# Managing Creek Pastures for Improved Water Quality

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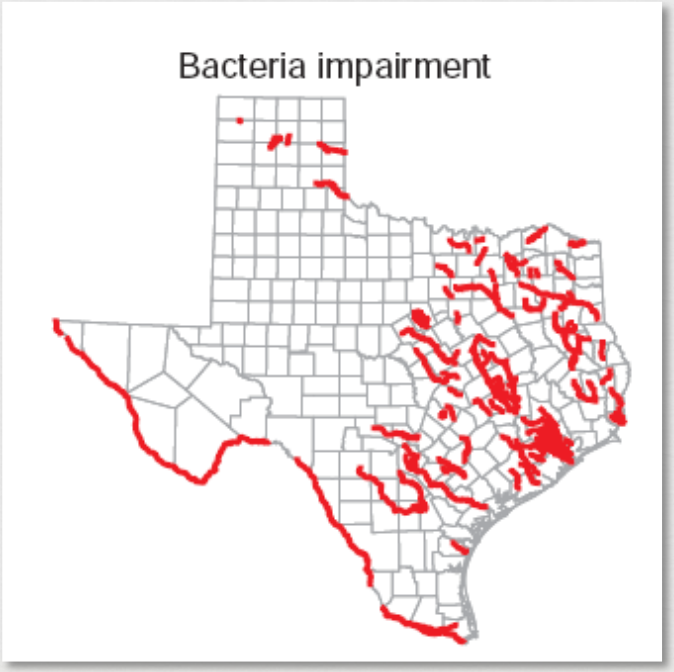
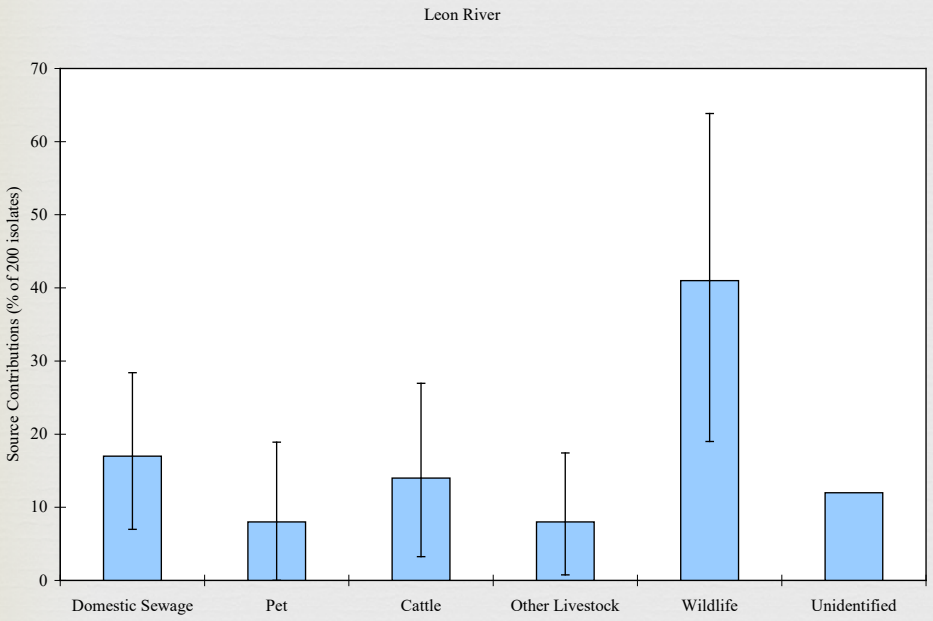
# Background

- More than 50% of impairments in Texas are due to excess bacteria levels.

