

**WFS 340:
"Wetland Management"**



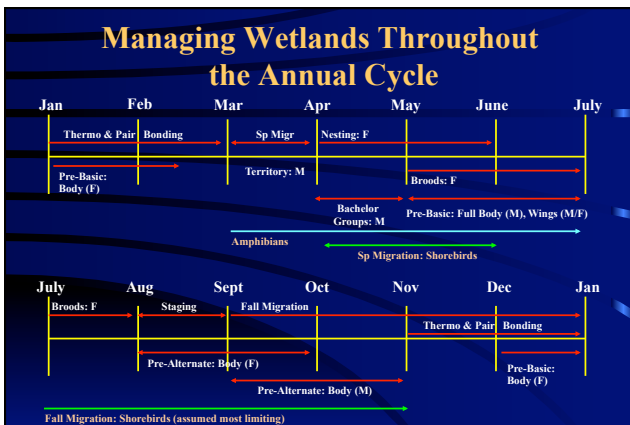


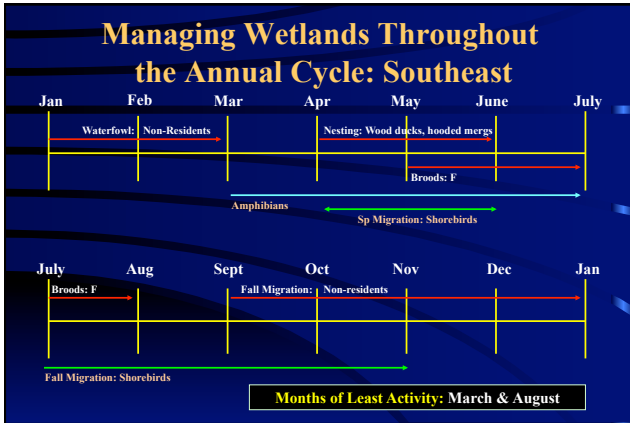
Matthew J. Gray, Ph.D.
College of Agricultural Sciences and
Natural Resources
University of Tennessee-Knoxville

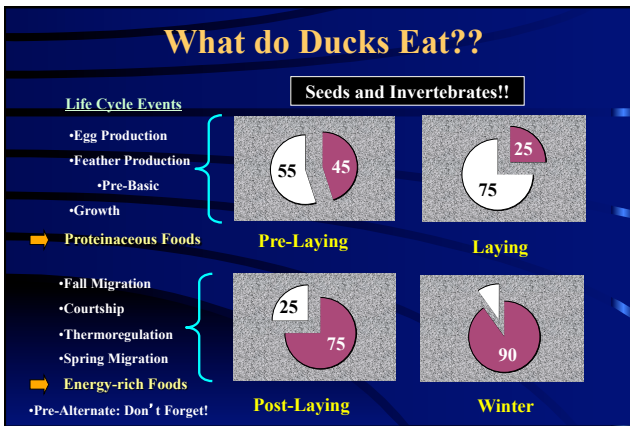


Lecture Structure

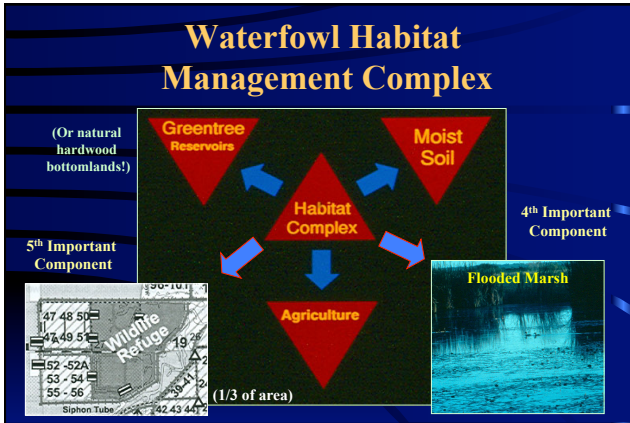
- I. Annual Cycle
- II. Waterfowl Diet & Management Complex
- III. Moist-soil Management
- IV. Agriculture Management

