



# Evaluation of Methods for Assessing Corn Hail Damage

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# Overview

- Maturity line weight appraisal method.
- Stand reduction appraisal method.



# Maturity Line Weight Appraisal Method

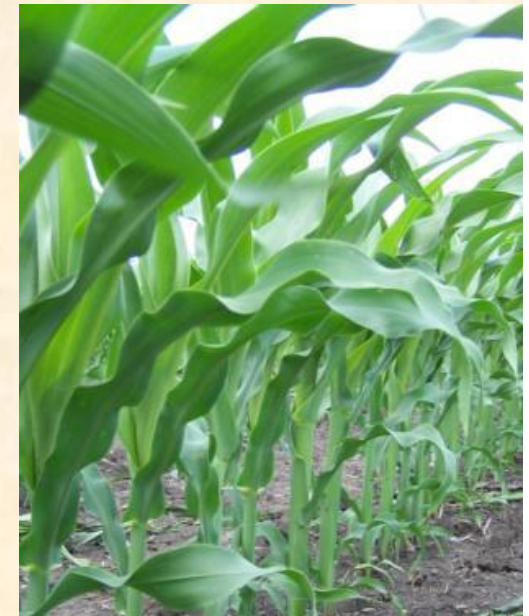
- For corn grain appraisals, from the milk stage until kernels are fully mature & moisture drops below 40%.
- Based on weighing ear samples which are grouped according to maturity, and then using this information to predict grain yield.
- Often used when corn has been insured as grain but then is harvested for silage.



*Source: USDA Corn Loss Adjustment Standard Handbook*

# Maturity Line Weight Appraisal Method

- Research in Wisconsin & Pennsylvania found that at early stages of grain fill, this method resulted in low appraisals when compared to actual yield at the end of the season.
- “If at all possible, defer appraisal to the weight method”  
– on page 15 of the *USDA Corn Loss Adjustment Standard Handbook*.



# Grain Fill in Corn

- Corn yield is closely tied to crop, weather, & soil conditions during the rapid grain-filling period.
- Rapid grain filling in corn occurs from late R2 (blister stage) to late R5 (dent stage).
  - Typically 35 to 40 days = 4 to 6 bushels/acre/day
- Daily grain-filling rates & the duration of this period determine final yield.



# Maturity Line Weight Study

- **Objective:**
  - To improve the maturity line weight appraisal method to more accurately forecast final yield.
- **Method:**
  - Weekly ear samples collected from replicated plots during the rapid grain-filling stages.