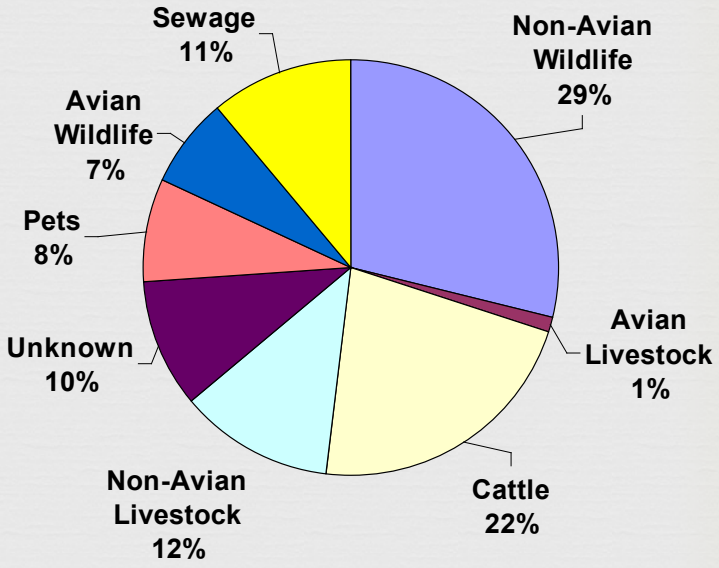



# Major sources of bacteria

## Leon River




## Peach Creek



# Exclusionary Fencing

- Eliminates cattle access to streams
- Expensive to construct & maintain
- Often not feasible to fence-off entire stream, i.e. rangeland
- Fencing of streams not accepted by many landowners

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

# Management of Creek Pastures is Critical

Reduce cattle's time in & near stream

Maintain ground cover with proper grazing management

# Grazingland Research

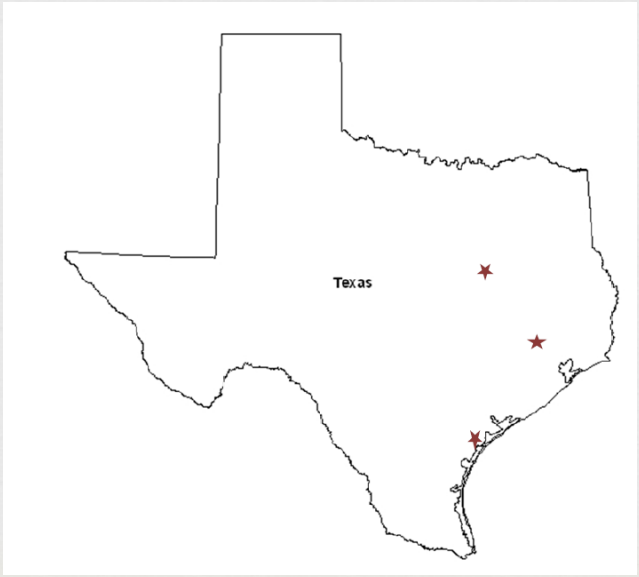
- **5 yr study on:**
  - Proper grazing management
  - Alternative water supplies
  - Alternative shade

- **Conducted by:**
  - Texas AgriLife Extension Service
  - Texas AgriLife Research
  - Texas Water Resources Institute
  - USDA-ARS

- **Funded by:**
  - Texas State Soil and Water Conservation Board
  - USDA Natural Resources Conservation Service
  - US Environmental Protection Agency