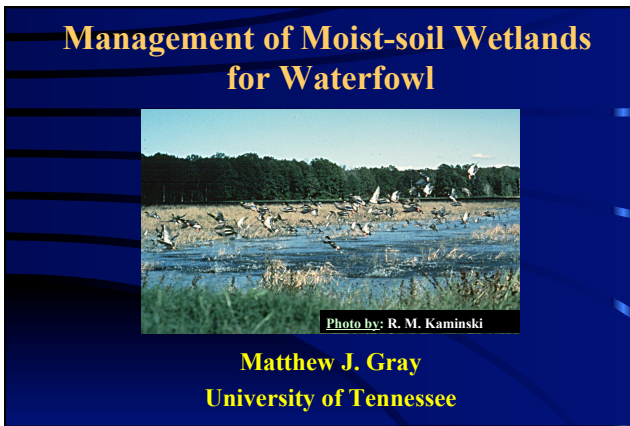








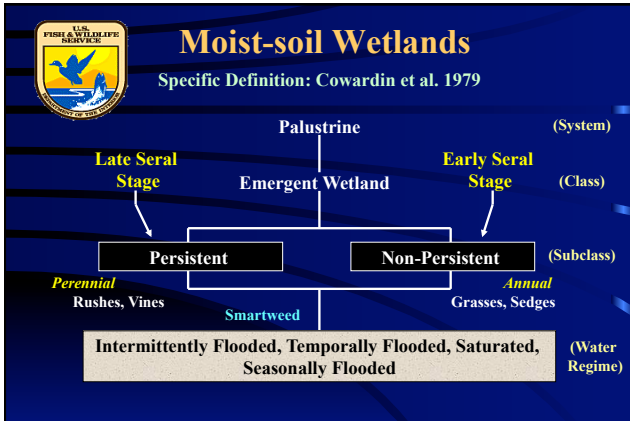




Moist-soil Wetlands

General Definition

Intermittently to seasonally flooded wetlands that are dominated by annual and/or perennial herbaceous hydrophytes.



Moist-soil Management Unit
A location of moist-soil management, often surrounded by levees (impoundments) <40 ha, 100 ac

Moist-soil Management Complex
A group of interconnected moist-soil impoundments that can be managed independently

Hydrologic Management
(Fredrickson and Taylor 1982)

Spring Drawdown:		Multiple Combinations Good!
<u>Duration</u>	<u>Date</u>	
•Fast (2-3 days)	•Early (April)	Eco. Trap
•Slow (2-3 weeks)	•Late (July)	
➡ Plant Diversity and Foods	➡ Annuals & Breeding	

Irrigation:

- Flooded shallowly (e.g., <10 cm)
- Offset drought 2-3 Weeks

Winter Flooding:

- Flood slow (2-4 weeks) & Sequential
- Flood shallow (e.g., 10-20 cm) Sept.

Hydrologic Management

Drawdown



Hydrologic Management

Growth & Irrigation



Hydrologic Management

Vegetation Responses

Early



Early-Mid



Late



Hydrologic Management

Fall Flooding & Bird Response



Waterfowl Foods in Moist-soil Wetlands



Invertebrates



Seed

Tubers



Hydrologic Management

Water Control Structures

Drop-board



"Tongue-and-Groove"

Flap Gate



Screw Gate



Hydrologic Management

Moving Water

www.crisafulli.com
www.gator-pump.com

Gravity (reservoirs, rivers)



Cheapest!

Diesel or PTO-Pumps & Wells



Towable PTO-Pumps



Crisafulli® & Gator®



Electric Pump & Wells



Mechanical Manipulations of Moist-soil Wetlands

(Fredrickson and Taylor 1982; Gray et al. 1999)

(Disking, Tilling, Scraping or Mowing)

Primary Goal: Set back Succession

2-3 Years
(Rotation)

Spring Manipulations: *(Historically: Northerly Approach)*

- Immediately after Early Spring Drawdown

Autumn Manipulations: *(SE Approach)*

- As soon as possible after Early or Late Drawdowns

Delays → Heavy Precipitation, Breeding Waterfowl

•Long growing season and climate conditions can produce dense and continuous stands of hydrophytes

Disking is Best!

Secondary Goal: Waterfowl Access

Why Forego Mechanical Manipulations until Autumn?





3 Primary Reasons

Mechanical Manipulations



Mechanical Manipulations

How many Disk Passes are Necessary?



Usually
1-3
passes is
sufficient



Offset Disk Best!

Mechanical Manipulations

Gray et al.
(1999)

Autumn Vegetation Responses

WSB 27:
770-779



Mowing and Control
No Change in Vegetation!

Mowing in Autumn Good for Opening
Dense Vegetation and Creating
Landing Areas for Waterfowl!