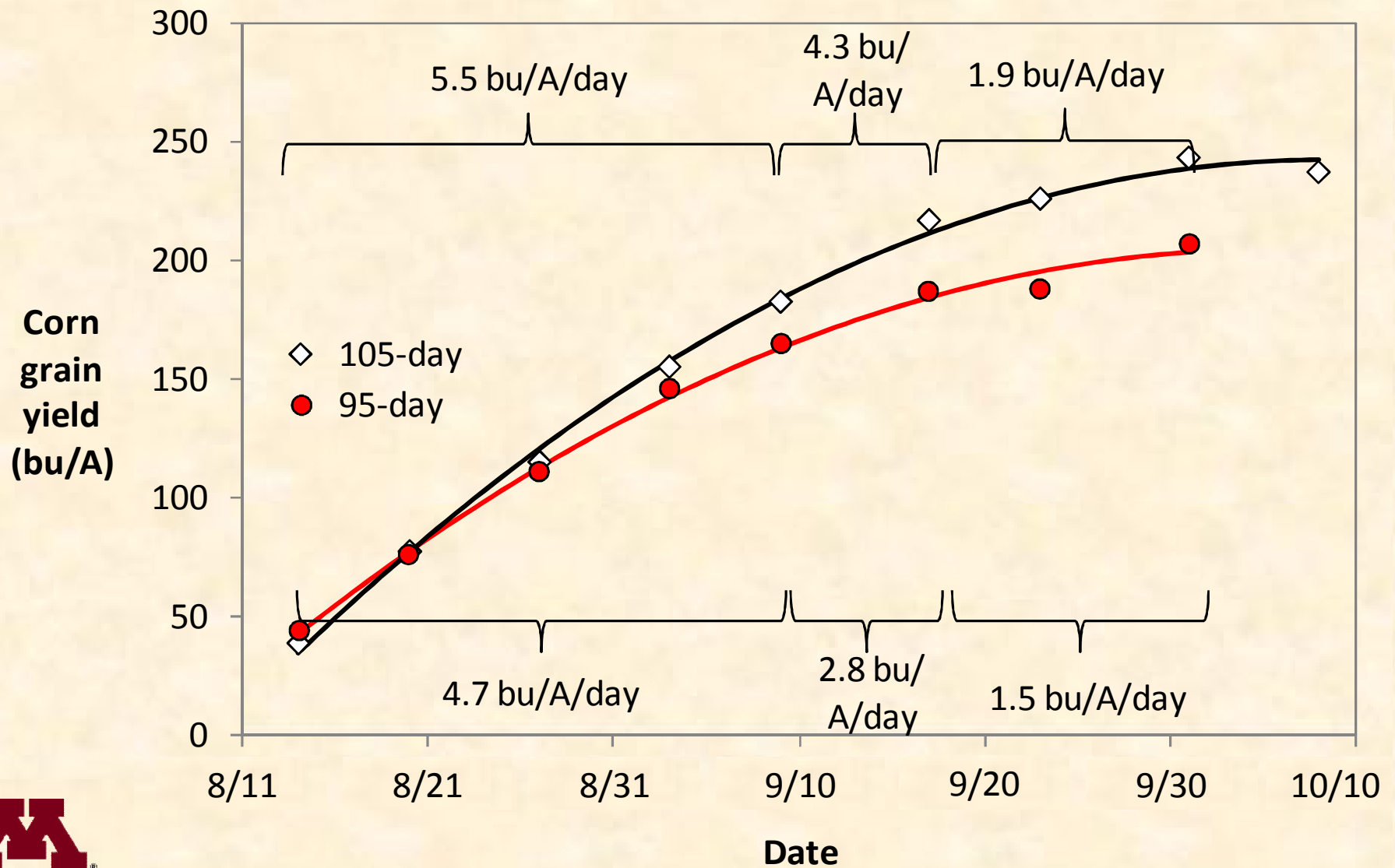
# Materials and Methods

- Lamberton & Waseca, MN - 2009 & 2010
- Planted after soybean on clay loam soils
- 2 hybrids with corn borer + corn rootworm resistance
  - 95-day & 105-day in 2009
  - 94-day & 104-day in 2010
- Ear samples were collected weekly from the milk (R3) stage through maturity (black layer)
  - Weighed wet, dried, shelled, weighed dry grain



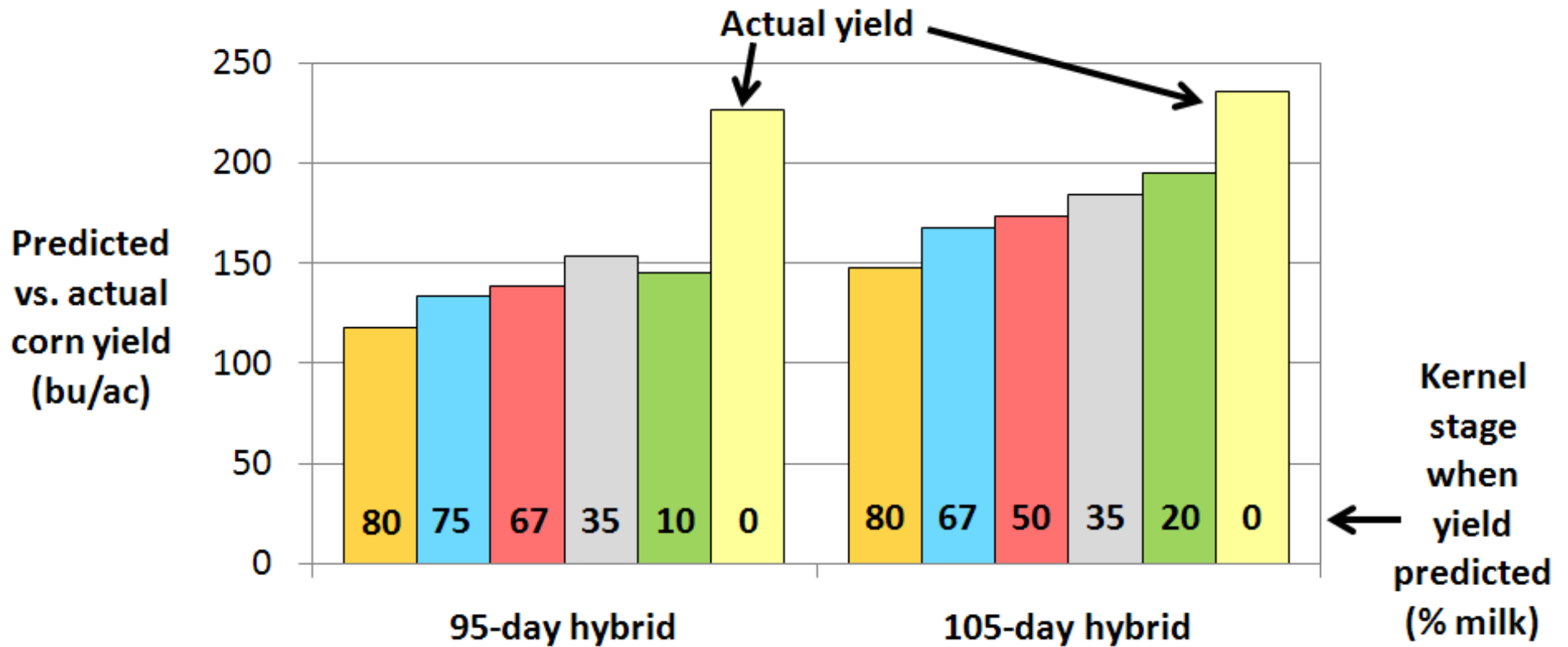
# Rate & Duration of Grain Fill Affect Final Yield