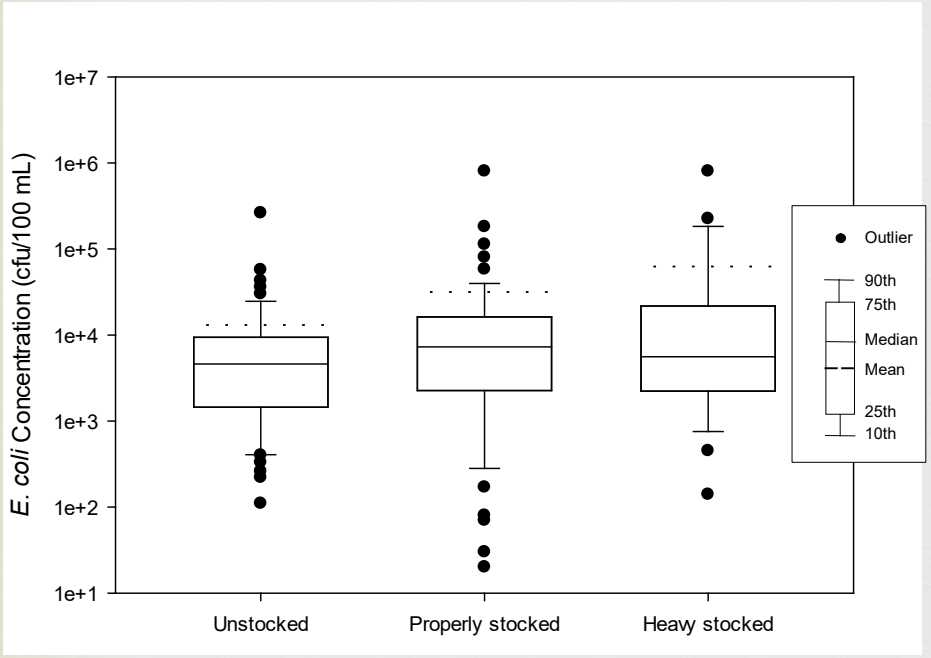
# Grazing Management Evaluation

- Seven 1 ha sites assessed across 3 locations
  - 3 – ungrazed
  - 3 – properly stocked
  - 1 – stocked @ 2 X recommended rate
- **Grazed sites were rotationally grazed**
- Flow measured w/ bubble flow meter
  - V-notch weir
  - H-flumes
- Sample Collection
  - Automated samplers

