

**Evaluation of Methods to Reduce Bacterial Contamination of Surface Water from Grazing Lands**

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*Funding provided by the Texas State Soil & Water Conservation Board, USDA-Natural Resources Conservation Service, and U.S. Environmental Protection Agency*

**Livestock activities identified by TMDLs as contributing bacteria:**

- “Livestock grazing on pasture and rangeland depositing manure containing indicator bacteria onto land surfaces which are subsequently washed into water bodies by runoff”
- “Livestock that have direct access to water bodies providing a concentrated source of indicator bacteria loading directly into streams”

**Reduce cattle’s time in & near stream**



**Maintain adequate ground cover**




**RIPARIAN PROTECTION**

**How can you reduce the amount of time cattle spend in & near stream?**

- Why do cattle spend time in & nr streams?
  - Drinking water
  - Shade
  - Grazing
  - Get away from flies
  - Cooling
- What can you do to address these?
  - Provide other sources of water and shade
  - Practice good grazing management
  - Practice good herdsmanSHIP
  - Fence off stream

### Alternative water supply effectiveness

Reduction in Time Spent in Stream	Reference
43%	Wagner et al. 2011
85-94%	Miner et al. 1992 Clawson 1993 Sheffield et al. 1997




### Alternative Water Source

Bacteria Reduction	Reference
85-95% (EC)	Byers et al. 2005
51% (FC)	Sheffield 1997
NSD (EC)	Wagner et al. 2011

- Sheffield (1997) also found:
  - 77% decrease in sedimentation
  - 90% decrease in suspended solids
  - 54% decrease in nitrogen
  - 81% decrease in phosphorus

### Shade Structures


- Shade, coupled with alternative water & salt/mineral locations, encourages cattle to spend less time in riparian areas.



Time Spent w/in 25' of Stream	Testing Date
31% Reduction	October 2010
11% Reduction	June 2011

### Rip-Rap of Critical Areas


- Option to fencing
- Provide permanent barrier
- Applicable primarily to critical areas only



Rip-Rap Size	Observed Effects
4-8" diameter	<ul style="list-style-type: none"> <li>• No Effect</li> </ul>
12" diameter	<ul style="list-style-type: none"> <li>• Young heifers &amp; calves – little effect</li> <li>• Heavier cows – impeded crossing</li> </ul>

### Exclusionary Fencing

- Eliminates cattle access to streams
- Expensive to construct & maintain
- Not feasible to fence-off entire stream in many cases
- Electric fencing may provide a lower-cost alternative



Fecal Coliform Reduction	Reference
30%	Brenner et al. 1994
41%	Brenner 1996
66%	Line 2003

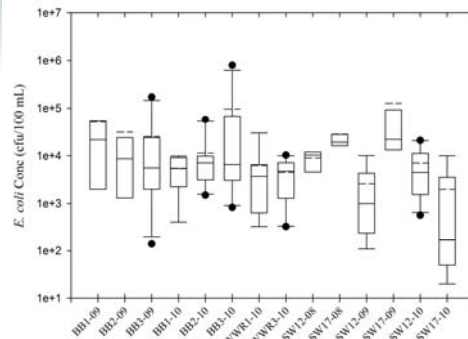
### MAINTAINING GROUND COVER

**What can you do to improve / maintain adequate ground cover?**

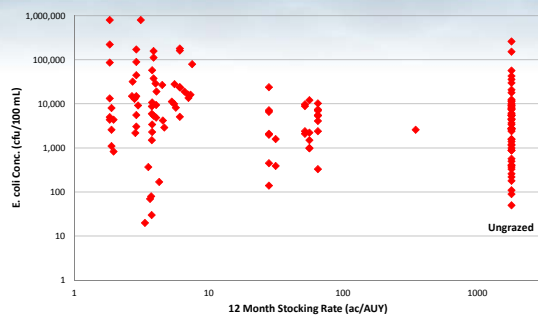
- Stocking Rate / Grazing Systems
- Forage Selection / Management
- Nutrient & Pest Management



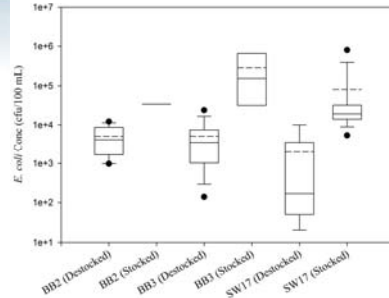
**E. coli not correlated w/ grazing mgt. (in rotationally grazed pastures)**



