/3 of the pasture was burned in year one, the middle 1/3 of the pasture was burned in year two and the final 1/3 burned in year three. Year four the burn cycle was repeated through 2012 when the cycle began again. As you read this report, you will see we will only be reporting 6 years of research on the east pastures; due to lack of water in the east pastures, cattle were co-mingled from mid-June until August 15th in 2011.

"Patch burning" has created some very unique challenges when it comes time to burn in the spring. A straight path was mowed on the perimeter of the patches that were to be burned in an attempt to have a straight fire line to compare burn versus non-burned patches within the pasture. A significant amount of water and man power are required properly complete the burn each spring. Practical "patch burning" for ranchers would utilize natural barriers instead of focusing on burning in a straight line!

Bressner Range Unit has utilized several outstanding cooperators to furnish cattle for the research on this pasture. This is a bid process for 235 head of steers weighing between 500-600 pounds. The past seven years of cattle owners were:

- 2012-Phillip Collins
- 2011-Eric Karmann
- 2010-Eric Karmann
- 2009-Michael Old
- 2008-Michael Old
- 2007-Ronnie Reynolds
- 2006-Ronnie Reynolds

Without their cooperation and cattle utilization, this research would not be possible. Thank you cooperators!!

Year 2011 was the start of the worst drought in recent history. Ponds "known" to have ample water were discovered to have ample mud. The east pond on the Bressner Pasture was one of these ponds. A back-hoe drained some good water into a couple of holes in an attempt to keep the cattle in the correct pastures, but it became apparent after losing one steer in the mud, that it was not going to solve the water problems. The cattle were allowed enter the center pastures that had access to several good springs in the creek which has. On the north end of the creek there was no water running but 100 feet or so into the Bressner property there were springs that kept water moving very slowly. Therefore the east pasture data for 2011 will not be included.

However, with that happening, it did allow for the opportunity to expand and complete a new and better watering system for the far east pastures. Shortly after the cattle were removed in 2011, the pond dam was cut, and the mud was removed in the early spring. During the cleanout process, it was discovered there had actually been two ponds in that location, that is now combined into one large pond. Changing the pond dam and surrounding area made it necessary to replace the electric fence between pasture 4 and 8. The pond was fenced off adding a limited water access to pasture 4 and a water tank into pasture 8.

Thank you for attending the 2012 Bressner Pasture Field Day. As the patch-burn project comes to a close, we look forward to the next project. If you have an important issue that you feel is important to the future of native grass prairies, please talk to any of the committee members that will be deciding the next project. Committee members: Dave Kehler, Extension Agent Butler Co; Jeff Davidson, Water Quality Specialist; Warren Bell, retired Water Quality Specialist; Gary Kilgore, retired Crops & Soils Specialist; Dr. Frank Brazle, retired Southeast Livestock Specialist; Dr. Dale Kirkham, Kansas Rural Center; Dr. Doug Shoup, Southeast Agronomist; Altis Ferree, Woodson County Rancher; Lauren Pringle, Woodson County Rancher; Mike Collinge Greenwood County Rancher; Harvey Raaf, Coffey County Rancher and Dale Lanham, Woodson County Extension Agent.

A huge thank you goes to the group that helps weigh, ear tag and burn pastures are: Mike Holder, Chase County Agent; Dave Kehler, Butler County Agent; Darren Hibdon, Franklin County Agent; Rod Schaub, Osage County Agent; Darl Henson, Coffey County Agent; Jim Mengarelli, Crawford County Agent; Jeff Davidson, former Greenwood County Extension Agent, Warren Bell, former Coffey County Agent, Keith Martin, Labette County Agent, Dave McNett, Woodson County Noxious Weed Department, Yates Center Rural Fire Department, Woodson County Road &Bridge Dept.; Eldon Lanham, Linn County Rancher and Scot Lanham, Linn County Rancher. Without their dedication and involvement, the Bressner Range Unit would be just another pasture in Woodson County and not the Research Pasture that it is known by.

Cattle Performance Grazing Full-Burned Versus Patch-Burn Tall-Grass Pastures

Seven years of cattle grazing performance on full-burned versus patch burn tall-grass native pasture was evaluated at the KSU Bressner Range Unit located west of Yates Center, KS. The 625 acre unit is comprised of 13 soil types with the major soil types comprising of clay upland sites consisting of moderately deep to deep soils that are somewhat poorly drained. Clay upland sites have natural potential vegetation of mixed grasses dominated by big bluestem, little bluestem, Indiangrass, and switchgrass. Average growing season (April-September) precipitation is approximately 27 inches.

The 625 acre unit was divided into 8 individual pastures, each consisting of approximately 78 acres. Using a split-block experimental design, full-burn versus patch-burn treatments were replicated four times over 7 years (2006-12). In the patch-burn treatments, pastures were fenced only on the exterior boundary with no fences dividing the patches. Burning was conducted in the month of April. Each of the north 4 pastures were patch-burn grazed on a one-third (26 acre) basis. Therefore, each patch in the patch treatment was burned once in the 3-year cycle. By the end of the study each patch in the patch-burn pasture would have had at least two years of patch burns the year of grazing, two years of patch burns the previous year, and two years of patch burns 2 years prior. Each of the south four pastures were subjected to the traditional method of full-burn grazing.

Cattle were weighed individually using electronic scales at the start and end of the grazing period. Using color-coded ear tags, they were randomly assigned to each of the eight pastures. Average initial cattle weights in pounds per acre each year for each pasture are given in Table 1.

Cattle (n = 120, average initial weight = 565 lb) were stocked in patch-burn treatment pastures from mid-April through mid-August using a three-quarter season (114-d) grazing period that was customary to the research unit at a rate of 2.7 acres/head. Cattle had free access to all areas within each pasture, so they could choose between burned and unburned patches in the patch treatment.

The remaining pastures were assigned the full-burn treatment and were designed to mimic similar grassland management used throughout the Flint Hills area. Treatment of these pastures consisted of an annual spring burn where all pastures were burned with a single fire every year. Cattle (n = 112, average initial weight = 567 lb) were stocked from mid-April through mid-August at a rate of 2.7 acres/head and had free access to the entire area of each pasture.

Average daily cattle gains (ADG) and beef gain per acre were analyzed using SAS proc GLM procedure and means were separated using Least Significant Difference (LSD) at p=0.05.

Animal Performance Results

In 2011, due to the dry weather and limited water supply on the west pastures, data were not analyzed after a mid-season co-mingling of cattle across treatments. Therefore analysis and data reporting was done for the remaining 6 years of the 7 year study. The raw averages for cattle gain per acre and average daily gain of the 4 uncompromised pastures in 2011 are presented in Table 2.

There was no year by treatment interaction so data were analyzed across years. The greatest cattle gains were achieved in 2009 and 2010 with the lowest cattle gains experienced in 2007 and 2012 (Figure 1). There was no significant difference in ADG between full-burn and patch-burn treatments with an LSD of 0.10 lb/head/day. Cattle grazing on the patch-burn pastures gained 2.44 lb/head/day over the 6 years of the study while cattle on the full-burn pastures gained 2.42 lb/head/day. Similarly, season long cattle gains per acre were not significantly different across years (Figure 2). The average gain per acre for patch-burn and full-burn pastures were 118 and 116 lb/acre, respectively.

Table 1. Initial cattle weights prior to grazing in pounds per acre for each pasture in the patch-burn and full-burn treatment.