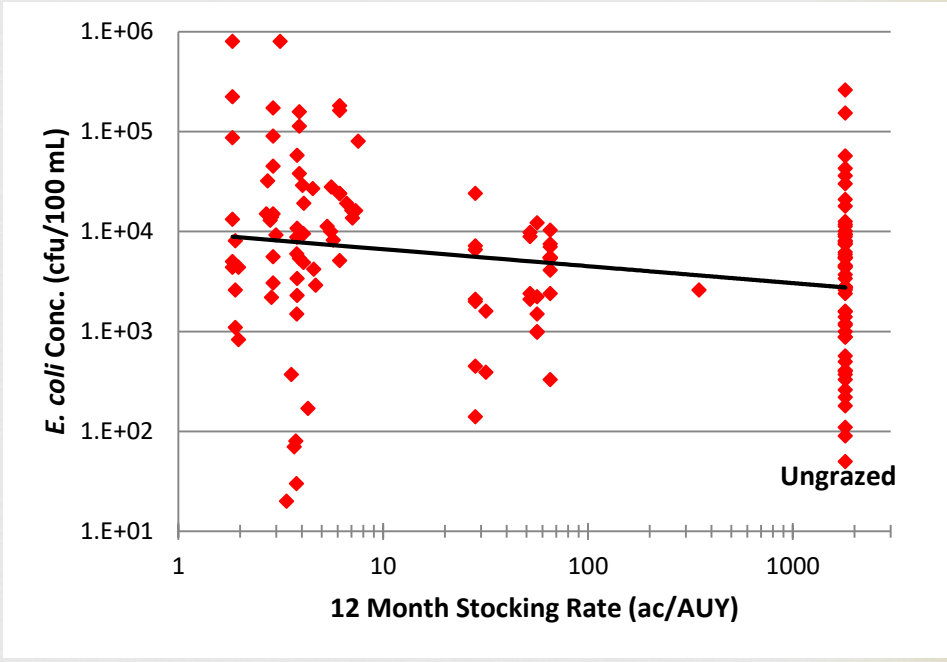



# Grazing management effects on *E. coli* runoff

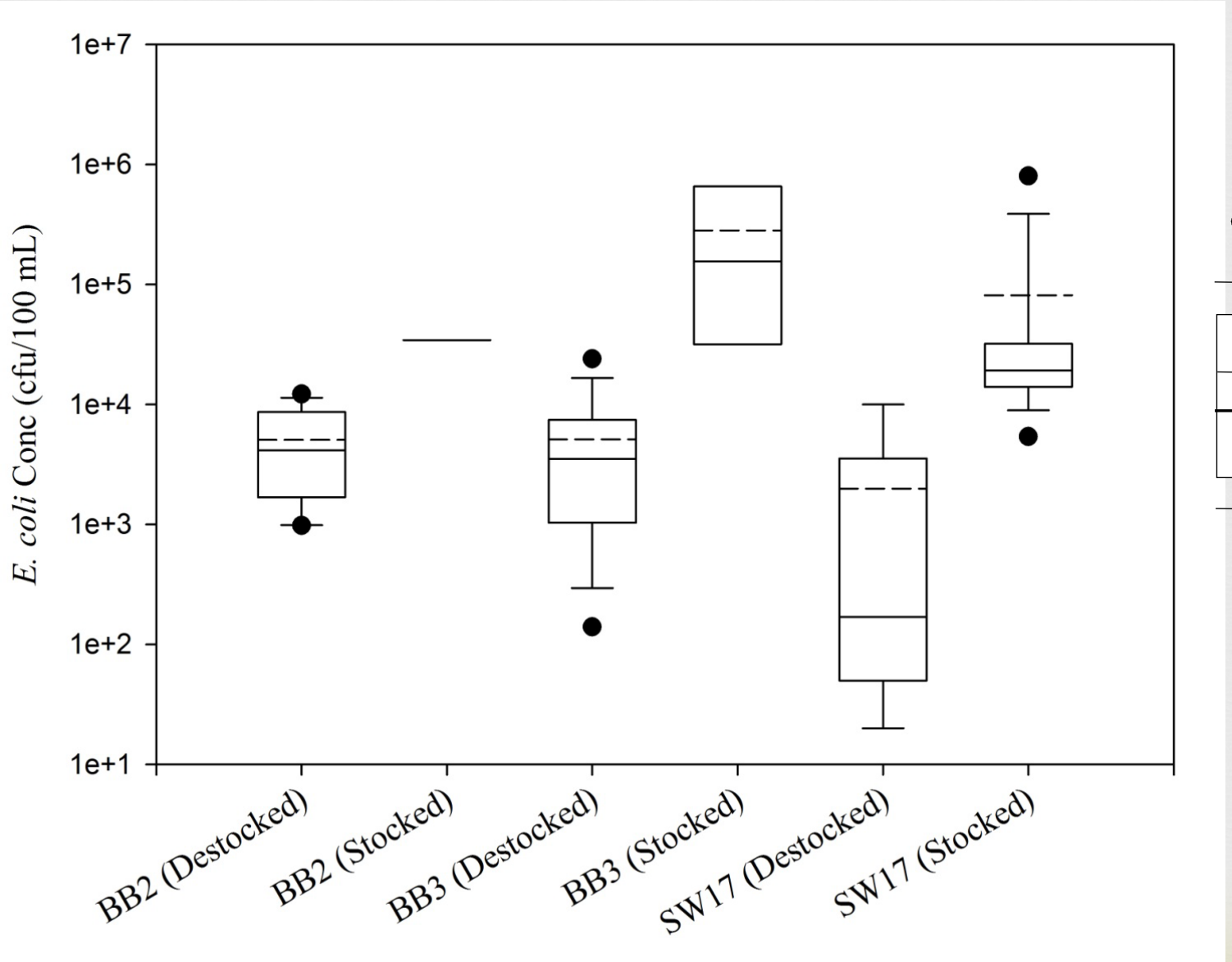
## Grazing Management




## Stocking Rate

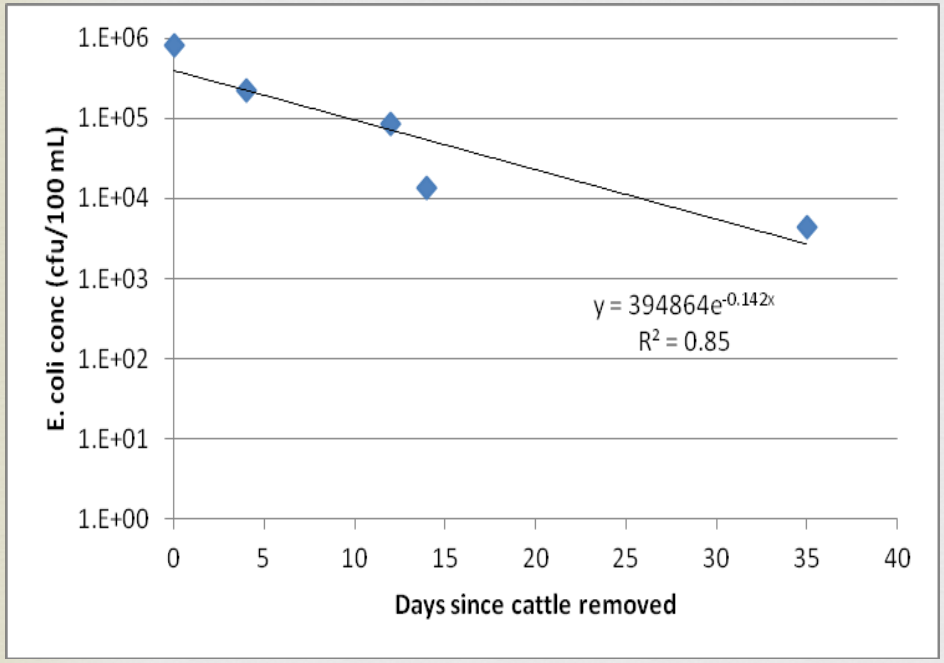


# Comparison of *E. coli* Levels While Sites Stocked & Destocked

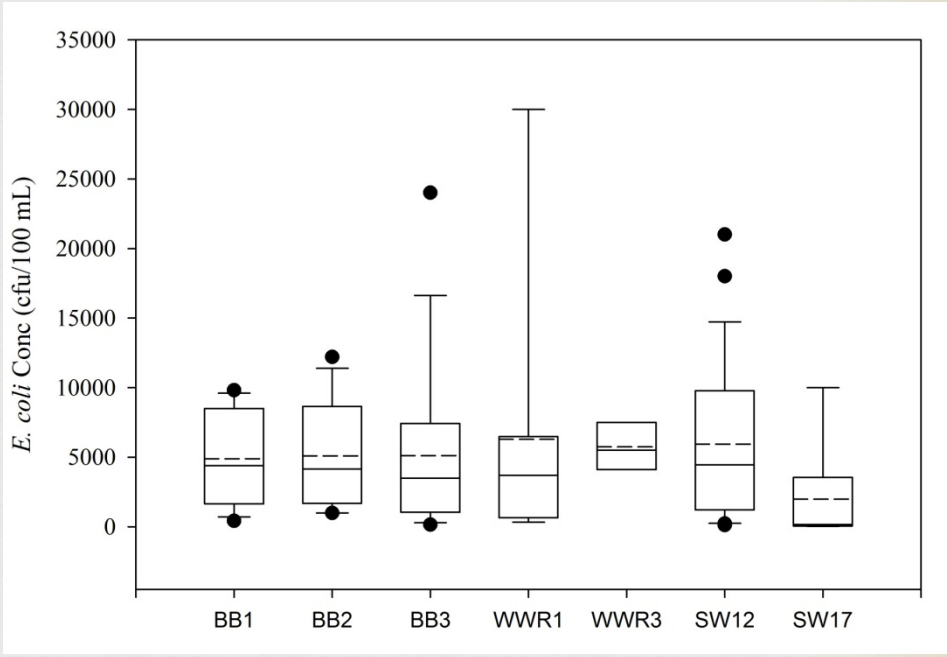