Lamberton and Waseca, MN - 2009



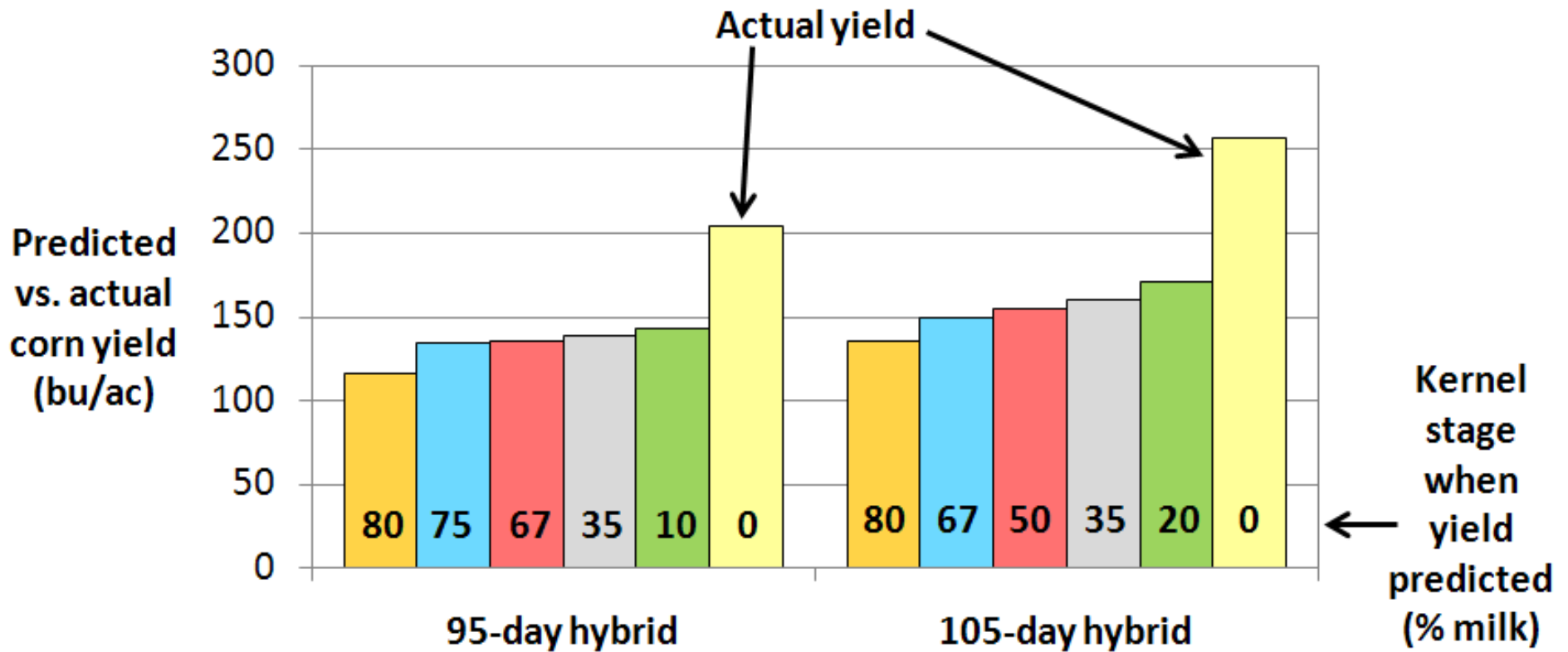
# Evaluation of the Maturity Line Weight Appraisal Method

