Crop Quality 2009 and 2010 and Grain Storage Management

The Extension Grain Management Team

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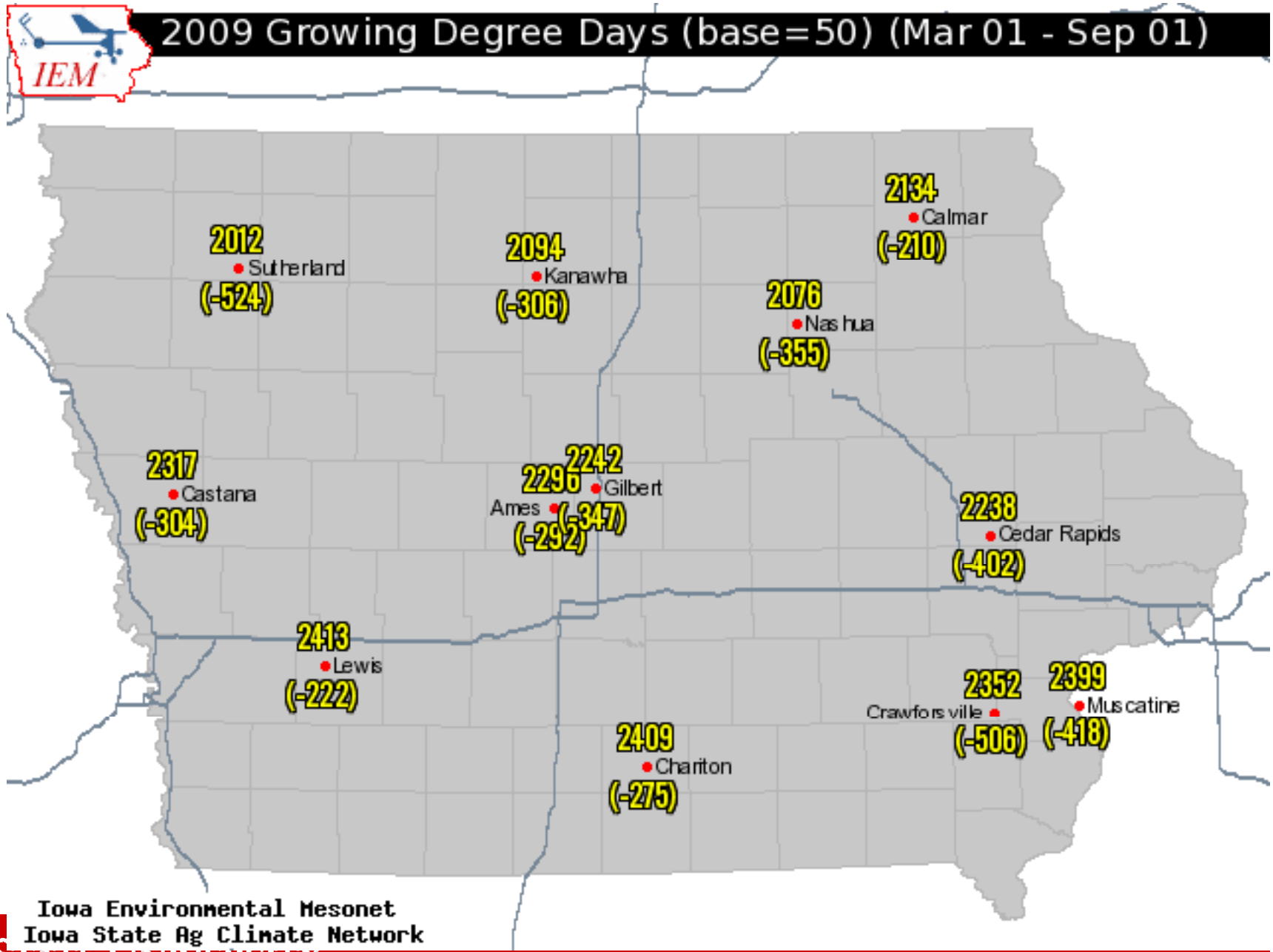
Farm Management

Mark Licht: Agronomy

Alison Robertson: Plant Pathology

OUTLINE

- Crop quality
  - 2009 Corn Issues
  - Blending and Carryover
  - 2010 Weather and Quality
- Basic storage practice
- Future needs for grain storage