# Why no correlation btwn *E. coli* & grazing management?

## Rapid decline following rotation




## Significant background levels



# Why no correlation btwn *E. coli* & grazing management?

80-99% of loading from wildlife at 3 sites in 2009

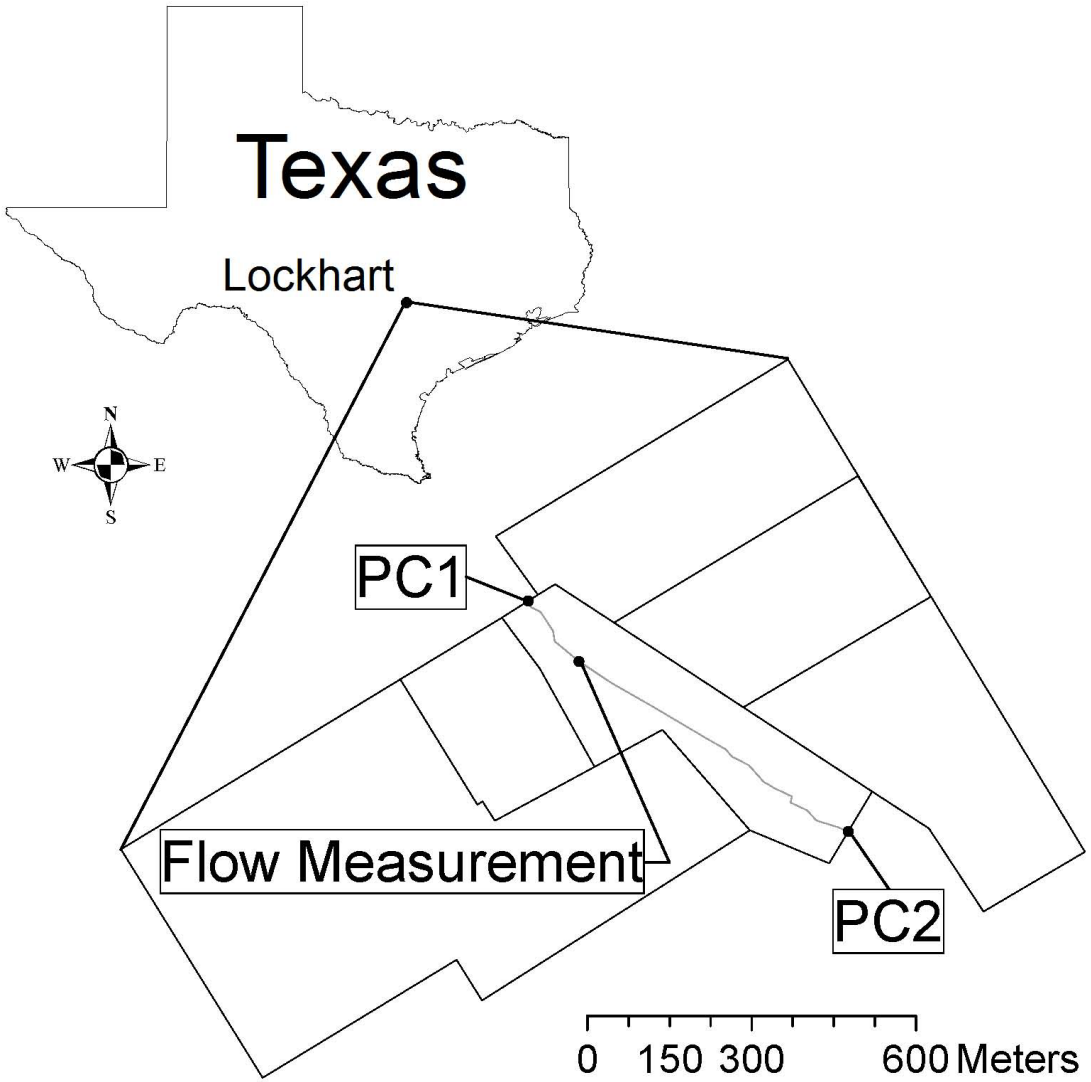
| Date | BB1 | BB2 | BB3 |