**E. coli not correlated w/ stocking rate (in rotationally grazed pastures)**



**E. coli correlated w/ % of events occurring while stocked (in rotationally grazed pastures)**



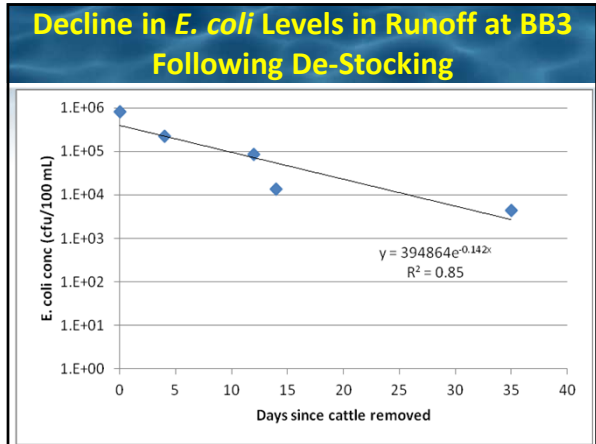
88% reduction at BB2      98% reduction at BB3      99% reduction at SW17

**Effect of grazing management on E. coli levels in rotationally grazed pastures**

- Rotational stocking can be an effective practice
- Timing of grazing (in relation to runoff events)
  - More important than grazing mgt or stocking rate
- Recommendations:
  - Utilize rotational grazing
  - Graze creek pastures when runoff less likely
  - Percent reductions potentially achievable = 88-99%

**Other findings**

- E. coli levels in runoff decline rapidly following destocking
- Sources other than grazing cattle can significantly impact E. coli runoff from grazing lands
- Background E. coli concentrations are significant
  - Water quality models need to incorporate this

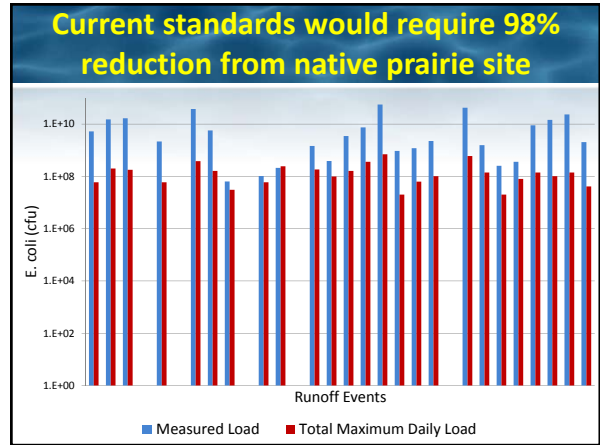
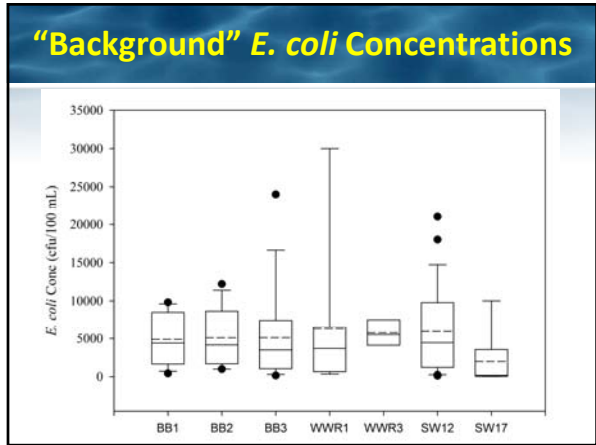


### Impact of non-domesticated animals

Date	BB1	BB2	BB3
3/13/09			140
3/25/09	1,200		7,200
3/26/09		1,000	2,000
3/27/09			450
4/17/09	1,155	980	2,100
4/18/09	4,400	2,225	24,000
4/28/09	7,600	12,200	24,000
10/4/09	57,000	5,114	3,065
10/9/09	36,000	24,043	15,000
10/13/09	42,851	23,826	5,591
10/22/09			172,500
10/26/09	261,000	181,000	45,000

Site	Stat	October 2009	Excluding Oct 2009 & grazed periods
BB1	Median*	49,926a	4,400b
	Max	261,000	9800
BB2	Median*	23,935a	4,150b
	Max	181,000	12,200
BB3	Median*	15,000a	3,500b
	Max	172,500	24,000



- ### For more info:
- Lone Star Healthy Streams website
    - <http://lshs.tamu.edu>
    - Annotated Bibliography
    - Beef Cattle Manual
  - Evaluation Of Methods To Assess And Reduce Bacterial Contamination Of Surface Water From Grazing Lands
  - Kevin Wagner
    - [kwagner@ag.tamu.edu](mailto:kwagner@ag.tamu.edu)
    - 979-845-2649