Lone Star Healthy Streams:

Keeping Texas Waters Safe and Clean

Beef Cattle Production
The goal of Lone Star Healthy Streams (LSHS) is to reduce levels of bacterial contamination by livestock in Texas watersheds by:

• Developing an educational curriculum,
• Evaluating and demonstrating best management practice (BMP) effectiveness,
• Testing the functionality of the education program and,
• Promoting statewide adoption of appropriate BMPs.

Project is funded by EPA and TSSWCB through 319 funds.
Purpose of this Presentation

To make you aware of a water quality issue affecting beef cattle producers statewide...
Background on the Issue

- EPA must approve standards.
- CWA requires states to assess quality of surface water (i.e. whether the water meets state-set water quality standards).
- Water bodies not meeting water quality standards are impaired and go on the 303(d) List.
- CWA Section 303(d) requires states to develop a Total Maximum Daily Load (TMDL) for the impaired water body within 13 years from listing.
WATER QUALITY IMPAIRMENTS IN TEXAS
What is a TMDL?

- A TMDL outlines:
  - Pollution reductions needed to restore water quality in “impaired” water bodies.
  - *Where* reductions will come from (in the broadest terms).

- TCEQ Commissioners vote to approve each TMDL
  - TSSWCB Board votes to approve TMDLs with significant agricultural and silvicultural issues.

- TMDLs must also be approved by EPA.
Escherichia coli (E. coli) is the leading cause of food-borne illness.

- There are, however, documented cases of water-borne E. coli illness in Texas.

E. coli is an indicator organism of other pathogens.

- Enterrocooccus
- Giardia

E. coli lives in the intestines of all warm-blooded animals; this makes determination of the source of contamination extremely difficult.
Bacteria: #1 Water Contaminant in Texas

But, who’s contributing?
Major sources according to bacterial source tracking (BST)

- Sewage: 11%
- Avian Wildlife: 7%
- Pets: 8%
- Unknown: 10%
- Non-Avian Livestock: 12%
- Cattle: 22%
- Non-Avian Wildlife: 29%
- Avian Livestock: 1%
- Pets: 8%
- Unknown: 10%
Sources according to bacterial source tracking (E. coli)
Results of BST in the Leon River

Source Contributions (% of 200 isolates):
- Domestic Sewage
- Pet
- Cattle
- Other Livestock
- Wildlife
- Unidentified

Source Contribution (%)
Livestock are part of the problem...
LSHS: BMPs to Reduce Fecal Contamination by Grazing Cattle
Two Types of BMPs

Riparian Protection
  – Designed to protect environmentally sensitive stream side areas.

Vegetation Management
  – Maintenance of adequate ground cover.
    • Involves use of appropriate stocking rate.
      – Reduces overland water flow.
      – Reduces bacteria and nutrient transport.
      – Reduces sediment production (soil erosion).
Riparian Protection BMPs

- No Exclusion – Full Access
  - Development of alternative water source
  - Shade
  - Mineral and/or salt locations

- Exclusion – Limited Access
  - Hardened single-point stream watering points
  - Hardened stream crossings

- Full Exclusion
  - Fence entire stream out
  - Use of rip-rap
  - Filter strips
  - Prescribed Grazing
No Exclusion, Full Access

- With full access, cattle will destroy creek banks and defecate directly into streams.
- Careful management is required when full access is allowed.
- Consider rotational stocking with limited access to riparian pastures.
Alternative Water Source

• Encourages livestock to obtain water away from the stream.
• Easy to implement.
• NRCS cost-share programs reduce costs.
• Consider solar-powered wells.
Without an alternative water source, this producer is out of business...
## Alternative Water Source

<table>
<thead>
<tr>
<th>Fecal Coliform Reduction</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>57 – 95%</td>
<td>Byers et al. 2005</td>
</tr>
<tr>
<td>51%</td>
<td>Sheffield 1997</td>
</tr>
<tr>
<td>Reduced time in riparian area 48 – 53%</td>
<td>Wagner et al. 2009 (unpublished Texas data)</td>
</tr>
</tbody>
</table>
Shade Structures

• Can be permanent or portable…
• May improve nutrient distribution & recycling in the pasture.
• Improves weight gain of cows and calves.
Shade Structures

• Coupled with alternative water & salt/mineral locations, encourages cattle to spend less time in riparian areas.

• Moderate cost associated with building and maintaining.

• Easy to implement following construction.
When used in conjunction with alternative water sources or shade, this BMP encourages cattle to spend less time in riparian areas.

- Inexpensive.
- Easy to implement.
Exclusion with Limited Access
In-Stream Watering Points

• Firm footing, single-point water locations along streams designed for 1 – 2 animals reduces time spent loafing in stream.
• Moderate cost associated with building & installation.
• Can be used for streams or ponds.
Good ideas, but possibly too wide a watering point...

Gravel alley with geotextile fabric or concrete. Alley width = 4'. Do not extend alley more than 2.5' into pond. Source: NC State University
Think about alternative water delivery from ponds…
Hardened Stream Crossings

• Establish hardened stream crossings using geotextile and gravel.
  – Reduces bacteria levels in streams.
  – Facilitates cattle movement.
  – Reduces loafing time in stream.
  – Reduces stream turbidity and sediment loading.