Lamberton, MN - 2009



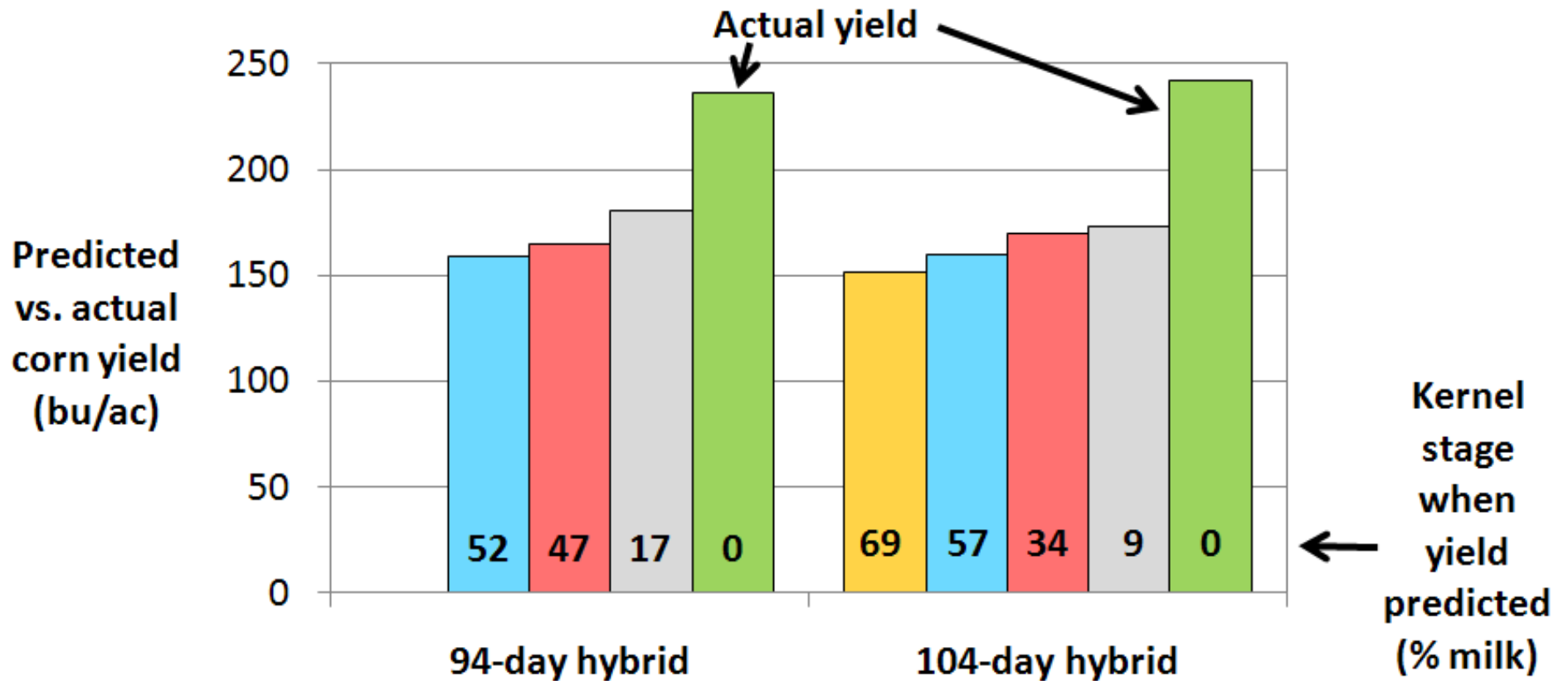
# Evaluation of the Maturity Line Weight Appraisal Method

Waseca, MN - 2009



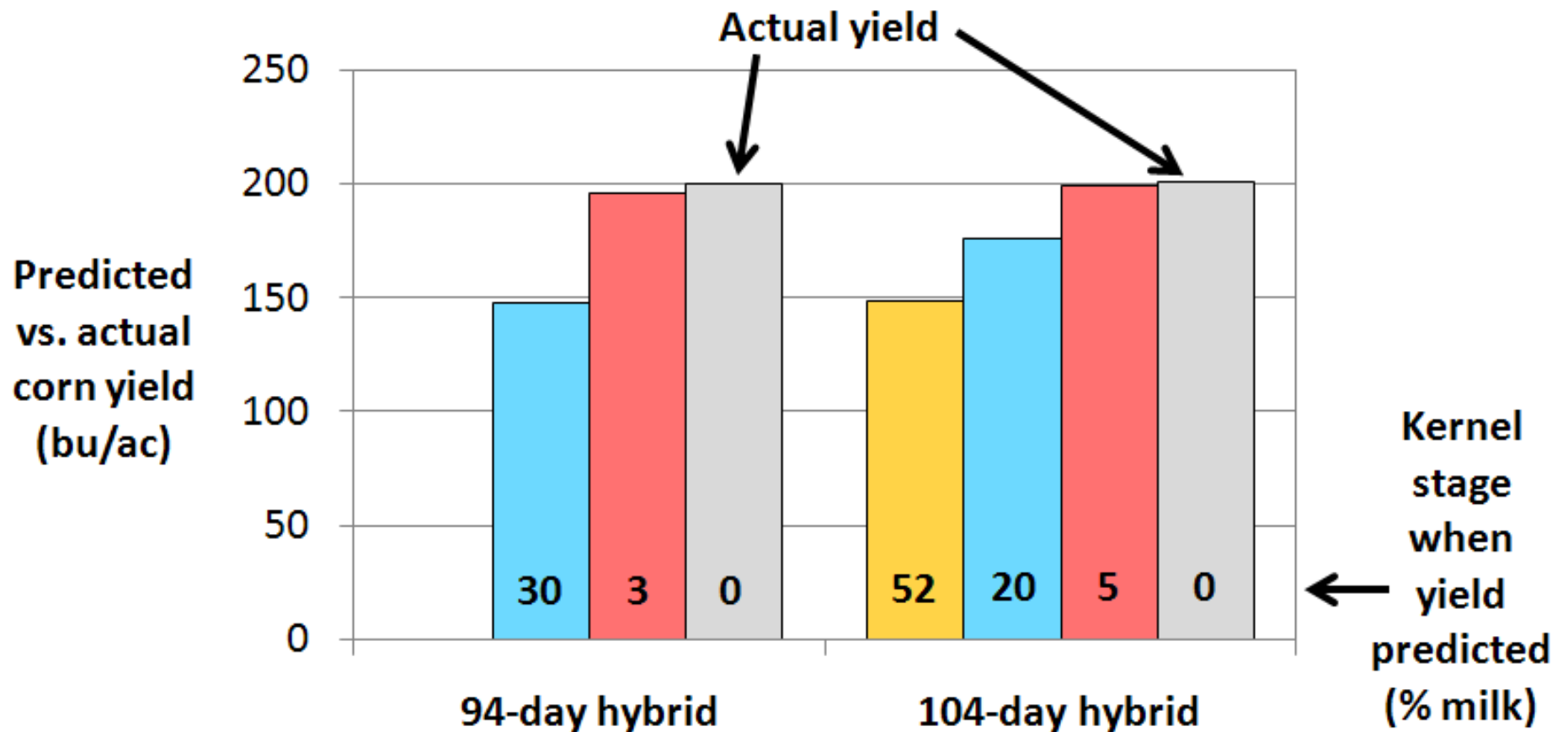
# Evaluation of the Maturity Line Weight Appraisal Method

