# Impact of Soil Aeration on Runoff Characteristics in Dual Purpose No-Till Wheat Systems

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#### Dual Purpose Wheat Systems (graze and gain)



- 6 million wheat acres managed as dual purpose in Texas, Oklahoma, and New Mexico (Taylor, 2010).
- Southern Great Plains:
  - 5% No-till
  - 80% Conventional Till
- No-till adoption in graze and grain systems lower than grain only systems





# **Grazing and Compaction**

- Grazing can:
  - Increase soil compaction
  - Increase the potential for soil erosion
  - Decrease water infiltration
  - Increase Runoff (71% vs 12% of received precip.)
  - Increase losses of N and P via runoff
- Texas High Plains
  - Grazing no-till reduced soil water storage and depressed wheat and sorghum yields.

### **Questions/Objective**

- Does grazing no-till wheat result in increased compaction, decreased infiltration, increased runoff?
- Should long-term no-till wheat be tilled to alleviate compaction concerns?
- Evaluate the impact of tillage, specifically soil aeration, on long-term no-till dual-purpose wheat systems on runoff water quantity and quality.







### **Materials & Methods**



- Smith-Walker Research Unit near Vernon
- Tillage Systems
  - Conventional Till (disking)
  - No-Till
  - Aeration at roller angles of:
    - 0, 5, and 10 degrees
- Grazing System
  - Graze and Grain
  - Graze out

#### Site History and Grazing

- Clay loam soil
- Converted to no-till wheat in 2001
- Study took place 2009-2011
- Grazing
  - 2009-2010
    - Graze/Grain = Jan 15 to March 1 (11,454 lb  $ac^{-1}$ )
    - Graze Out = Jan 15 to April 30 (26,172 lb ac<sup>-1</sup>)
  - 2010-2011
    - Graze/Grain = Drought, no grazing
    - Graze Out = March 15 to April 30 (54,000 lb ac<sup>-1</sup>)











## **Tillage and Rainfall Timing**

- Tillage treatments implemented September each year
- Runoff events occurred:
  - ✓ Oct 2009 6 wks after tillage, 30 N, 10 P 5 wks prior
  - ✓ June 2010 after wheat harvest, midseason N -18 lb
  - ✓ Sept 2010 20 days after tillage, immediately after N&P (18 lb)
  - ✓ June 2011 after wheat harvest, midseason N -27 lb



#### Bulk Density (0-4")





































### Conclusions

- Tillage and grazing did not significantly affect bulk density.
- Aeration was most effective in reducing runoff and nutrient losses when storm event occurred within 20 days of implementation, no longer effective at 6 weeks.
- Graze out plots had higher runoff rates, higher nutrient losses, and lower infiltration rates than graze and grain system.
- Overall, tilling of no-till wheat had a short term effect on runoff characteristics and not all tillage treatments improved these characteristics compared to no-till.
- No-till can increase infiltration and withstand the effects of proper grazing intensities compared with mechanical aeration and disking.
- Economic considerations must also be taken into account prior to tilling no-till wheat systems.



#### **Questions?** Paul DeLaune

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#### Appreciation to Texas Wheat Producers Board for project support



#### Producers Board and Association

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