Pasture Treatment	2006	2007	2008	2009	2010	2012
			Pounds per acre			
Patch-burn 1	276.85	281.99	251.58	273.22	246.03	323.08
Patch-burn 2	212.18	219.52	184.19	205.32	185.24	230.65
Patch-burn 3	265.29	267.06	238.68	246.47	235.00	300.59
Patch-burn 4	225.33	231.05	210.26	225.72	195.72	263.49
Average	244.91	249.90	221.18	237.68	215.50	279.45
Full-burn 5	257.43	259.43	225.43	240.64	235.14	302.57
Full-burn 6	230.43	239.40	201.03	225.60	193.79	272.76
Full-burn 7	233.71	235.45	207.65	239.17	212.20	264.32
Full-burn 8	256.91	263.82	234.26	267.57	243.60	261.40
Average	244.62	249.53	217.09	243.25	221.18	275.26

Table 2. Number of head, average initial cattle weights, average final cattle weights, and average daily gain (ADG) of the four uncompromised pastures in 2011. Data presented is raw unanalyzed data.

Treatment	Cattle	Initial weight	Final weight	ADG
	# Head	lb/head		lb/hd/day
Patch-burn	55	524	835	2.63
Full-burn	52	517	811	2.50

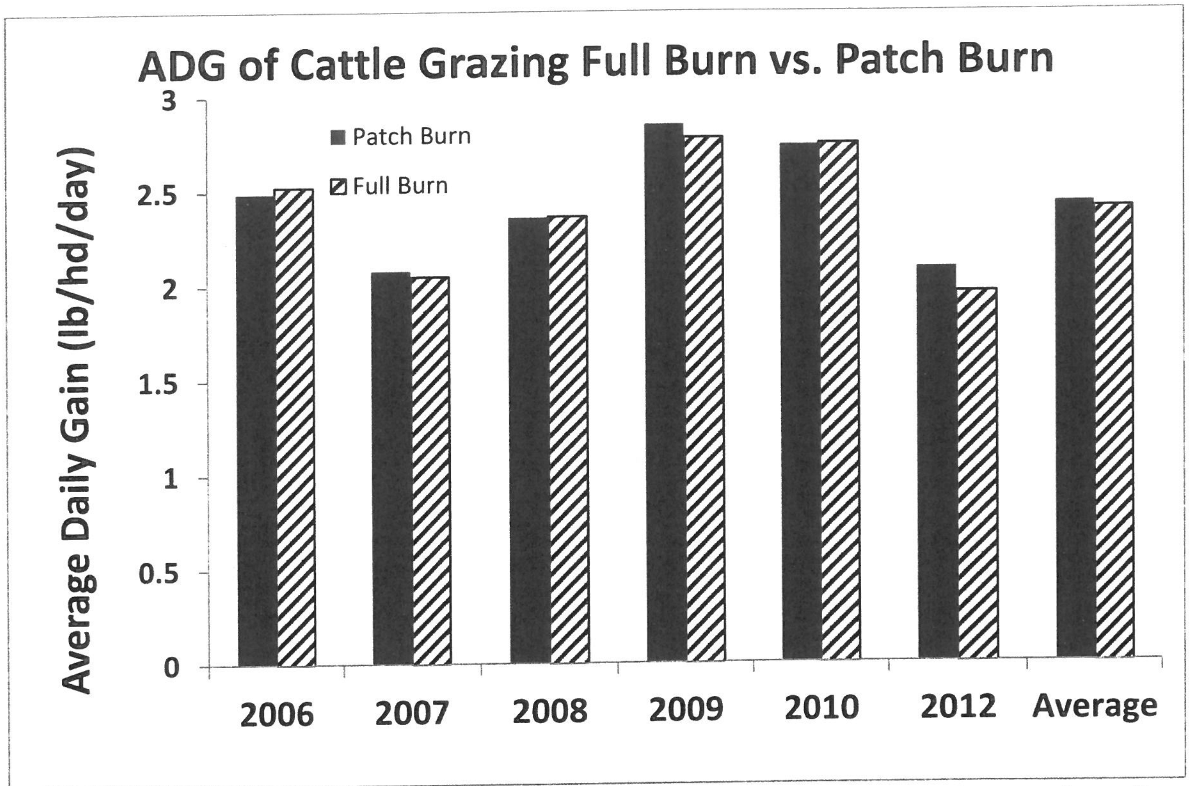


Figure 1. Average Daily Gain (ADG) of cattle grazing full-burn or patch-burn native tall grass prairie. No significant differences in ADG were observed between patch-burn or full-burn over 6 years of evaluations at p=0.05.

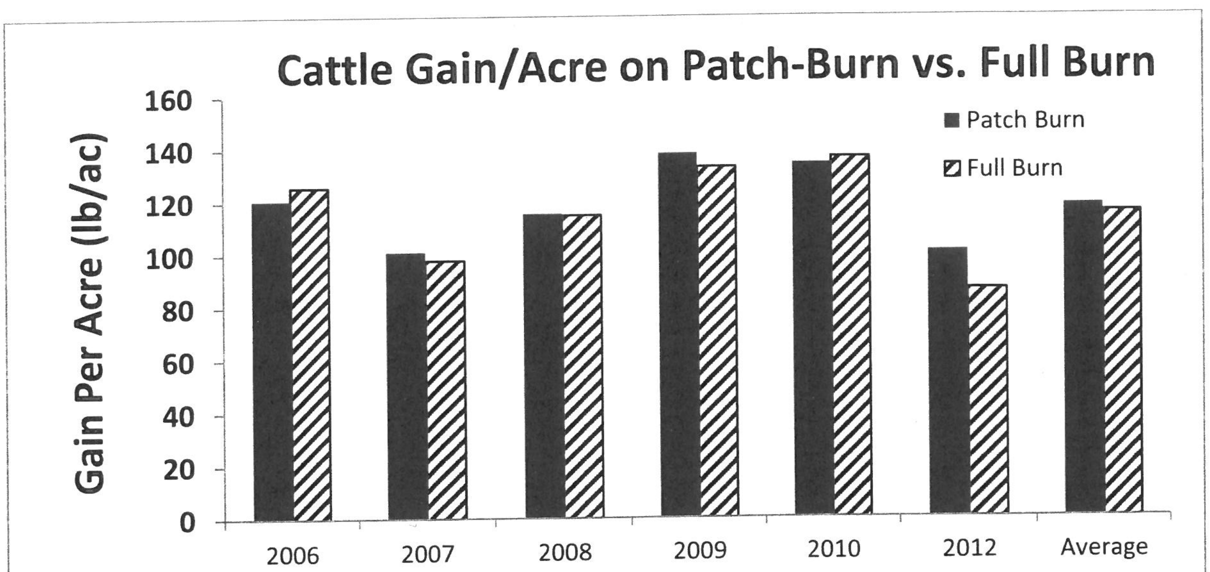


Figure 2. Season long gain per acre of cattle grazing full-burn or patch-burn native tall grass prairie. No significant differences in gain per acre were observed between patch-burn or full-burn over 6 years of evaluations at p=0.05.

Effect of Patch Burning on Forage Composition

Walt Fick and Cade Rensink

Introduction

Patch-burn grazing involves burning a portion of a grazing unit resulting in concentrated grazing that year. The next year, a different portion of the unit is burned shifting the grazing pressure. Typically, a grazing unit will be completely burned over a 3-year period. Previous studies have indicated that heavy use during the burn year may increase bare ground and stimulate forbs. The objectives of this study were to monitor the prairie using botanical composition to determine if a 3-year burn cycle allows sufficient time for the major tallgrass species to recover.