|---|---|---|---|
| 3/13/09 | | | 140 |
| 3/25/09 | 1,200 | | |
| 3/26/09 | | 1,000 | 7,200 |
| 3/27/09 | | | 2,000 |
| 4/17/09 | 1,155 | 980 | 450 |
| 4/18/09 | 4,400 | 2,225 | 2,100 |
| 4/28/09 | 7,600 | 12,200 | 24,000 |
| 10/4/09 | 57,000 | 5,114 | 3,065 |
| 10/9/09 | 36,000 | 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 |

# Management Implications

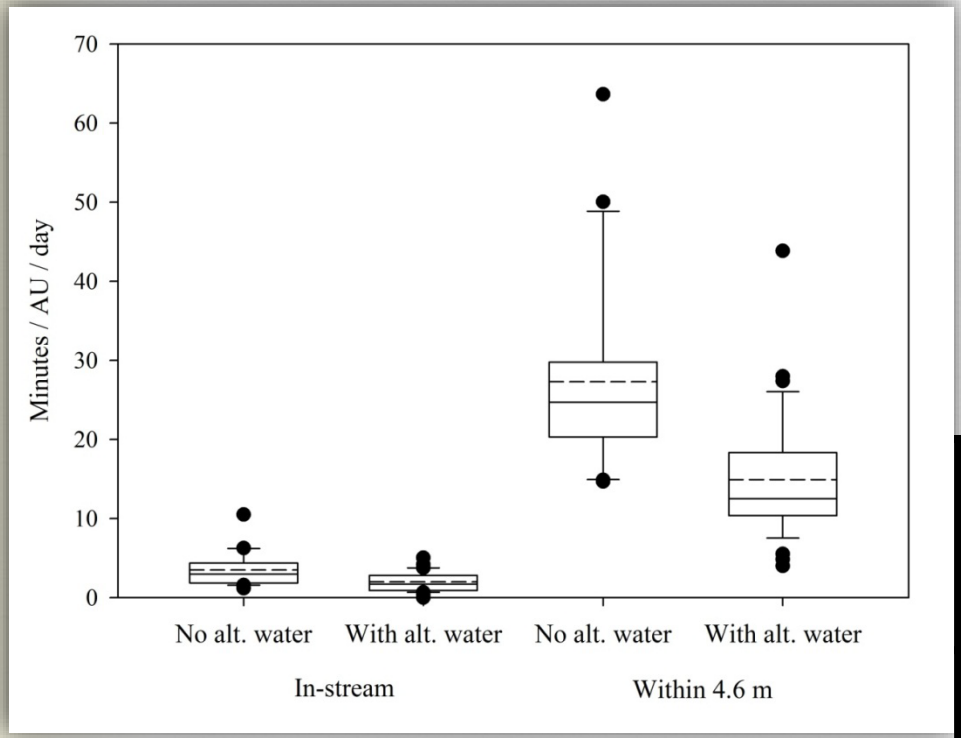
- **Rotationally graze creek pastures**
  - Target grazing of creek pastures to dry periods
  - Rotate cattle to upland pastures during wet periods
- **88-99% reductions** in edge-of-field runoff of bacteria from creek pastures **potentially achievable**