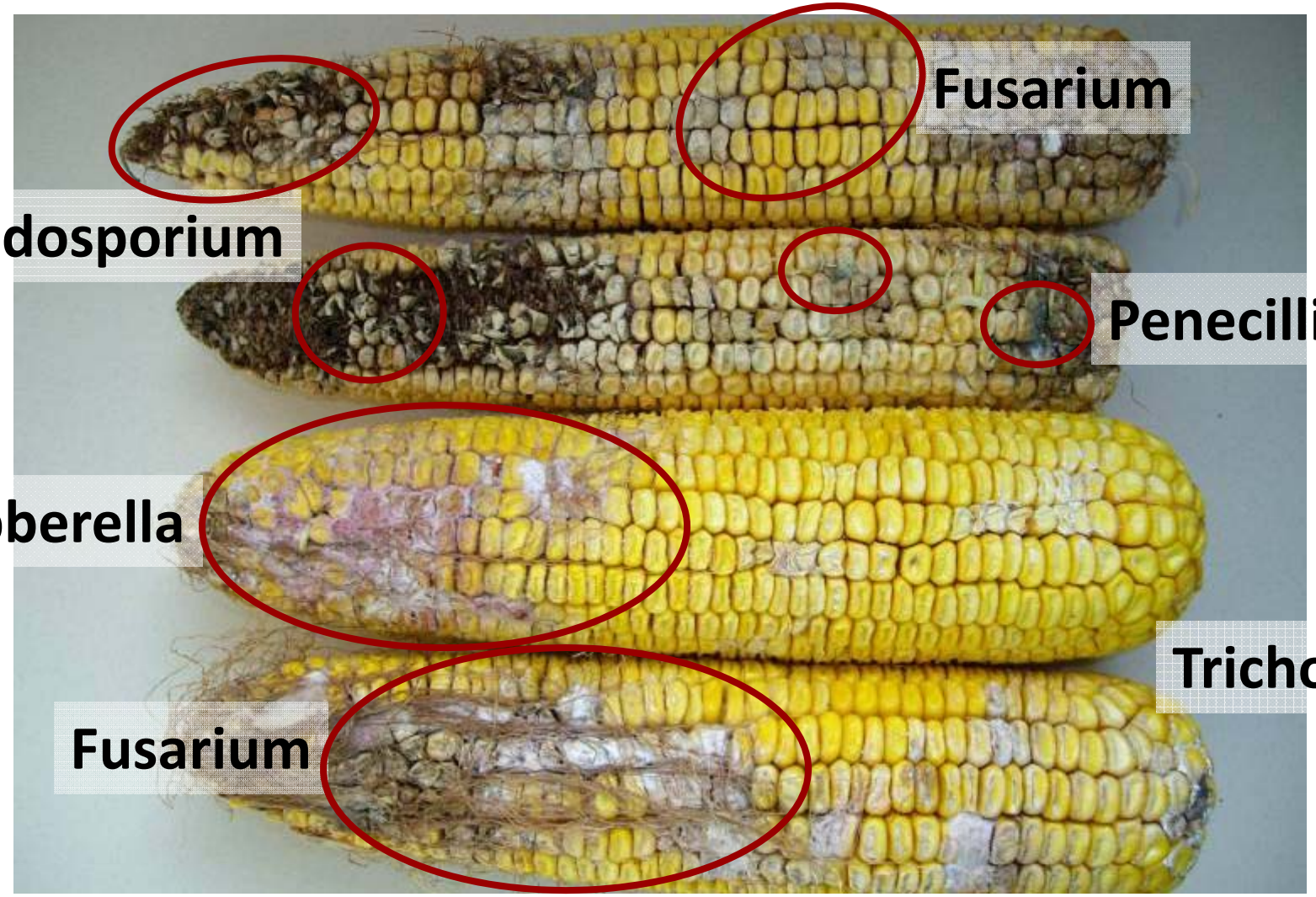

2009 Growing Degree Days (base=50) (Mar 01 - Sep 01)
IEM
2012
Sutherland
(-524)
2094
Kanawha
(-306)
2134
Calmar
(-210)
2076
Nashua
(-355)
2317
Castana
(-304)
2296
Ames
(-292)
2242
Gilbert
(-347)
2238
Cedar Rapids
(-402)
2413
Lewis
(-222)
2352
Crawfordsville
(-506)
2399
Muscatine
(-418)
2409
Chariton
(-275)
Iowa Environmental Mesonet
Iowa State Ag Climate Network

Wet Corn!