Materials and Methods

The study was conducted on the Bressner pastures from 2006 – 2011. One-third of pastures 1-4 were burned each year. Pastures 5-8 were completely burned each year. Burning occurred in April prior to stocking with 550 pound animals from mid-April to mid-August using a three-quarter season (114 days) grazing system allowing 2.7 acres/head.

One 100-point transect was established in each one-third portion of the patch-burn pastures and two transects were established in each of the full burn pastures on clay upland ecological range sites for a total of 20 transects. A modified step-point method was used, recording hits, closest plants, and the nearest forb or woody plant after a hit on a grass or when the closest plant was a grass. Step-point sampling was conducted in the late summer/fall after the grazing period.

Results and Discussion

Major grass species were relatively stable with some year-to-year fluctuation on the full-burn pastures (Table 1). The big 5 grasses, big bluestem, little bluestem, indiangrass, switchgrass, and sideoats grama made up 58-76% of the botanical composition during the study. Annual grasses, including crabgrass, yellow bristlegrass, and common witchgrass were generally less than 10% of the botanical composition except in 2009, a year following a wet summer.

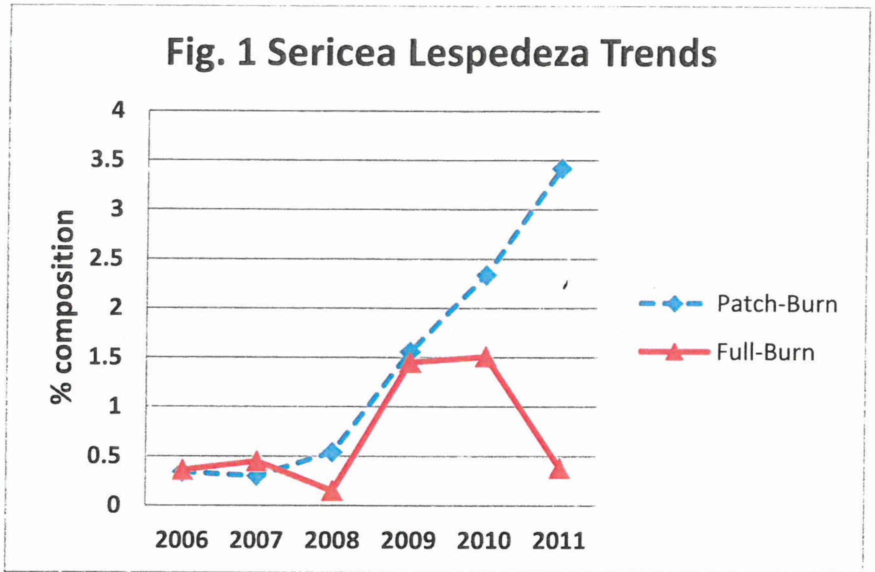
Table 1. Average percent plant composition during 2006 to 2011 on Bressner pastures 5-8 (full burn treatment).

Species/Category	2006	2007	2008	2009	2010	2011
Big bluestem	38.0	34.6	32.0	29.5	19.5	32.2
Little bluestem	11.5	11.5	9.6	11.6	16.2	8.8
Indiangrass	9.7	13.4	12.1	8.8	11.1	6.9
Switchgrass	13.3	14.8	12.2	4.5	9.0	8.6
Sideoats grama	2.5	2.1	2.9	3.5	4.2	6.0
Annual grasses	2.6	1.0	5.1	11.6	9.1	1.8
Forbs	9.1	8.7	8.3	11.1	12.4	7.9
Sericea lespedeza	0.4	0.4	0.2	1.4	1.5	0.4
Total basal cover	9.9	11.1	8.6	9.8	7.8	6.5

After two patch-burn cycles, botanical composition shifts were similar on patch-burn pastures and full-burn pastures (Table 2). One major change was the increasing trend of forbs on the patch-burn units. Sericea lespedeza was increasing in most pastures (Fig. 1). The full-burn pastures were sprayed for sericea lespedeza the fall of 2010.

Table 2. Change in percent botanical composition by treatment on Bressner pastures, 2006-2011.

Species/Category	Patch-Burn	Full-Burn
Big bluestem	- 5.7	- 5.8
Little bluestem	- 7.3	- 2.7
Indiangrass	- 0.1	- 2.8
Switchgrass	- 5.8	- 4.7
Sideoats grama	+ 1.7	+ 3.5
Annual grasses	- 6.3	- 0.8
Forbs	+ 5.7	- 1.2
Sericea lespedeza	+ 3.1	0 (+ 1.2 in 2010)
Total basal cover	- 6.2	- 3.4



The most dramatic change in botanical composition was the increase in annual grasses the year of patch-burning (Table 3). These species declined in the 2 years following the patch-burning. Big bluestem, sideoats grama, and forbs remained relatively stable during the patch-burn cycles. Little bluestem and indiangrass recovered following the first burn. Switchgrass composition has trended downward following patch-burning.

Table 3. Percent botanical composition relative to year of patch-burn.

Species/Category	Year before burn	1st burn	1 year post burn	2 years post burn	2nd burn
Big bluestem	22.8	26.1	17.8	19.3	22.5
Little bluestem	14.3	9.2	13.1	12.2	7.1
Indiangrass	11.8	8.0	10.6	14.0	5.7
Switchgrass	5.5	9.6	5.6	4.0	2.7
Sideoats grama	1.6	1.8	1.5	1.0	2.3
Annual grasses	6.9	26.5	17.7	7.8	23.3
Forbs	12.2	12.3	13.2	13.0	12.2
Sericea lespedeza	1.3	0.4	1.2	2.3	2.8
Total basal cover	7.0	11.8	8.2	5.9	8.8

Summary

1. Forbs were tending to increase under patch-burning compared to full-burn pastures.
2. Sericea lespedeza was increasing regardless of burning regime.

3. Annual grasses, including common witchgrass, yellow bristlegrass, crabgrass, and prairie threeawn , dramatically increase the year of patch-burning.
4. The native grasses monitored, except possibly switchgrass, remain stable or recover the 2 years following patch-burning.

Electric Fences

Dale Lanham

Electric fences were installed on the Bressner Pasture in the spring of 1990 to separate one pasture into eight pastures. Twenty some years later most of the original electric fences are still there, but some of it needs to be redone.

Insultimbers were used on the east 4 pastures in 1990 and they have withstood burning every year. However, in the early years someone got the hairbrain idea that mowing the grass under the electric fence and around the posts would be a good deal! Maybe a better mower driver would have helped, but it was harder on the post when the mower hit them, than burning had been. That experiment only lasted one time. If you look at these posts today you would find a large percentage of them broken off about 2 to 4 inches into the ground. I haven't replaced any with the insultimbers post, but have put several of the "cheap" plastic and fiberglass post in to supplement the broken posts.

On the west side we used a 5 ½ foot by 5/8 fiberglass rod post. These posts were very quick and easy to install. However over the past 20 plus years, the weight of three high tensile wires puts a lot of downward pressure on the post causing them to move deeper, making the fence shorter, except in the draws where the posts come out of the ground. These posts have deteriorated over time and leather gloves are a requirement when handling these posts. Both polyethylene insulators and porcelain insulators have been used on the corners and I have had to replace more of the polyethylene than porcelain over the past 22 years.