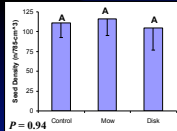
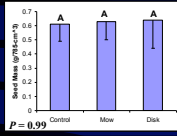
Disking and Tilling
Increased Vegetation Biomass
Increased Species Diversity
Increased Seed Yield



Fall Mechanical Manipulations

Moist-soil Wetlands

Are Seed Resources Lost?
(Gray, Kaminski, Hopkins; 1995)



Is it Illegal if Hunted Over?
(50 CFR Part 20; 1999)

No, if any of the following:

- Natural moist-soil wetland
- Natural moist-soil wetland with volunteer crops (including millet); >1 yr since planting

- Unharvested agricultural crop
- Agricultural crop harvested via *bone fide* technique (i.e., combine)

Yes, if any of the following:

- Agricultural crop (including millet) that is manipulated via bush-hog or knocked down: <1 yr planting

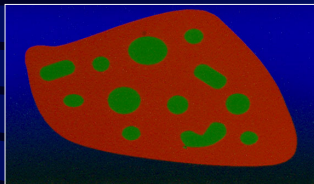
Mechanical Manipulations

Hemi-marsh Configuration

Smith et al. (2004)

Replication on
Wintering
Grounds

WSB 32:474-480



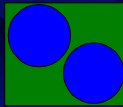
Aquatic
Invertebrate
Biomass
Greatest

Kaminski and
Prince (1981)

Hemi-marsh Concept

An approximate equal area of
water and vegetation is ideal!

50:50 Ratio



Greatest Abundance and
Richness of Waterbirds
are Attracted

Weller (1970)

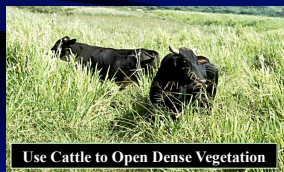
Natural Manipulations of Moist-soil Wetlands

Burning: (Use w/ Disking to set back succession)

- Release Nutrients
- Increase Nutritive Quality (Coastal Wetlands)
- Increase Plant H'
- Increase Aquatic Invert Biomass

Grazing: (similar to mowing) (Early Succession)

- ➔ Structural; Aquatic Invertebrates



Use Cattle to Open Dense Vegetation

Follow by Disking



Natural Manipulations of Moist-soil Wetlands



Other Manipulations of Moist-soil Wetlands



- Agriculture**
- Ag. Var. Hydrophytes
 - Higher Elevations
 - Mid-June
 - 40 kg/ha; \$150/ha

Herbicide Application

- Nuisance Plants
 → *Sesbania, Xanthium*
- 2,4-D, Renovate 3: Broad-leaved
- Glyphosate (Rodeo): Non-selective
- Habitat (Imazapyr): Invasive Exotics



Agriculture Management



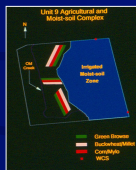
Corn + Moist-soil

Thus, birds can acquire high energy ag grains without flying long distances.

(Energy, Harvest Probability)

Crops Should be in Close Proximity to Natural Wetlands!!

Green Browse



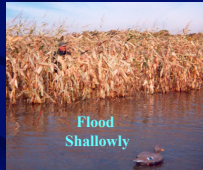
Agriculture Management



Rice



Flooded Corn



Flood Shallowly

Other Common Agricultural Foods

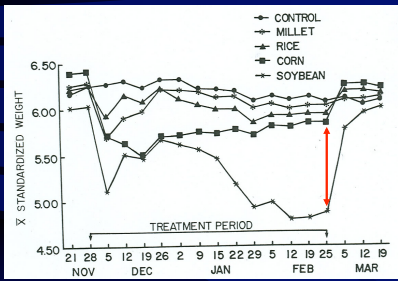
Milo, soybeans, browntop millet, and common buckwheat (*Fagopyrum esculentum*)

Agriculture Management

Rice and Millet
Better than
Soybean and Corn

3.5 kcal/g vs. 2.5 kcal/g

TME in Ag vs. MS



Mallards Metabolize Less Energy from Soybeans than other Ag Grains

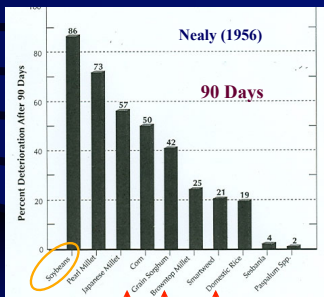
Trypsin Inhibitor in Soybeans May Decrease Useable Protein (35%)

"Waterfowl cannot maintain body weight on agricultural seeds alone!" R. M. Kaminski and C. Loesch (1989)

Agriculture Management

Why not Agriculture Only??

Moist-soil seeds decompose more slowly and retain their nutritional quality longer than agricultural grains.