Lamberton, MN - 2010

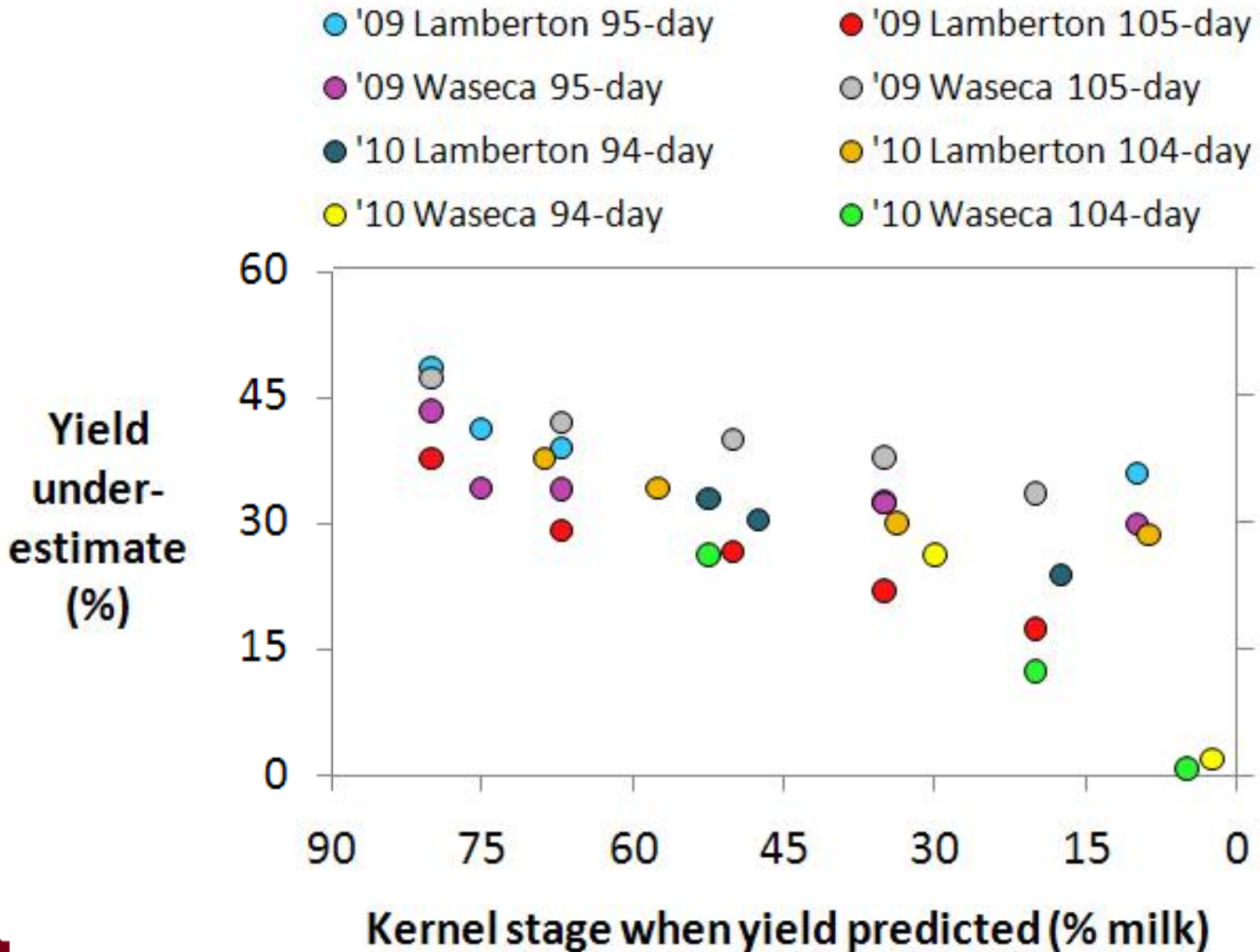


# Evaluation of the Maturity Line Weight Appraisal Method

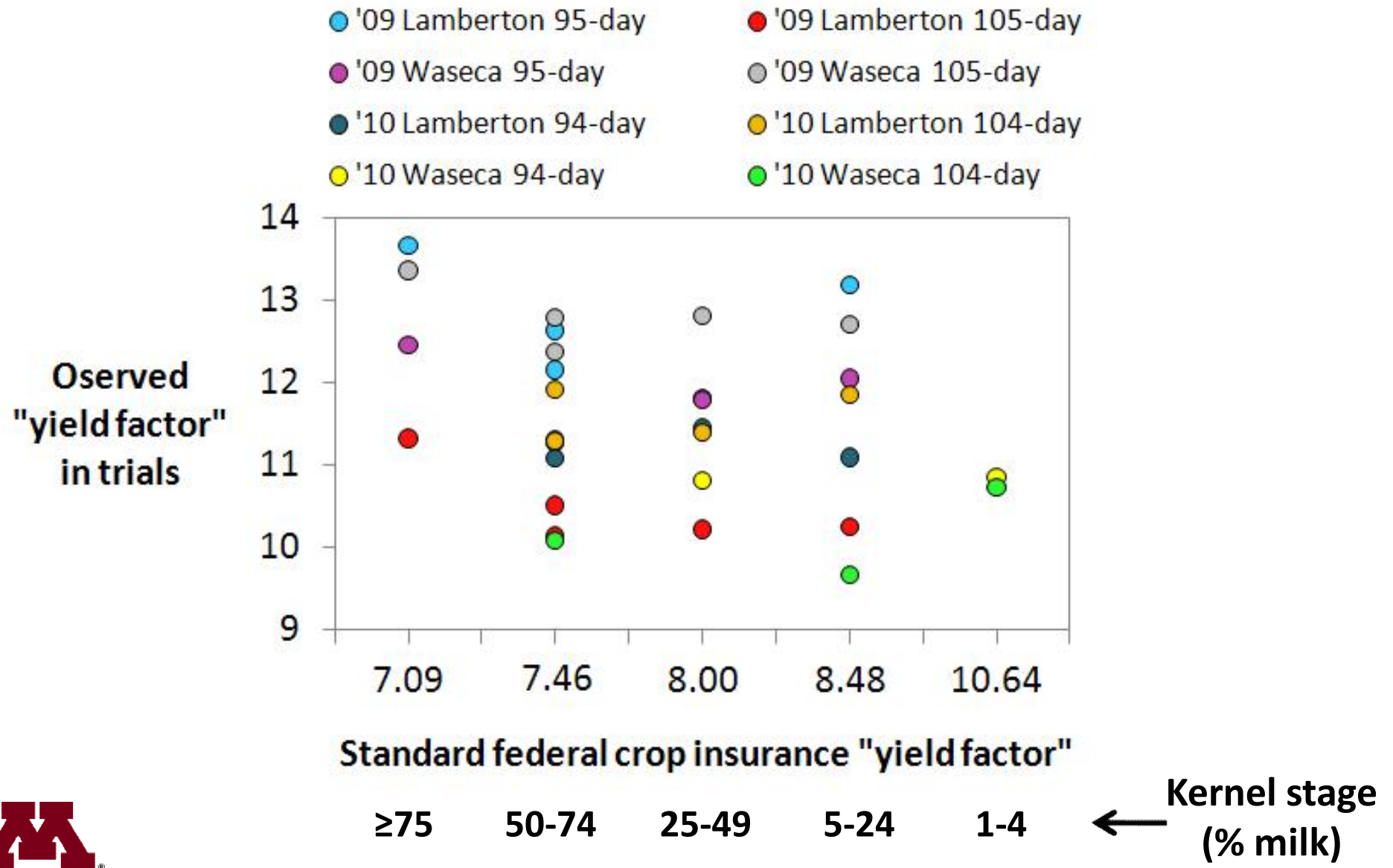
Waseca, MN - 2010



# Yield Under-Estimation with the Maturity Line Weight Appraisal Method



# Standard vs. Observed "Yield Factors" for the Maturity Line Weight Appraisal Method



# Summary - Maturity Line Weight Study

Kernel stage	Milk in kernel	Average yield underestimate with maturity line weight method	Current "yield factor" for maturity line weight method	Average observed "yield factor" in our trials
1/4	≥75%	44%	7.1	12.7
1/2	50 - 74%	35%	7.5	11.5
3/4	25 - 49%	30%	8.0	11.5
Doughy	5 - 24%	26%	8.5	11.6
Extended	1 - 4%	1%	10.6	10.8