Hail damage, Sac County, 8-09-2009

Photos courtesy: Mark Licht, ISU Extension

Ear rot assessments – percent severity; rot present



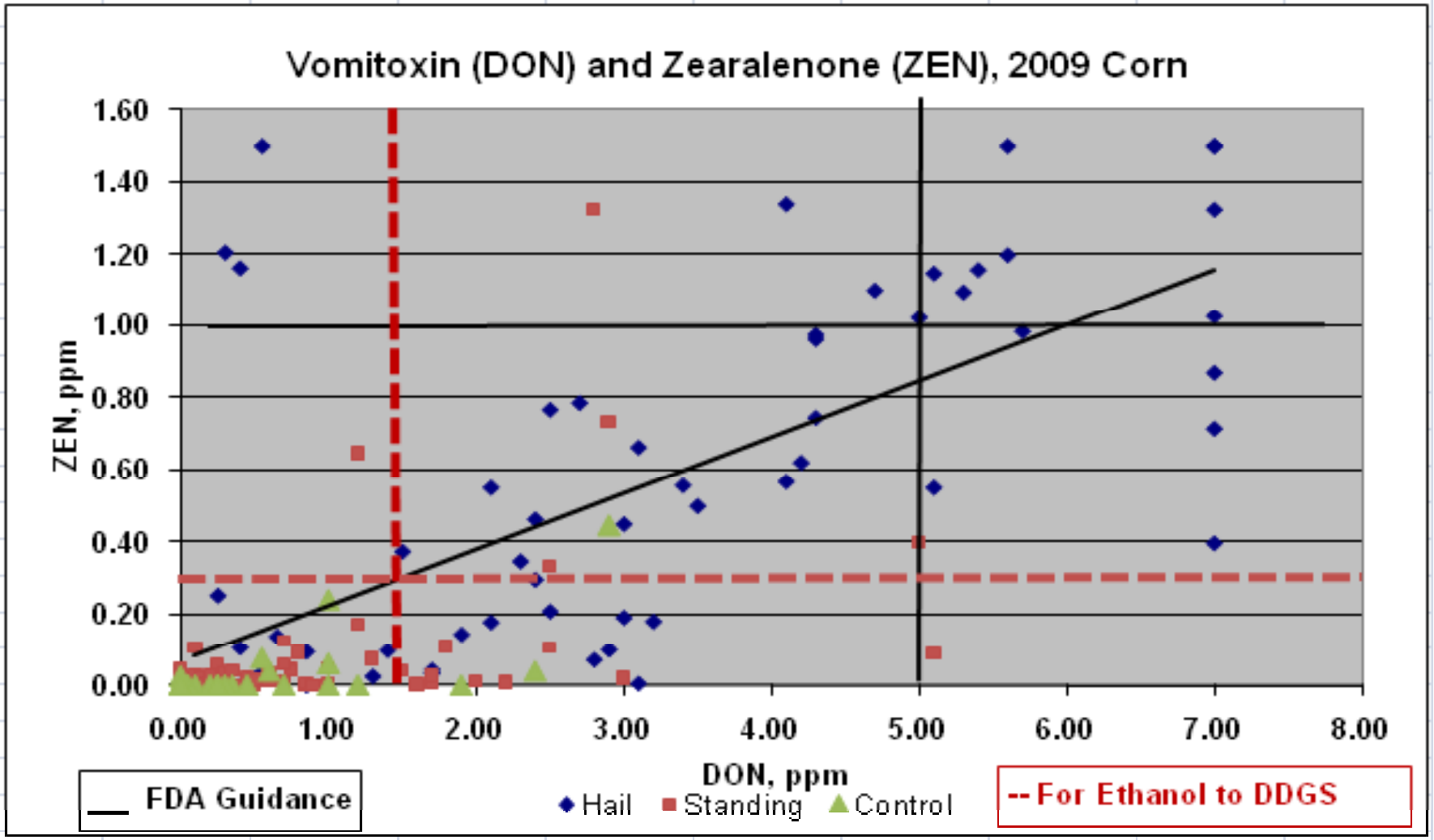
Corn, NE Iowa, January 2010

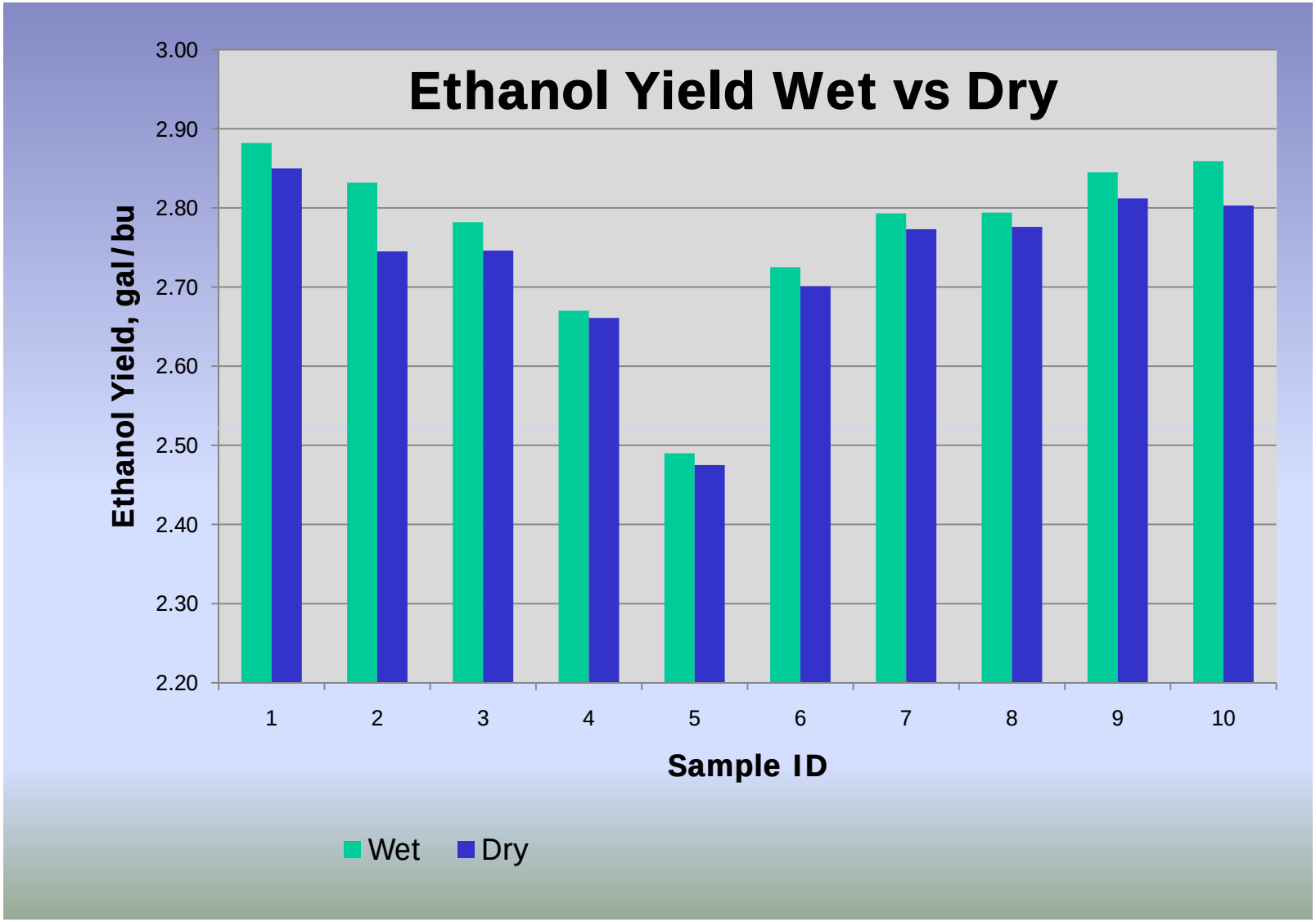
Ear Rot Summary

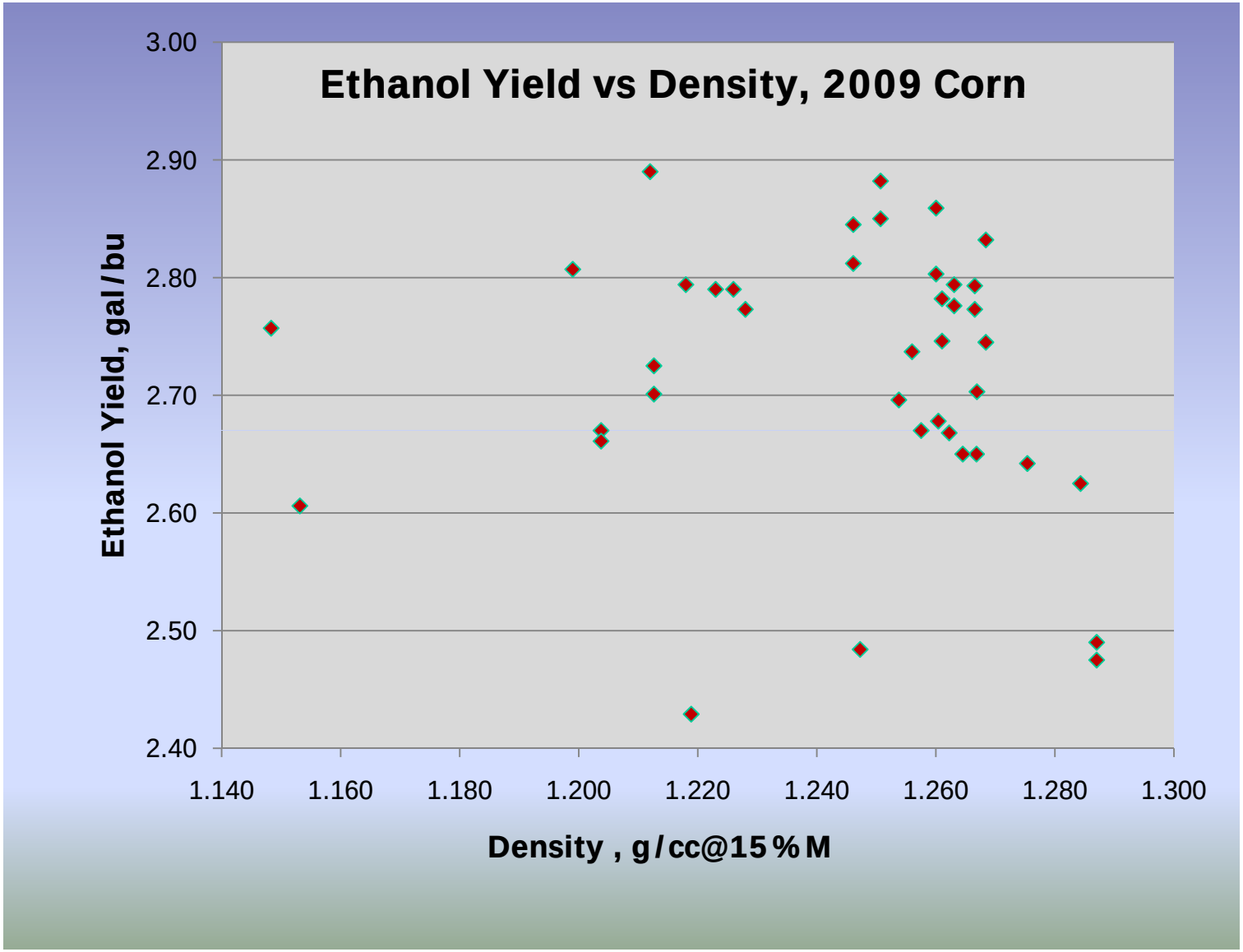
Total Damage ➔	Mean ear rot severity (%) (Range)	Ear rots present
Hail damage samples *(N=56)*	11.8 (0 – 53.4)	Fusarium* Gibberella* Cladosporium, Penecillium
Background samples (N=27)	3.3 (0 – 16.4)	Cladosporium* Fusarium, Gibberella
