Biomass and fate of grain in harvested and unharvested agricultural fields for waterfowl in Tennessee

Melissa Foster

Matthew Gray, Lisa Muller, Craig Harper, Richard Kaminski

1986: NAWMP created

- Non-breeding areas focus on providing foraging habitat
  - Rebuild lipid reserves lost during migration
  - Return north in good condition to breed.

Photo: Michael Walsh

Waste grain: grain left in agricultural fields following harvest

Important food resource!

Why study waste grain in the Southeast?

Why study waste grain in the Southeast?

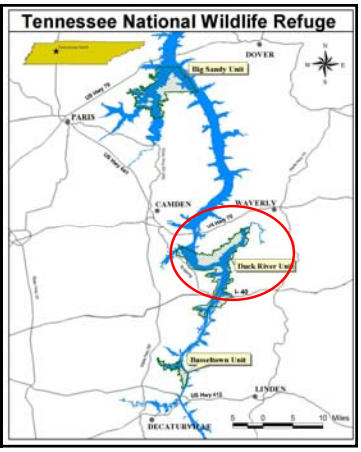
- Quantify DEDs
  - Goals of NAWMP met?
- Previous studies outdated or from geographic areas that differ greatly from SE.

Objectives:

1. ***Estimate biomass in harvested and unharvested corn, grain sorghum and soybean fields from harvest through January.***
   -Compare to LMVJV estimates
2. ***Quantify the fate of grain loss.***

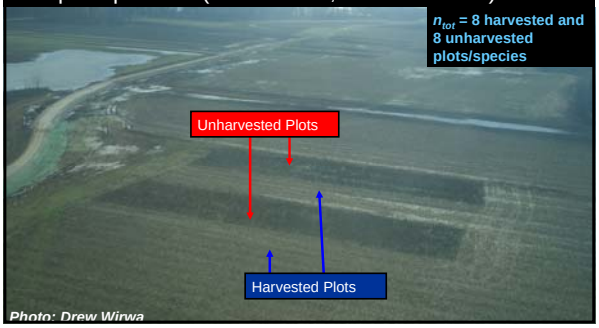
PLOT LOCATIONS

Federal land: TNWR



TNWR

- Corn and soybean: *n* = 4 fields/species
  4 plots per field (2 harvested, 2 unharvested):



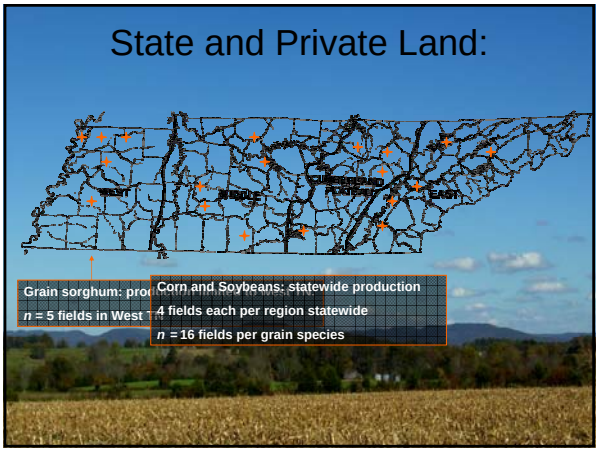
TNWR

Grain Sorghum:

n = 4 fields

None harvested

State and Private Land:



METHODS

- Experimental unit 0.202 ha
- All fields sampled every 4 weeks post-harvest/drydown
- Three subsampling plots randomly selected

Subsampling plot:

Fixed area
(Frederick et al. 1984)

Seed collected by hand

Soybean subsampling plot:

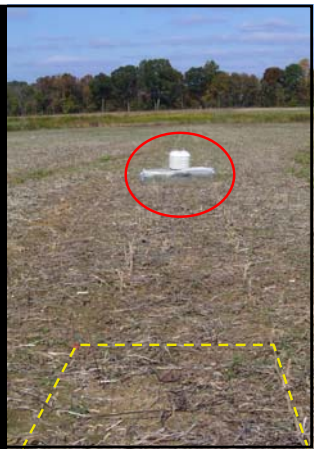
Sample Processing

1. Thresh seeds
2. Store in freezer
3. Dry to constant mass
4. Weigh

QUANTIFYING SEED FATE

Methods:

- 100 seeds scattered under granivore exclosure
- 100 seeds scattered in open plot 5 m away
- Counted every 4 weeks from harvest through Jan.
- Difference between exclosed and open plots = Depredation



Analyses:

- **January biomass estimates**
  - **Means and standard errors (SE)**
  - **Qualitatively compared to estimates currently used by the LMVJV.**
- **Biomass of seed: temporal declines**
  - **Repeated-measures ANOVA**
  - **Tukey's multiple comparison test.**
- **Fate of seed in microclimate plots:**
  - **Overall percent lost to each**

Preliminary Results: Biomass

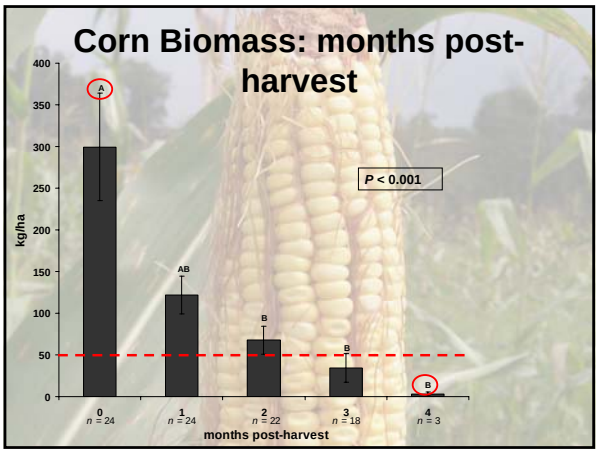
January Estimates: Harvested

Crop	Fields (*n*)	Biomass (kg/ha) mean	Biomass (kg/ha) SE	DED/ha	LMVJV estimate (DED/ha)	
Corn	24	34.60	13.91	194.1	1,250	- 84%
Grain sorghum	5	11.22	4.31	11.2	1,088	Zero!
Soybean	24	16.90	4.30	19.9	89	- 78%

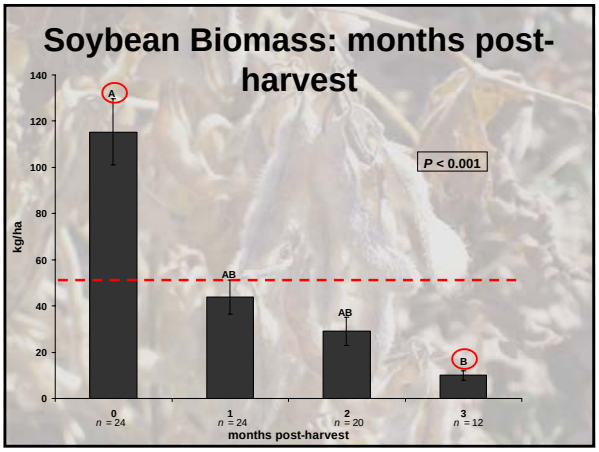
"Giving-up density" (Rutka 2004) = 50 kg/ha

- **DEDs functionally zero**
- **Corn and Soybean: 92% of fields below**
- **Grain Sorghum: 100% of fields below**