# Corn Stand Reduction Appraisal Method

- Used to assess yield loss due to hail-induced stand reduction from the 7-leaf (V5) stage until the milk (R3) stage.
- Assumes...
  - Remaining plants can partially compensate when stand loss occurs between the 7- and 10-leaf stages (V5-V8).
  - The same level of yield compensation from remaining plants when stand loss occurs between the 7- and 10-leaf stages.
  - After the 10-leaf stage, remaining plants cannot compensate for lost plants, and yield loss equals percent stand loss.



# Stand Reduction Study

- **Locations:**

- DeKalb, IL: 2006-2008
- Urbana, IL: 2006-2008
- Ames, IA: 2007-2009
- S. Charleston, OH: 2007-2009

- **36,000 plants/acre reduced by:**

- 1/6 (to 30,000), 1/3 (to 24,000), and 1/2 (to 18,000)

- **4 timings of stand reduction: V5, V8, V11, V15**

- **2 patterns of stand reduction:**

- Uniform: removed every 6<sup>th</sup>, 3<sup>rd</sup>, or 2<sup>nd</sup> plant
- Random: removed the required number of plants within every 6-plant segment at random



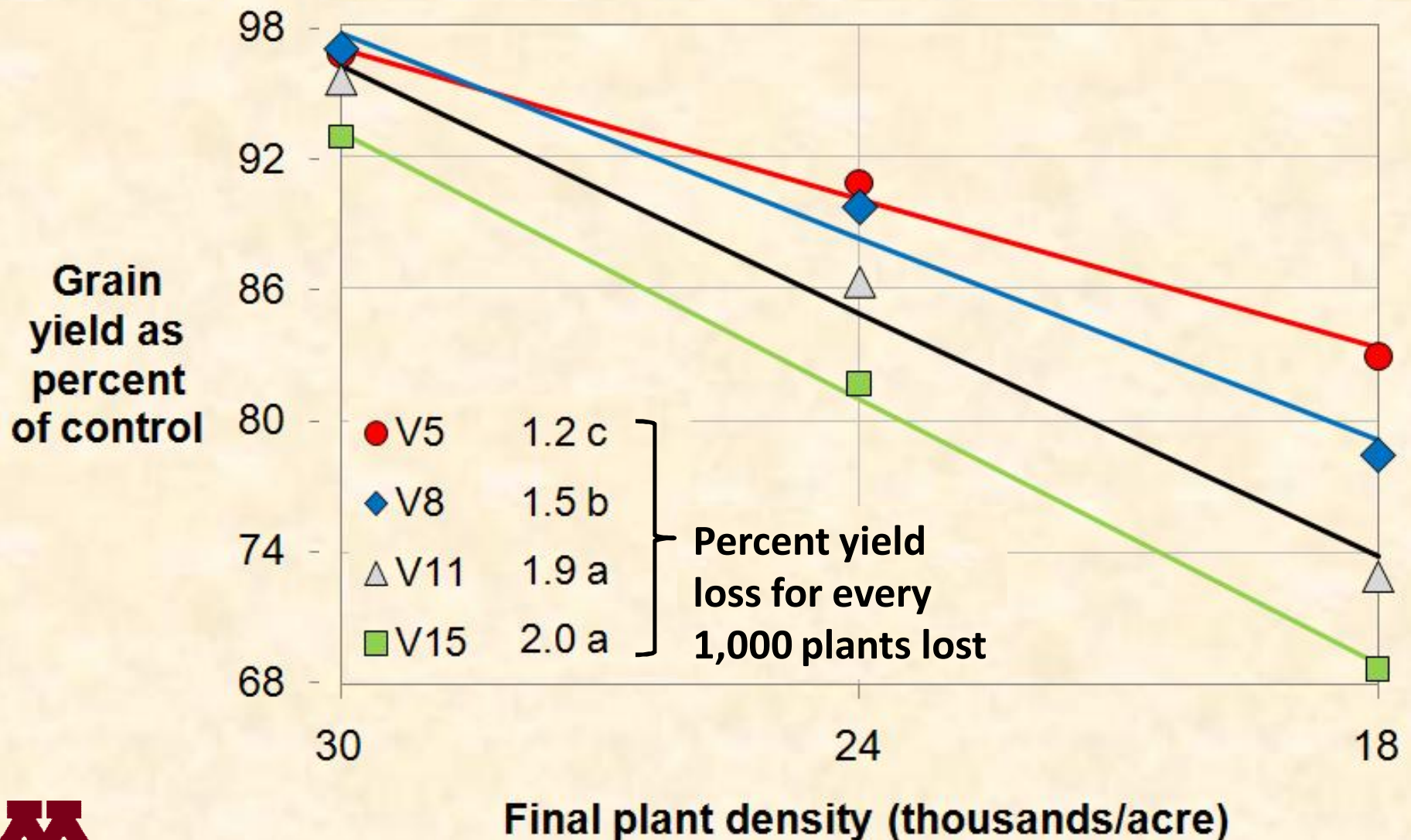
# Stand Reduction Study

- Yield results were similar for both the uniform and random patterns of stand reduction.