Ag Seed

42-86% Decomposition

Moist-soil Seed

2-21% Decomposition

Food Available in Rice Fields

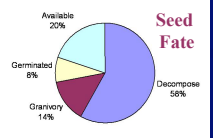
Manley et al. (2004), Stafford et al. (2005)

71%, 79-99% Decrease in Seed Availability

271 kg/ha Post Harvest → 78 kg/ha Late Autumn WHY?

Less Food (DED) Available!!

140 kg/ha → 752 DED/ha
325 DED/ha



Post-harvest Fates of Agricultural Seed in Tennessee Croplands

Melissa A. Foster, Craig A. Harper, Johnathan G. Walls, and Richard M. Kaminski





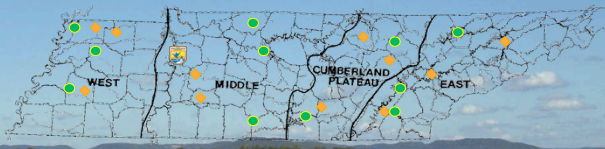


Matthew J. Gray
UT Wetlands Program
SEAFWA
19 October 2010

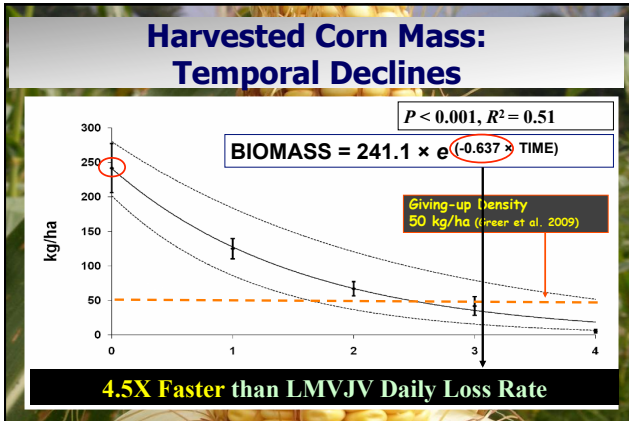
Study Areas

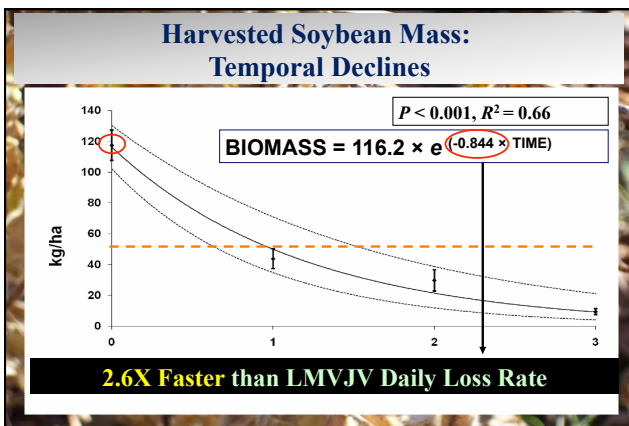
Corn, Grain Sorghum and Soybeans Fields

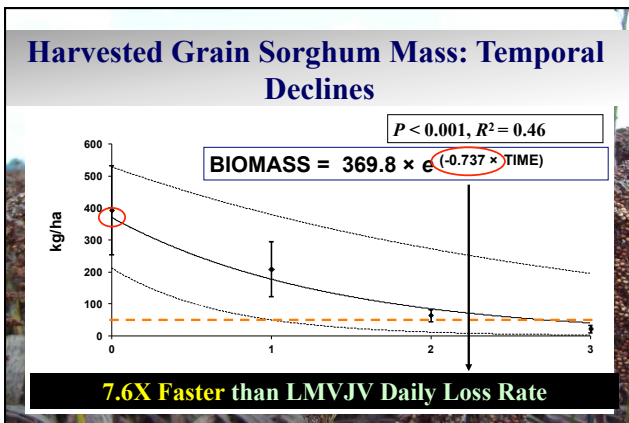