Standing corn samples *(N=72) (**No increased toxin**)*	24.0 (0.2 - 83.8)	Cladosporium* Fusarium, Gibberella

* Predominant ear rot present

DON and ZEN in 2009 Corn from Iowa




Ethanol Yield Wet vs Dry
Ethanol Yield, gal/bu
3.00
2.90
2.80
2.70
2.60
2.50
2.40
2.30
2.20
1
2
3
4
5
6
7
8
9
10
Sample ID
Wet
Dry


Ethanol Yield vs Density, 2009 Corn
Ethanol Yield, gal/bu
3.00
2.90
2.80
2.70
2.60
2.50
2.40
1.140
1.160
1.180
1.200
1.220
1.240
1.260
1.280
1.300
Density , g/cc@15%M

Reduce to half for 2009 crop

Maximum storage time (months) for corn and soybeans*							
Corn temperature ° F	Corn, soybeans moisture content						
	13%, 11%	14%, 12%	15%, 13%	16%, 14%	17%, 15%	18%, 16%	24% N/A
40	150	61	29.0	15.0	9.4	6.1	1.3
50	84	34	16.0	8.9	5.3	3.4	0.5
60	47	19	9.2	5.0	3.0	1.9	0.3
70	26	11	5.2	2.8	1.7	1.1	0.2
80	15	6	2.9	1.6	0.9	0.9	0.06

*Based on 0.5% maximum dry matter loss—calculated on the basis of USDA research at Iowa State University. Corresponds to one grade number loss; 2-3% pts in damaged seeds Soybeans approximated at 2% lower moisture than corn.