A creek separates the two half sections, so each side is connected to different solar panel and charge. Solar panels have held up and still doing a good job. Deep cycle marine batteries are used and they usually last 2 to 4 years. Lighting arresters have helped, but if not replaced in a timely manner, a fence charger that takes a lighting hit is usually not fixed by replacing fuses!

In 1990 when we installed the first electric fences, we followed the recommendations of both of the companies that suggested making the top wire hot, middle wire a ground and the bottom wire hot also. This has sometimes caused problems when the deer attempt to jump over, only to get the top two wire twisted together, which has a major impact on shorting out the fence.

Year 2012 was the first time to rebuild any of the electric fences. When the east pond was cleaned out, the old fence was taken down. The fence between pasture 4 and 8 was moved to adjust to the new pond dam and to exclude cattle from having access into the pond. The old insultimber posts for approximately 1/4 mile were taken out and there were only two posts within that fence that were not broken. The original wire was reused and a new composite post was installed. This new post is called Pasture Pro. These are a 30-40% reclaimed wood flour with 60-70% polypropylene, and a small percentage of process additives such as pigments and UV inhibitors. The posts should last at least 20 years and were very easy to install. This should be interesting to see how they stand up to fire. With this new fence I made all three wires hot.

Erosion Reduction at the Bressner Pastures

Dale Kirkham, Kansas Rural Center

Native bluestem pastures are primarily managed for abundant forage production and good livestock performance. But other benefits from properly managed pastures include clean runoff water, habitat for wildlife, carbon sequestration, and scenic views. Reducing sediment and other impairments in the runoff from the Bressner pastures is important because it contributes about 10% of the drainage area for the Yates Center Reservoir, a multipurpose water supply constructed in 1990.

Soil erosion is a natural process and generally not a major concern in pastureland. However, certain activities by cattle and ranchers can accelerate the process resulting in gullies started by ruts that concentrate water flows. Cattle trailing, ranch roads and feeding during wet periods are high on the list of activities that subject the prairie sod to erosion damages.

Cattle are creatures of habit and commonly "trail" to water, salt and mineral feeders, and shade which can form paths that lead to gullies. Gullies also start along fences where stocker cattle travel steadily during the first few days after turnout during the spring. Where small gullies have started along fences, cattle paths, and pasture roads, *placing short "kickout" berms of earthen fill will divert concentrated runoff onto good sod.*

Where cattle trail along fences, *short stub fences can be installed to direct their movements toward the center of the pasture,* especially on steeper slopes. Even those unwanted osage orange trees can be cut and placed to direct cattle traffic. At turnout time for stockers, *a low-stress handling procedure called "pitch-and-catch" will settle the cattle and minimize trailing* along the fences.

What about healing actively eroding gullies? The key is to slow the flowing water in the channel if it cannot be diverted away. Starting at the upper end of smaller gullies (often a headcut), *place available materials such as used net wrap held by rocks or tree branches at intervals to slow water flow and trap sediments.* Annual grasses and weeds will soon establish and eventually be replaced by native species. Larger gullies often require structures made of rock or earthen fill designed by an engineer to be fully effective.

Pasture roads can also lead to gullies as repeated vehicle traffic, especially during wet times and on steeper slopes, breaks the sod cover and forms ruts. Negative *impacts can be reduced by following the contour of the land and altering routes* whenever possible. Also, use lightweight vehicles with broad tires such as ATVs and UTVs if available and suitable to the task.

Winter feeding sites are another source of sediment, minerals and bacteria in runoff. *Moving feeding locations to new areas often* will alter traffic patterns, reduce spot damage to the sod, and encourage cattle to consume dormant forage in lightly used areas of the pasture. *Feed in open* *areas away from ponds and streams during suitable weather* while saving sheltered spots for extreme conditions. Feeding supplements in larger amounts just 2-3 times per week will also reduce vehicle traffic.

Spring burns that remove both the standing dead material and the surface layer of mulch leave the soil vulnerable to sheet and rill erosion until new plant growth is sufficient to provide protection. Whenever possible, *burn native pastures when the soil and mulch layers are moist* in order to leave a protective layer on the soil surface. In the patch burn-patch graze system, the higher rates of sheet and rill erosion than may occur in the heavily grazed third of the pasture are likely offset by greater protection in the remaining two-thirds.

Remember that maintaining good grass and mulch cover will slow runoff, trap sediments and increase infiltration, thus, **Rule #1** in reducing soil erosion in pastures. **Rule #2** is to minimize livestock and human activities that lead to concentrated flows of runoff. And, YES, runoff rains will come again.

Tire Tank Installation

Herschel George - K-State watershed specialist

1. **Choose size of tire and type of opening.**
    - Small circles for drinking
    - Whole tire
    - Half tire

2. **Cut tire opening.**
    - Tools
        - o Tire chalk
        - o Drill with large twist drill bit (may hit wire)
        - o Reciprocating saw with metal cutting blade with 6 to 8 tpi (teeth per inch).
        - o Special cleaning and lubricating fluid
    - Mark the desired cut line with tire chalk
    - Cut tire and remove the center

3. **Select site for tank.**
    - Needs a minimum of about 2 psi (4 ft) difference between water level in pond and top of water in full tank
    - Ideal to have overflow line that drains to daylight

4. **Plumb water lines to and from proposed site.**
    - Ideal to have 1 ½ or 2 inch waterline to and from the tank
    - Ideal to have flexible connector on both incoming and outgoing lines
    - Ideal to have Brass (or Galvanized) line coming into tank to connect to float valve
    - Plumb intake line so bottom of threads on the metal pipe is even with top of concrete line (top of bead inside the tank).
        - o Lightly thread a female connector onto the top of the pipe with a 1 ft or longer piece of pipe in it to prevent concrete from getting into the pipe or threads and to allow you to maintain as vertical as possible pipe placement. Do not glue these pieces; they will be removed when concrete is cured.
    - Plumb the drain and overflow so the top of the collar connector is installed to be just flush with the top of the concrete (top of bead inside of the tank).
        - o Lightly place a 1 ft or longer piece of spare pipe into connector, but do not glue it! This is to protect the pipe from being filled with concrete and to allow you to maintain the pipe as vertical as possible. This will be removed after the concrete in cured.

5. **Firm, tamp and fill center of tank** so there are 4 to 6 inches of space left for the concrete. There can be greater space, but it requires more concrete.

6. **Level and set tire into site.**
    - Ideal to have tire into ground at least a few inches
    - Ideal to have geotextile around the tank to extend the life of the gravel sinking into mud
    - Firm and tamp the gravel base under tank.
    - Level tank using a tube level.
    - Install reinforcing rod or wire into the space for the concrete.

7. **Install a bead of silicone** onto the center of the bead that will be in the concrete.
   - Install a bead of silicon onto the incoming and outgoing lines about 2 inches down from the top of concrete line.
   - An optional 2nd bead of silicon can be installed about 4 inches from the top of the concrete line (top of tire bead inside the tank).

8. **Mix the concrete for the tank.**
   Tire tank concrete mixture tips from Herschel George: I have been using bagged concrete mix with additions. I add a bit of Portland cement to the mixture to make it a bit richer and stronger. I also add a bit of "fiber" to the mixture. It helps to maintain the material from cracking apart. (Some tell me this is unnecessary, but for the cost it makes me feel better. Fiber adds about $5.00 to the cost of a yard of concrete.) It takes about 4 or 5 bags to do the tires I am demonstrating on today (5 ft diameter with 24 inch bead).
   - Mix the concrete mixture (with additives) for the tire.
   - Place concrete into the center through the bead opening only.
   - Work the concrete under the tire as best as you can. You may need a trowel and a sledge hammer to make the concrete move under the tire well.
   - Make sure the pipes are straight. Make sure the reinforcing rod is in place.
   - Continue poring concrete until area below the tire is full up to the top of the bead. Trowel the area. You can have a ½ inch of crown to the concrete if you desire. Check the level of the bottom of the threads and the top of the drain collar to make sure they are at the desired depths.