# Alternative Water Evaluation

## Bi-monthly water sampling & quarterly GPS tracking

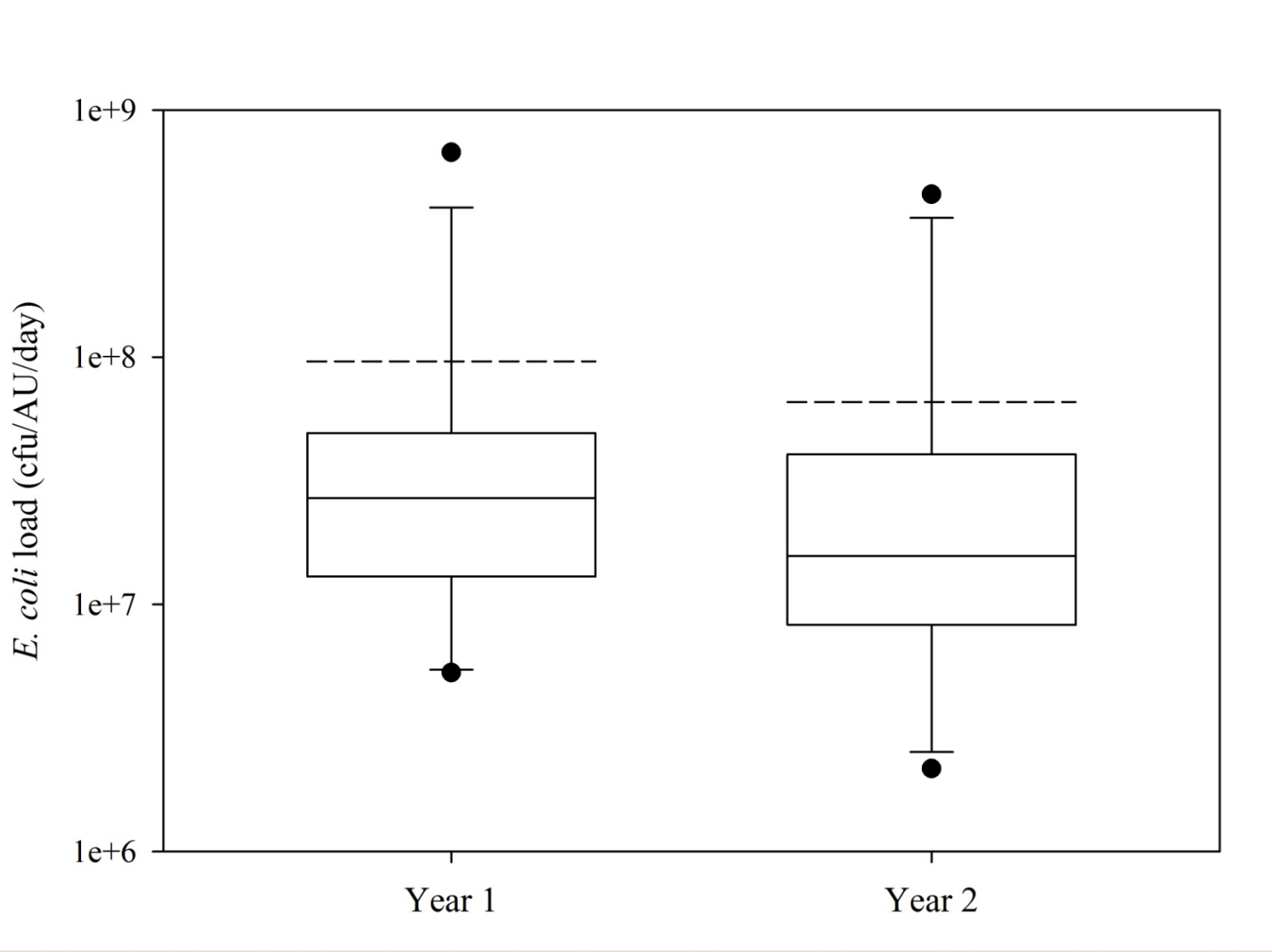



# Alternative water effectiveness




| Reduction in Time Spent in Stream | Reference |
|---|---|
| 43% | Wagner et al. 2012 |
| 85-94% | Miner et al. 1992<br>Clawson 1993<br>Sheffield et al. 1997 |

# *E. coli* Load (cfu/AU/day)



# Alternative Water Source

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

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

# Shade Structure

## GPS Collar Evaluation

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

| Time Spent w/in 25' of Stream | Reference |
|---|---|
| 27% Reduction | Wagner et al. 2012 |

# Conclusions

- **Rotate** cattle to upland pastures during wet periods
- Promote loafing, drinking & grazing away from creeks
  - Alternative water supplies
  - Additional shade
  - Proper grazing management
- Be aware of impacts of background/wildlife sources

# Livestock BMPs

**Brush Management (314)**

- Removal, reduction, or manipulation of non-herbaceous plants
- Mechanical, chemical, biological, prescribed burning, or combination
- Increased vegetation growth

**Fencing (Cross Fencing) (382)**

- Helps facilitate the management and utilization of different land uses and land types
- Can be used to protect critical areas and prevents over grazing

**Filter Strips (393)**

- Permanent strip or area of herbaceous vegetation situated between cropland, grazing land, or disturbed land and environmentally sensitive areas
- Reduces sediment, nutrient and pathogen loading from the protected area
- Enhances herbaceous habitat for wildlife, beneficial insects and watershed function

# Livestock BMPs

**Grade Stabilization Structures (410)**

- **Helps control channel erosion, prevents gully formation, reduces pollution hazards**
- **Reduces sediment loss, nutrient and pathogen pollution**

**Grazing Land Mechanical Treatment (548) (Aerating)**

- **Modify physical soil and/or plant conditions with mechanical tools by treatments such as pitting, contour furrowing, and ripping/sub-soiling**
- **Improve soil permeability, increase infiltration and reduce runoff while stimulating plant growth**

**Heavy Use Area Protection (562)**

- **Stabilizes areas frequently and intensively used by people, animals or vehicles**
- **Improves livestock health, reduces erosion and improves water quality**

# Livestock BMPs

**Pond (378)**

- Water impoundment made by constructing a dam or by excavating a pit or dugout
- Provide water for livestock, fish, wildlife, recreation, fire control and other uses
- Maintains or improves water quality
- Captures runoff and sediment

**Prescribed Burning (338)**

- Controlled fire applied to a predetermined area; controls unwanted vegetation and plant disease while improving forage and seed production and quality
- Reduces wildfire hazards and promotes better grazing distribution

**Prescribed Grazing (528)**

- Managing the controlled harvest of vegetation with grazing animals
- Improve forage quality through proper utilization
- Reduces soil erosion and improves soil condition

# Livestock BMPs

**Range/Pasture Planting (550 / 512)**

- **Establish native or introduced forages to improve or maintain livestock and wildlife nutrition while providing improved wildlife cover**
- **Reduces erosion and promotes infiltration**

**Shade Structure**

- **Provides an alternative source of shade**
- **Place away from riparian areas to minimize time spent near the creek**
- **Best when paired with alternative water and supplemental feeding**

**Stream Crossing (578)**

- **Stabilized area or structure constructed across a stream to provide a pathway for people, livestock, equipment or vehicles**
- **Reduces streambank and streambed erosion, sediment, nutrient and other pollutants**

# Livestock BMPs

**Supplemental Feeding Locations**

- **Situate supplemental feed away from the creek in under-utilized areas**
- **Promotes better grazing distribution, especially when paired with water and shade**

**Water Well (642)**

- **Well drilled to provide water for livestock, wildlife**
- **Promotes better grazing distribution and minimizes time spent near the creek**

**Watering Facility (614)**

- **Device for providing animal access to water (tank, trough, etc.)**
- **Decreases amount of time animals spend near the creek**

# Questions?

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