• Moderate cost associated with building and maintaining.
Geotextiles provide base support.

Panels are often used.

Fine layer of top gravel encourages cattle to readily travel across.

In some cases, a bridge over the creek may be preferred; here is a novel use of an old stock trailer.
Full Exclusion

- Eliminates cattle access to streams.
- Permanent fences are expensive to construct & maintain.
  - Cost-share from NRCS.
- Not feasible to fence-off entire stream in many cases.
- Electric fencing may provide a lower-cost alternative.
# Exclusionary Fencing

<table>
<thead>
<tr>
<th>Fecal Coliform Reduction</th>
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</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>Brenner et al. 1994</td>
</tr>
<tr>
<td>41%</td>
<td>Brenner 1996</td>
</tr>
<tr>
<td>66%</td>
<td>Line 2003</td>
</tr>
</tbody>
</table>
Exclusion = Filter Strips

How a riparian buffer strip functions to protect the stream from contaminants. Illustration Carolyn Brooks.
Use of Filter Strips

Note denuded stream banks, sand depositions in creek, and algal bloom.

Note the effectiveness of a vegetative filter strip in trapping sediment that would have wound up in the creek or reservoir. Nutrients, pesticides and bacteria were also trapped.
Filter Strip Effectiveness in Reducing Fecal Coliform Levels

Figure 3. Effectiveness of filter strips in reducing fecal coliform levels under varying conditions

<table>
<thead>
<tr>
<th>Fecal Coliform Reduction</th>
<th>Slope</th>
<th>Buffer Length</th>
<th>Runoff Source</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>94.8% – 99.9%</td>
<td>5% - 35%</td>
<td>.1 – 2.1m</td>
<td>Grazing cattle</td>
<td>Tate et al. 2006</td>
</tr>
<tr>
<td>43% - 74%</td>
<td>9%</td>
<td>9m</td>
<td>Poultry litter on no-till cropland</td>
<td>Coyne et al. 1995</td>
</tr>
<tr>
<td>64% - 87%</td>
<td>4%</td>
<td>9m</td>
<td>Manure</td>
<td>Fajardo et al. 2001</td>
</tr>
<tr>
<td>&gt;99%</td>
<td>4%</td>
<td>1 - 25m</td>
<td>Manure on pastureland</td>
<td>Sullivan et al. 2007</td>
</tr>
</tbody>
</table>
Filter Strip Specifications

Minimum width for vegetative filter strips.  

<table>
<thead>
<tr>
<th>Slope</th>
<th>Minimum width of buffer strip</th>
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</thead>
<tbody>
<tr>
<td>1-3%</td>
<td>25 ft</td>
</tr>
<tr>
<td>4-7%</td>
<td>35 ft</td>
</tr>
<tr>
<td>8-10%</td>
<td>50 ft</td>
</tr>
</tbody>
</table>
Use of Rip-Rap Instead of Fencing

- Cattle will not travel where there is >30% rock cover.
- Can we use rip-rap to modify cattle travel patterns?
- Depending on the amount used, there may be a reduced cost compared to fencing.
  - Reduced maintenance.
Summary of Riparian Protection

- Riparian areas are environmentally sensitive areas that deserve protection.
- Full exclusion offers the highest level of riparian protection.
- Where full exclusion is not practical, alternative BMPs provide enhanced protection of riparian areas.
Vegetation Management BMPs

• Vegetation Management BMPs are designed to:
  – Reduce soil erosion.
  – Improve forage production.
  – Enhance water conservation.

• Vegetation Management BMPs also:
  – Improve animal performance.
  – Enhance long-term sustainability of beef cattle production systems.
• Grazing Management
  – Maintaining adequate ground cover is essential for watershed protection and optimum beef cattle performance.
  – The correct stocking rate is *the* most critical component of grazing management.
  – Consider the total amount of grazeable acres…
  – Is drought management a part of the grazing management strategy?
  – What grazing system is appropriate?

• Additional *Grazing Management* module available through LSHS.
Sources of Cost-Share Funds

• Environmental Quality Incentive Program (EQIP):
  – Cost-share programs for cross-fencing, water development, erosion control, etc.
  – Select EQIP 09 Standard Rate (XLS; 82 KB)

• Section 319(h):
  – Clean Water Act money from EPA passed through to TSSWCB.

• Water Quality Management Plans (WQMPs):
  – Affords producer protection from regulation.
• Bacteria in Texas waterways is a concern for everyone.
• BMPs can reduce bacterial contamination.
• Where full exclusion is not practical, alternative BMPs provide enhanced protection of riparian areas.
  – Alternative water sources
  – Shade
  – Hardened crossings
  – In-stream watering points
  – Others
• Full exclusion offers the highest level of protection for Texas waterways.
  – Exclusionary fencing
For More Information Contact:

• Texas State Soil & Water Conservation Board.
• Your local NRCS office.
• Your local Soil & Water Conservation District office.
• Your local County Extension office.
"A thing is right if it tends to preserve the stability, integrity, and beauty of the biotic community. It is wrong if it tends otherwise."

Aldo Leopold, 1966.