n = 105 harvested, *n* = 59 unharvested

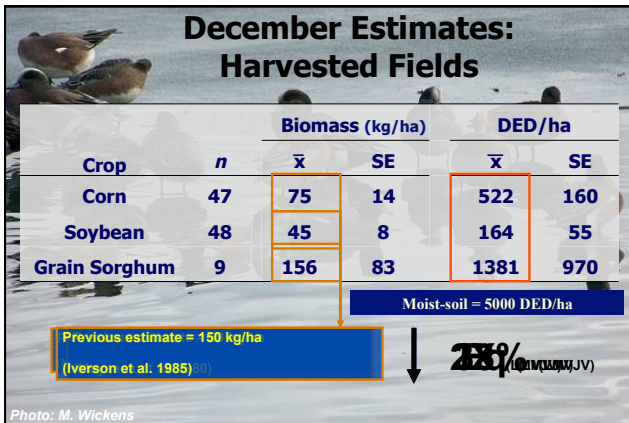


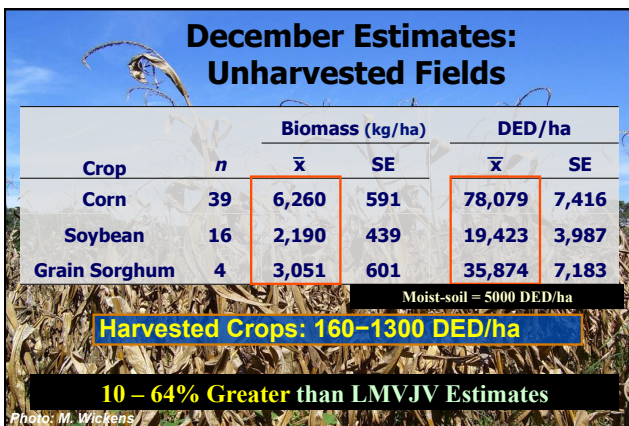
- Federally-owned (TNWR)
- State-owned (TWRA)
- Privately-owned








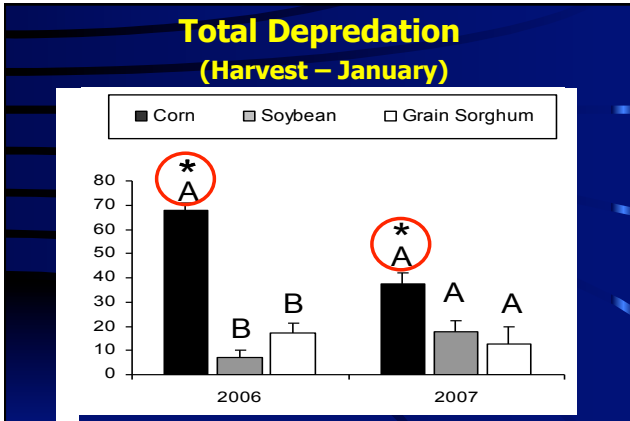


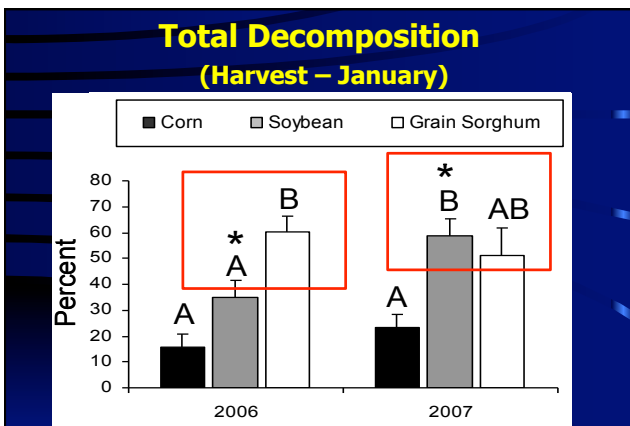


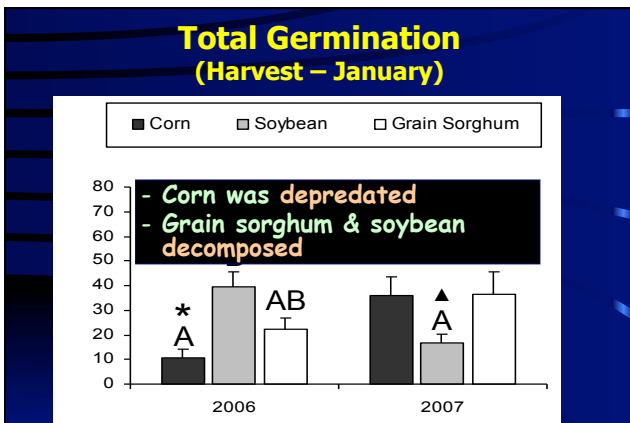
Part II: QUANTIFYING SEED FATE



In harvested fields, there is less available seed and it is disappearing quickly. What is happening to it?







Hunting Agriculture



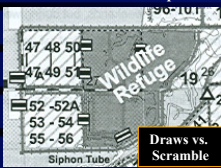
Flooded Fields



Harvested Fields

Create Hunting Access

Walk-in Access Ramps



Boat Pull-over Sites



Hand or Power Winch



Managing Hunting Disturbance

Spatial Refuge

Vs.

Temporal Refuge

Conceiving a Moist-soil Management Strategy