9. **Run water into the tire outside the concrete area** until the water softly flows across the concrete and covers the concrete by 2 inches.
   - Leave the project (with the water on the top of the concrete!).
   - Clean all tools.

10. **After the concrete cures** (ideally 3 weeks or so), install the water level valve with float.
    - Consider the refill rate of the tank when selecting a valve. Small valves cost less but may have slow flow or refill rates.
    - Tanks installed using gravity flow from a pond may have very low pressure, select the valve accordingly.
      - The valve I often show is from: Watson Manufacturing Inc., Stock Water Control Products, P.O. Box 397, Morrill, NE 69358, 1-800-292-2987, 1-308-247-2281
      - http://floatvalveusa.com/index.html
    - HG - I recommend installing a "Break-a-way" connection below the valve to protect the metal pipe threads and valve in case your neighbor's ornery cow tries to take a bath in the tank.
    - HG - I recommend, where possible, installing a winter minimum continuous flow valve to prevent freezing and an overflow line.
    - Set the float level for the desired water level.

11. **Place additional gravel** to the sides of the tank, leaving at least 1 ½ ft of tank showing above the finished gravel layer.

Bressner Pasture Pond cleaning and upgrades 2011-2012

During the fall of 2011, the pond in the east pasture at Bressner was cleaned with a dozer. At the time of the pond cleaning, a 6 inch primary spillway pipe (or trickle pipe) was installed in the pond along with a 2 inch livestock watering pipe.

The pond had lots of mud removed and was in a large pile on the north edge of the pond. It was decided that if it were possible, much of the mud, after settling and drying could be used on the back slope of the pond dam. It was an expensive process but much of the mud was moved.

With the growing cost of cleaning of the pond, it was decided that the pond should have an exclusion fence around it to prevent the wear and tear on the pond dam and edges by the livestock. Electric fence is used for cross fences and was decided that is should also serve as the exclusion fence.

The cleaning of the pond caused us to consider how to protect the pond in the future. The livestock water line through the pond allowed us to consider a waterer for the livestock below the pond. The site had a minimum of slope which required the pipe to be extended downhill in order to get the desired 6 foot of head at the tank site. Prior to the cattle coming to the pasture in the spring of 2012, a tire tank was installed. The used 30.5 – 32 tire was recycled for the tank. The wide tire similar to a "Rice" tire used on many combines. The tank was installed following the guidelines provided with this report. A valve and float in the tank control the tank at the desired level for the livestock. An overflow line was added to allow the site to remain dry yet allow for the minimal flow through the valve to prevent freezing the valve during the winter.

The tire tank is shown with the geotextile and gravel. Ideally, the fabric would be covered deep enough that the geotextile will never show.

The water from the pond is turbid due to the clay in the water. Typically the water will clear, over time, as the clay finally settles and no cattle will have access to disturb the pond water.

Limited Access

The site of the tire tank was further south than desirable to use with the cattle in the north pasture. Rather than allow the cattle to have access to the newly cleaned out pond, a limited access area was considered. Initially we considered a traditional site using the geotextile with gravel on the top. However, we chose to demonstrate two alternative systems for limited access. The first of the systems was to use semi-trailer treads in a pattern to allow the cattle to have access to the stream (See figure #1). The treads were not woven; rather they were simply screwed together.

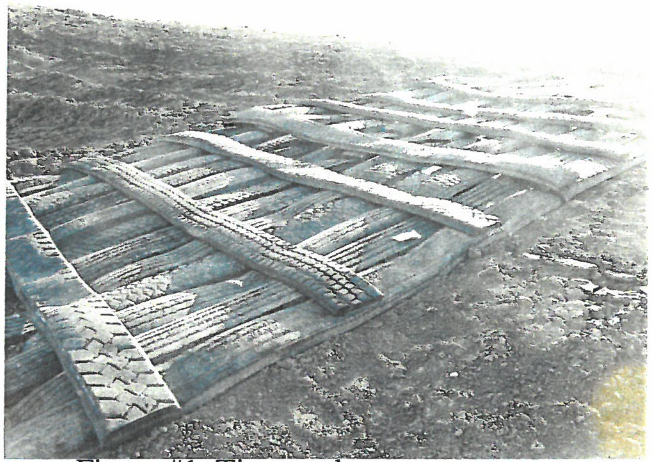


Figure #1 Tire tread mat (no geotextile used).

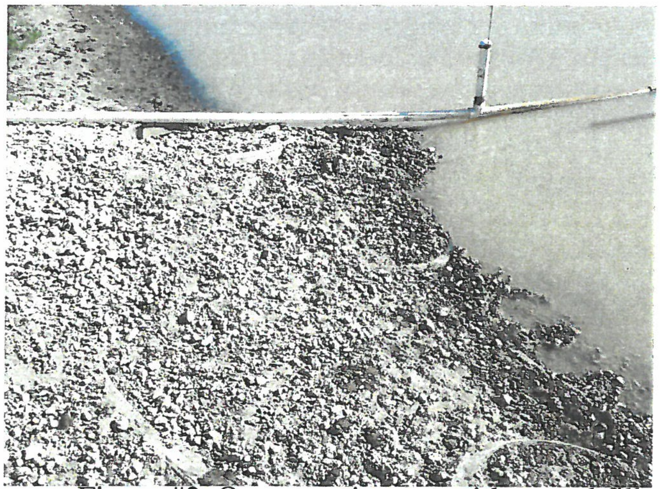


Figure #2 Open top tire mat with gravel fill on a geotextile base.

The second system was a series of semi-trailer tires with one sidewall removed. The tires were placed on the geotextile as closely as possible with the open side up. Gravel was added to the site to fill the tires. The thought process was that the tires would help prevent the gravel from working downhill off of the geotextile into the pond.

The exclusion fence around the pond was constructed with the access to the pond. A floating electric fence was used to prevent the cattle from going further into the pond than we desired.

The slope of the entrance area was about 1 foot in 4 feet which was greater than we desired, but similar to many ponds in the area.

From observing the cattle behavior, both accesses worked well.

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Solar Water Pumping

Solar water pumping is the process of pumping water with the use of power generated by sunlight. Solar pumping systems are reliable stand-alone systems that require no fuel and very little attention. Solar panels generate maximum power in full sun conditions when larger quantities of water are typically needed.

Panels-

This demonstration unit has two 85 Watt panels convert the solar energy into electrical energy. In this system it is the only energy. No batteries are attached. 25 year warranty.

Sun Tracker-

Some system uses a tracker to follow the sun to increase the solar panel efficiency. The system I have used have passive tracking, meaning they take no power from the system, it operate from the heat of the sun striking the frame members. The frame member is warmed causing the Freon inside to move from one cylinder to the other as it follows the suns heat. The tracker allows the system to pump an estimated 30-40% more water during the summer. Most likely it increases the pumping in the early parts of the morning and the late afternoon. Currently we are not using a tracker. They cost about $500-600. The trackers come with a 10 year warranty.
This system we demonstrate here uses panels with more wattage and does not use the tracker.