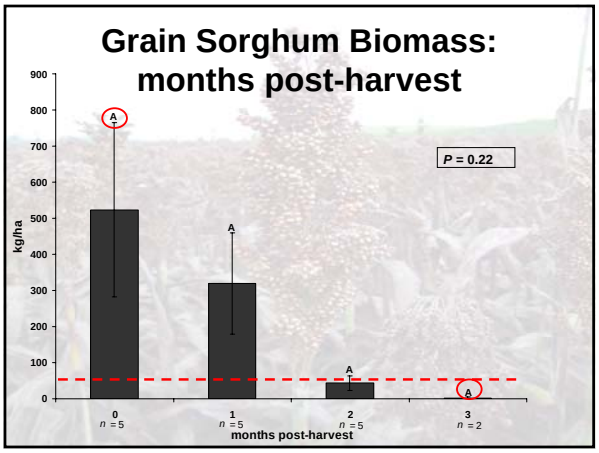
Corn Biomass: months post-harvest



Soybean Biomass: months post-harvest

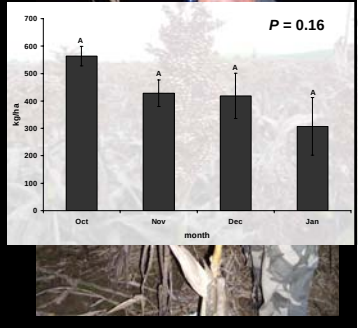


Grain Sorghum Biomass: months post-harvest

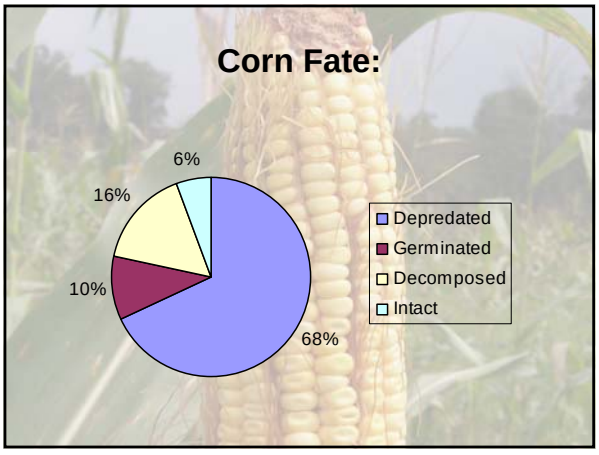


Unharvested Fields:

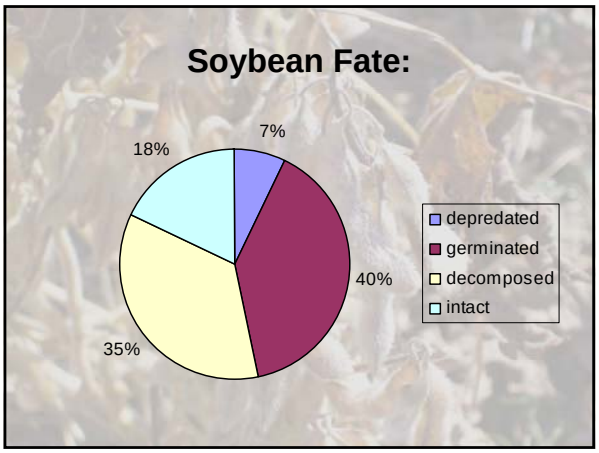
- Corn & Soybeans:
  - No temporal trends (*P* > 0.71)
- Grain Sorghum:
  - trend to decrease



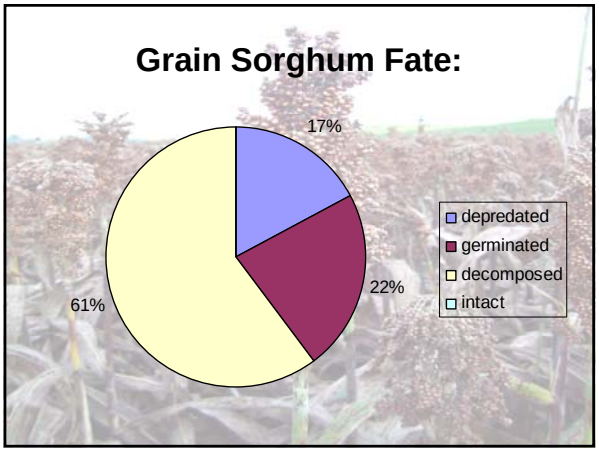
Preliminary Results: Seed Fate



Soybean Fate:



Grain Sorghum Fate:



Note:

- Data represents individual seeds scattered on ground
- Aggregate fate quantified last fall
  - Data

Summary:

- DEDs = 0
  - Grain sorghum: 1 month post-harvest
  - Soybean: 2 months post-harvest
  - Corn: 3 months post-harvest
- January:
  - DEDs = 0 in most (90-100%) fields
- Cannot rely on harvested agricultural fields to sustain waterfowl!

Management Recommendations:

- Delay harvest if possible
- Plant additional food plots
  - Delay bush hogging
- Increase waterfowl carrying capacity through management of natural wetlands (e.g., moist-soil impoundments)
  - Moist-soil seeds decompose more slowly than agricultural seeds.

Acknowledgements:

- Larry Armstrong, TWRA
- Randy Cromer, TWRA
- Robert Caveny
- Ed Conrad
- Edgar Evans State Park
- Clayton Ferrell, USFWS
- Farmer's Fertilizer Co.
- Dan Gibbs, TWRA
- Andy Hofmann, USFWS
- Jim Lane, TWRA
- Dan Lavacot, TWRA
- Jeff Martin, TWRA
- Jason Maxedon, TWRA
- John Mulhouse
- John Mulhouse
- Alex Peña
- John Ed Powers, Final Flight Outfitters
- Phillip Smith, TWRA
- Berney Swiney, TWRA
- UT Plateau Research and Education Center
- Jonathan Walls
- Robert Wheat, USFWS
- Archie Whitehead, TWRA
- Michael Wickens
- Tim Willis, DU
- Carl Wirwa, TWRA
- Many other private landowners!


Questions?