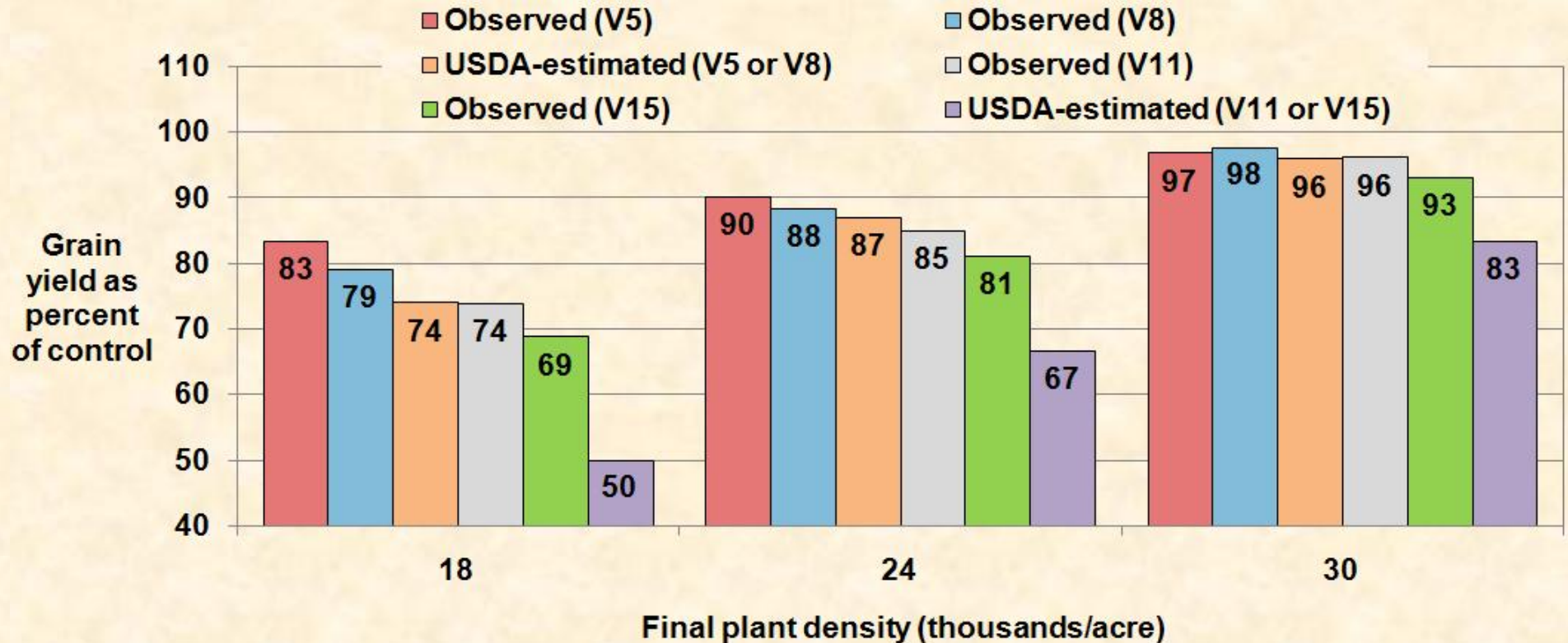
# Time & Severity of Stand Reduction Affected Yield

Averaged over 12 site-years & both patterns of stand reduction.



# Evaluation of the Stand Reduction Appraisal Method

Averaged over 12 site-years & both patterns of stand reduction.



# Summary - Stand Reduction Study

- Yield loss estimates with the stand reduction appraisal method were:
  - Always over-estimated.
  - 1-9% greater than measured when stand loss occurred at V5 or V8.
  - Farther off when stand loss occurred at V11 or V15 than V5 or V8.
  - Farther off as the amount of stand loss increased.



# Conclusions - Stand Reduction Study

- Plants remaining after stand loss can partially compensate for destroyed plants when stand loss occurs through late vegetative growth stages.
  - The ability to compensate was greater when stand loss occurred earlier.
- The stand reduction appraisal method could be greatly improved if it assumes that remaining plants can compensate for lost plants after V8.
- Remaining plants in this study had no hail injury, so the level of their yield compensation may have been greater than that following a true hail event.





# Thanks!



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