Controller -

This electronic "magic" box converts the variable energy from the solar panel to the constant voltage for the pump. The controller include a pump speed control circuit, a remote switch circuit, a sensor-less low water cut-off circuit, an electronic circuit breaker and indicator lights.

Pump -

This is the part that does the actual pumping of the water. It is a diaphragm pump. This means the pump works on a positive displacement process. The pump has the capacity to pump water to greater height (greater head) without much decrease in volume. Pumping to greater height does require more energy from the solar panel. This pump has the capacity to pump to 100 ft of head (43 psi).

Do I need a water storage tank?

Storing water in a cistern or tank has many advantages. It's less expensive, more trouble-free and more efficient than storing power in batteries. Since water is always a critical issue, we recommend the tank should be able to store a minimum 3 to 6 days worth of water or whatever you think your needs may be during cloudy weather or in case of a system failure.

Generally speaking, animals, plants and humans use less water on cloudy days. Conversely, the sunniest days are when we consume the most water and when the solar panels are providing the pump with the most power.

Should I use batteries in my solar pumping system?

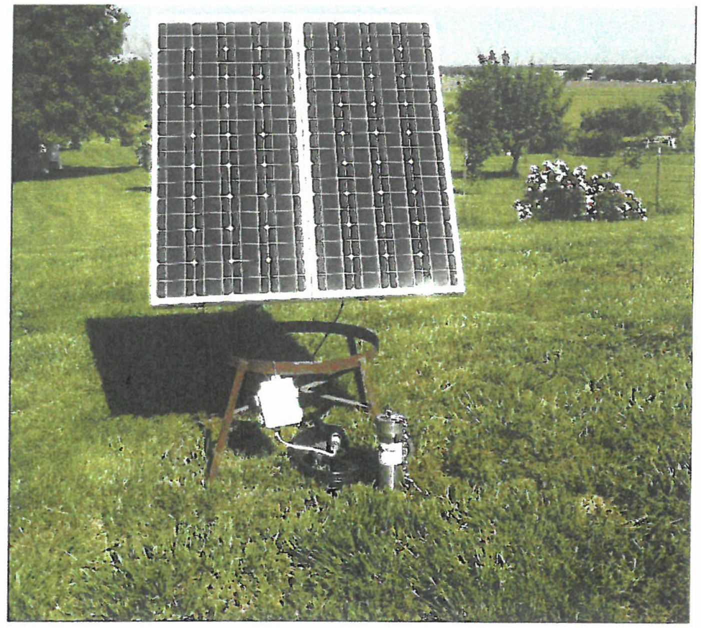
While batteries may seem like a good idea, they have a number of disadvantages in pumping systems. First, they reduce the efficiency of the overall system. Second, they are another source of problems and maintenance. Third, they add cost to the system.

Solar Pump System suppliers indicate livestock producers should "Store water and not power when possible and you will have much better performance and reliability with your solar pumping system."

Solar Pump System costs

for demonstration unit

Photovoltaic Panels	
2 - 85 watt panels Solarland 85 Watt	**$470**
Fixed Rack	
DP-TPM2 Solarland 85	**$205**
Controller	
SolarJack PCA 30-M1D	**$275**
Pump Wire	
10-2 w/grn. **100 ft x $1.55/ft**	**$155**
MC4 interconnect	**$ 38**
Pump	
Sun Pumps SDS-Q-130	**$976**
Freight to Eastern Kansas about	**$155**
Prices - April 25, 2012	**$2,274**



Sunpumps: (diaphragm pump, brass and stainless steel, with brushes, design for shallow well), (air filled motor cavity), (DC power only).

Grundfos: Sqflex pumps, CU200 controller, Pole Mount ,Solar Panels, **$3152**

(Helical rotor pump, stainless steel, brushless, design for deep wells), (oil filled motor cavity for lubrication and heat dissipation), (AC or DC powered)

Bison: BSP pump, SPC Controller, Pole Mount, Solar Panels, **$2425**

(Helical rotor pump, stainless steel, brushless, design for deep wells), (oil filled motor cavity for lubrication and heat dissipation), (AC or DC powered)

How much water can a solar pump supply?

These Sunpumps can pump at the rate 4 to 5 gallon per minute in full sun for about 2000 gallon per day. The maximum head of water = 100 ft (or 43 psi), (a slower rate pump can pump up to 200 ft head (or 86 psi)).

The Grunfos and Bison pumps can pump similar gallons with the same wattage of panels, these pumps have the capability to pump 300+ ft head..

Below is a list of the dealers that I know of for the eastern Kansas area:

Sun Pumps	Safford, Arizona (Jim Allen)	800-370-8115	www.sunpumps.com
Panhandle Sales & Service	Beaver, Oklahoma (Brandy Nelson) 580-525-1919	580-646-0911	www.solarwellpumps.com
Lyman Inc.	Medicine Lodge, Kansas (Dean)	620-886-5731	
Solar Water Technologies Inc.	317 S Sindny Baker St, Kerrville, TX	800-952-7221	www.solarwater.com
Robinson Solar System	207 West Main, Canton, OK	866-519-7892	www.solarpumps.com
Mike's Pump & Well	109 S Colorado, Ellsworth, Kansas	785-472-4919	
Oak Grove Fabrications	RR1 Box 69, 15221 Schmedemann Rd , Alta Vista, KS		785-499-5311
Zeitlow Distributing Co	2060 East South Front Street, McPherson, KS 67460		620-241-4279 or 800-527-5487

Solar Pumping System options

When wishing to have a **pressurized water system**,
I have found the following item effective:
2 gal pressure tank ($40)
Pressure switch (preset at 15-30 psi. or less) ($15),
Pressure Gauge ($7),
check valve ($7)
(with all other connections and adapters ,
the system will cost about $100 total)

Any **float valve** can work.
I have found the Hudson float valve effective ($30

When wanting to store energy to be used at nights or cloudy weather, batteries are required.
This system requires 12 or 24 Volt DC.
Use 2-12 Volt Marine-type **deep cycle batteries** ($65 each).
I believe we should include a **charge regulator** when using storage batteries.
I am using a Morningstar SS-10L-24V ($65)

Herschel George, K-State Watershed Specialist, 913-294-6021

K·STATE Research and Extension

Limited Access Watering Points

Overview

Ponds and streams are common sources of livestock water in Kansas. However, allowing unlimited access can cause severe bank erosion, poor water quality and other related problems.

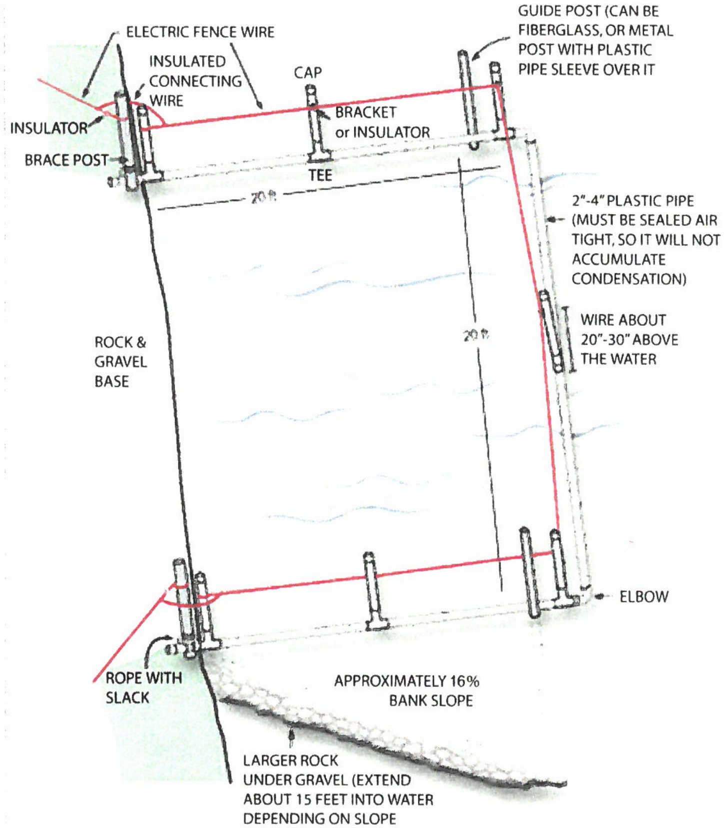
Cattle prefer clean water and avoid steep, muddy approaches to water sources whenever possible. Developing access watering points with a hardened surface and fencing is often fairly simple and solves many of these concerns.

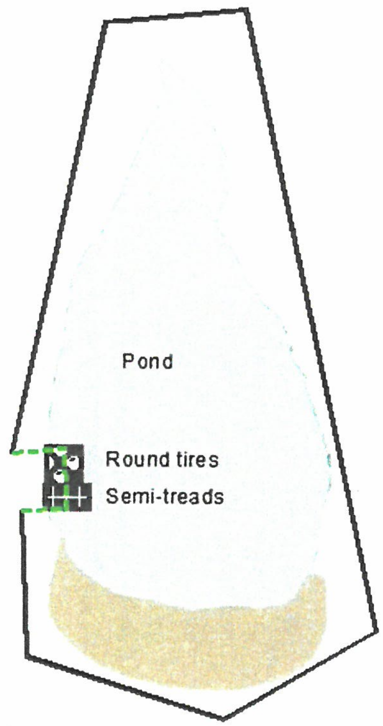
Advantages

- Simple and inexpensive
- Improved livestock safety and health, less foot rot and fewer leg injuries
- Reduced bank erosion
- Less sediment and fewer nutrients entering streams and ponds
- Extended pond life
- Applicable to new and existing ponds
- Increased water intake may mean better livestock gains
- Works with "Pit ponds" and exclusion fences

Limitations

- Not adapted to large streams
- Fence maintenance required when stream floods
- Few options for location of watering point
- Few examples in Kansas





Design Considerations

To encourage animal use, an access ramp or walkway should have a maximum slope of 6:1 run to rise (17%) or a 10 degree slope. Ramps as steep as 4:1 have been used. However, a flatter slope (8:1 to 20:1) is generally better when space allows, especially when conditions are icy. The ramp surface should be compacted and non-slip (crushed rock, gravel or concrete). A 3:1 slope (or flatter) for the sides of the ramp is preferable when site conditions permit.

Width may vary (recommendations range from 4 to 80 feet) but a minimum guideline is 10 feet plus one foot for each 10 head of cattle – for example, 15 feet for 50 head. Fencing is generally desirable to exclude livestock from other parts of the pond or stream, especially if they congregate and loaf during hot days.

A floating fence made of PVC pipe can be used to restrict access to the pond reservoir at a cost of $200-300. A 16-foot stream crossing/access point for small streams, using gravel with geotextile and sand base, can be constructed for less than $500.

This practice may require permits.

Extracted from "Water and Water System Handbook", http://www.ksre.ksu.edu/library/lvstk2/s147.pdf
Herschel George – K-State Southeast Watershed Specialist - 913-294-6021 Hgeorge@ksu.edu

Identification and Management of Blue-green Algae in Farm Ponds

K-STATE Research and Extension

MF-3065

Animal Safety

Blue-green algae include several different species of photosynthetic cyanobacteria that live in water. Cyanobacteria are bacteria capable of photosynthesis. These cyanobacteria can produce toxins that can sicken or kill livestock. Problems with blue-green algae and their associated toxins are most common during the summer and may become widespread in years with long periods of hot, dry weather.

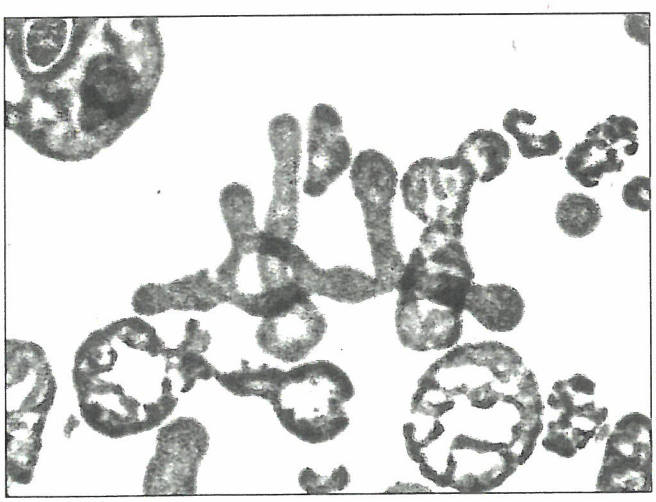
Occasionally, blue-green algae rapidly reproduce and form blooms, or large colonies, that are visible as a scum on the water's surface. They also may change the water color of a pond. Such blooms of toxic cyanobacteria are often referred to as harmful algal blooms, or HABs. These are typically most severe in stagnant areas, such as coves or inlets, where wind disturbance of the water surface is minimal and water temperatures are higher. Floating algal scums may accumulate at the downwind shores of lakes and ponds.

The causes of harmful algal blooms are not completely understood. They are related to increased nitrogen and phosphorus concentrations in water, but the exact relationships between nutrient concentrations and blooms are complex and difficult to predict.

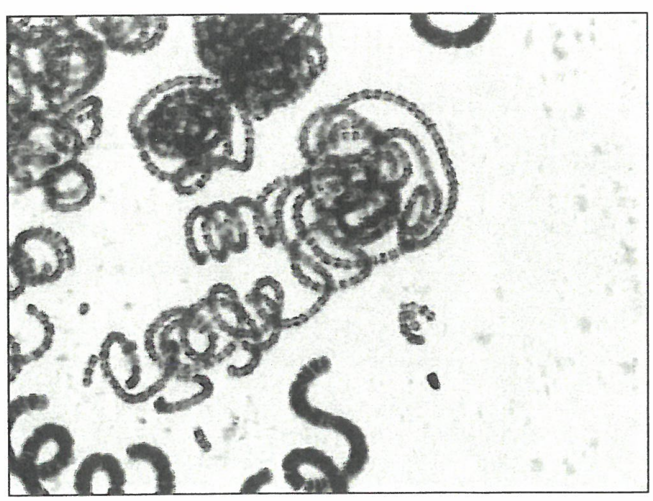
Although agricultural nutrient runoff is a known risk factor, harmful algal blooms also are found in ponds surrounded by rangeland, where agricultural nutrient loading is rarely an issue. Other environmental factors that may favor the formation of blooms include hot, sunny weather with little wind. Ponds with relatively clear water, or low turbidity, may be more likely to produce harmful algal blooms due to high sunlight availability throughout the water column.

Most toxins that are produced during harmful algal blooms are stored within the cyanobacteria until they die. As the cyanobacteria decompose, they release stored toxins into the water. Toxins are not evenly dispersed in a pond. *Mycrocystis* species, which are generally the most problematic blue-green algae in Kansas, self-regulate their position in the water. They are often buoyant at or near the surface to capture the most sunlight for photosynthesis. When the wind blows in a relatively constant direction, these organisms accumulate on the downwind side of the pond, where toxin concentrations may increase. Other blue-green algae species are less buoyant and may be more widely dispersed.

Toxin concentrations can vary dramatically, even at nearby locations in the same pond. Pockets of water that contain lethal quantities of toxins may be within a few feet of areas with low concentrations, so it is impossible to determine whether or not a water body is toxic by using a single water sample. Generally, if measurable toxin levels are found, it is prudent to suspect the entire pond is toxic, and the pond should not be used for livestock or human drinking water. Cyanobacterial toxins also may irritate skin, eyes, and the respiratory system, so wading or touching the



Microcustis aeruginosa, a toxic species of blue-green algae.



A toxic species of blue-green algae in the genus Anabaena.

water should be avoided. Some toxin types may cause the meat of fish to be poisonous. Fish caught from these ponds should not be eaten.

A pond containing a harmful algal bloom may be covered with a scum that looks like bright green paint, but other colors are possible, varying from blue-green to grey, and occasionally red or brown. Some types are filamentous and may form slimy strands when many are clinging to each other. Blue-green algae can be distinguished from duckweed by size, as individual duckweed plants are visible without a microscope. To view images of these plants, visit the website *aquaplant.tamu.edu/plant-identification*. Water from a pond with a harmful algal bloom often will have an unpleasant smell. Most livestock will avoid water with this smell, but some dogs are attracted by the smell and are at risk of drinking the water or ingesting scum at the edges of the pond. This behavior may lead to lethal exposures.

If blue-green algae are suspected, a water sample can be collected and sent to the Kansas State Veterinary Diagnostic Laboratory. (Directions for collecting and submitting water samples are at the end of this publication.) Because toxin concentrations can fluctuate widely within the same pond, animals drinking from the pond may or may not consume significant levels of the toxin. Because toxin consumption cannot be forecast with any degree of accuracy, water from a pond that tests positive for blue-green algae is considered unsafe for livestock consumption. The level of toxin in the water is generally not analyzed due to the cost of testing and because toxin concentrations vary so much by location and time within the same pond.

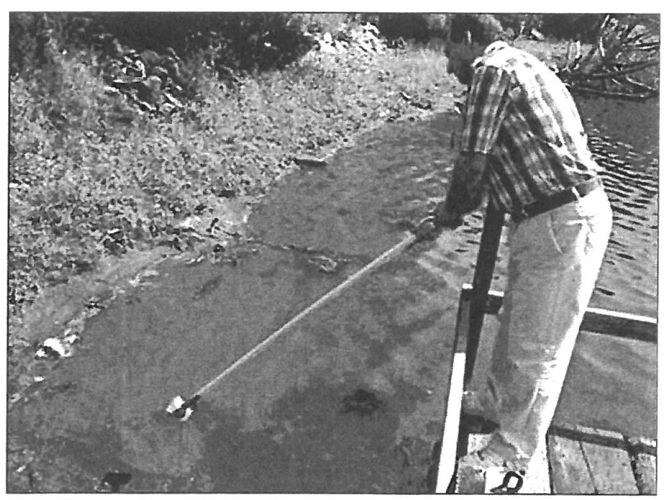
If a pond contains a harmful algal bloom, there are few choices for the livestock owner. Copper sulfate can be used to kill the blue-green algae. This chemical, however, will also kill competing organisms such as green algae, which help keep blue-green algae in check. Copper does not break down, but remains in pond sediment, where it can affect pond ecology for many years. Sheep are sensitive to copper. Hazardous levels of copper may remain in water and plants growing near treated ponds for several years after treatment. As blue-green algae die after the chemical application, toxins are released from the organisms and dispersed more widely.

A second option is to reduce the amount of sunshine available to the blue-green algae. Increasing turbidity through stirring up bottom sediment is not recommended. Instead, spreading a buoyant straw such as wheat or barley straw in a thin layer across the surface will shade the algae and may result in a decrease in blue-green algae bloom size. Straw will need to be replaced as it sinks. This method of control will have little lasting effect on the pond.

The third option is to provide an alternative water source for livestock. Using well water may necessitate drilling a well, which is not always an option. It takes time to have the well drilled, have the water tested, and set up a pumping unit and stock tank. Hauling water is expensive and time consuming but may be the only feasible way to supply clean water to livestock. Animals can be moved to another pasture with clean pond water or access to another water source.

The duration of harmful algal blooms is difficult to predict and is influenced by weather conditions. The condition may last from days to months. Cooler, cloudy weather with high wind speeds generally shortens the duration. Before allowing livestock to drink water from a pond that was previously determined to have a harmful algal bloom, another water test should be

Signs may be posted at lakes or ponds where blue-green algae have been found. Do not assume a body of water without a warning sign is safe.



Shorelines where algae collect are a good location to collect a water sample. Use care not to let the water contact exposed skin while sampling.

taken to make certain that hazardous concentrations are no longer present.

Harmful algal blooms are serious threats to livestock health and may be fatal. Testing suspect water sources is important to minimize livestock loss and poor animal performance. Once the presence of a harmful algal bloom has been confirmed, the best management practice is to find a different water source.

How to Collect a Water Sample to Submit for Blue-green Algae Detection

1) Find a location in the pond where algae is most concentrated. This may be a scummy area along the pond shoreline, or a patch of discolored water. If in doubt as to the best location, sample on the downwind side of the pond. Inlets and coves, where wind disturbance is minimal, are also good sites for collecting a sample.
2) Use a clean plastic bottle with a screw lid to collect the sample. The bottle does not have to be sterile. A 20-ounce or 1-quart soft-drink bottle will work well. Rinse the bottle with pond water before collecting the sample. If present, be sure to include some of the pond scum in the sample. Avoid touching the water or wear gloves while collecting samples.
3) Fill the bottle with pond water, screw on the lid, and immediately place it into a cooler with ice or transport it to a refrigerator.
4) Keep the sample cool until it is shipped to the lab. Although the sample can be kept cool for a few days before submitting it to the lab, it is recommended that it be shipped the same day it is collected. It is preferable to avoid collecting and shipping samples on days when they will arrive at the lab on the weekend and sit 1 to 2 days before being processed.
5) Fill out a sample submission form that includes your name, preferred contact method, and contact information (phone, fax, email, or address). A submission form can be found at: *www.vet.k-state.edu/depts/dmp/service/pdf/general.pdf*. Fill out the owner/producer section of the form. Specify the test you are requesting as "blue-green algae" in the history section at the bottom. Add any information you may need to identify where the sample was taken (Bottle 1, Jedlicka pasture, west pond). Place the form in a resealable zipper bag so moisture from the ice packs doesn't cause it to disintegrate or the ink to run.
6) Wrap the joint between the lid and the bottle with tape to seal it. Put the bottle in a resealable zipper bag and seal it. Place the bottle in a box or small polystyrene foam container and surround it with ice packs. Place enough packing insulation and ice packs around the bottle to keep it cool until it arrives at the lab. Multiple bottles can be included in one shipping container, but each should be clearly marked with the site where it was collected so results can be matched with water source.

Ship the water sample to :
Kansas State Veterinary Diagnostic Laboratory
Mosier D-117
1800 Denison Avenue
Manhattan, KS 66506-5601

Results should be available within 24 to 48 hours after the sample arrives.

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