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Blue-eye; Penicillium or A. Glaucus
No Dry Air in July and August!

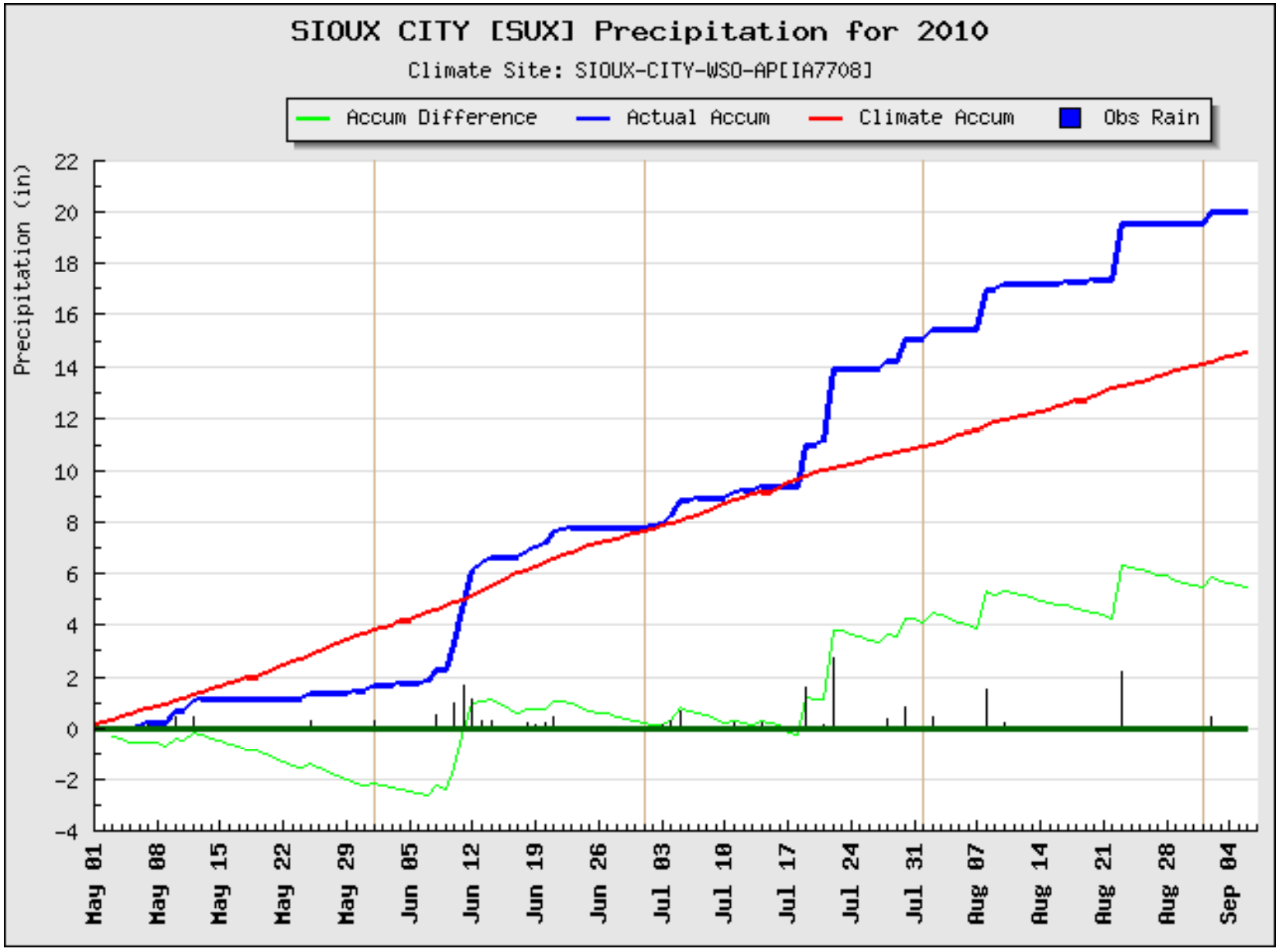
EQUILIBRIUM MOISTURE CONTENT

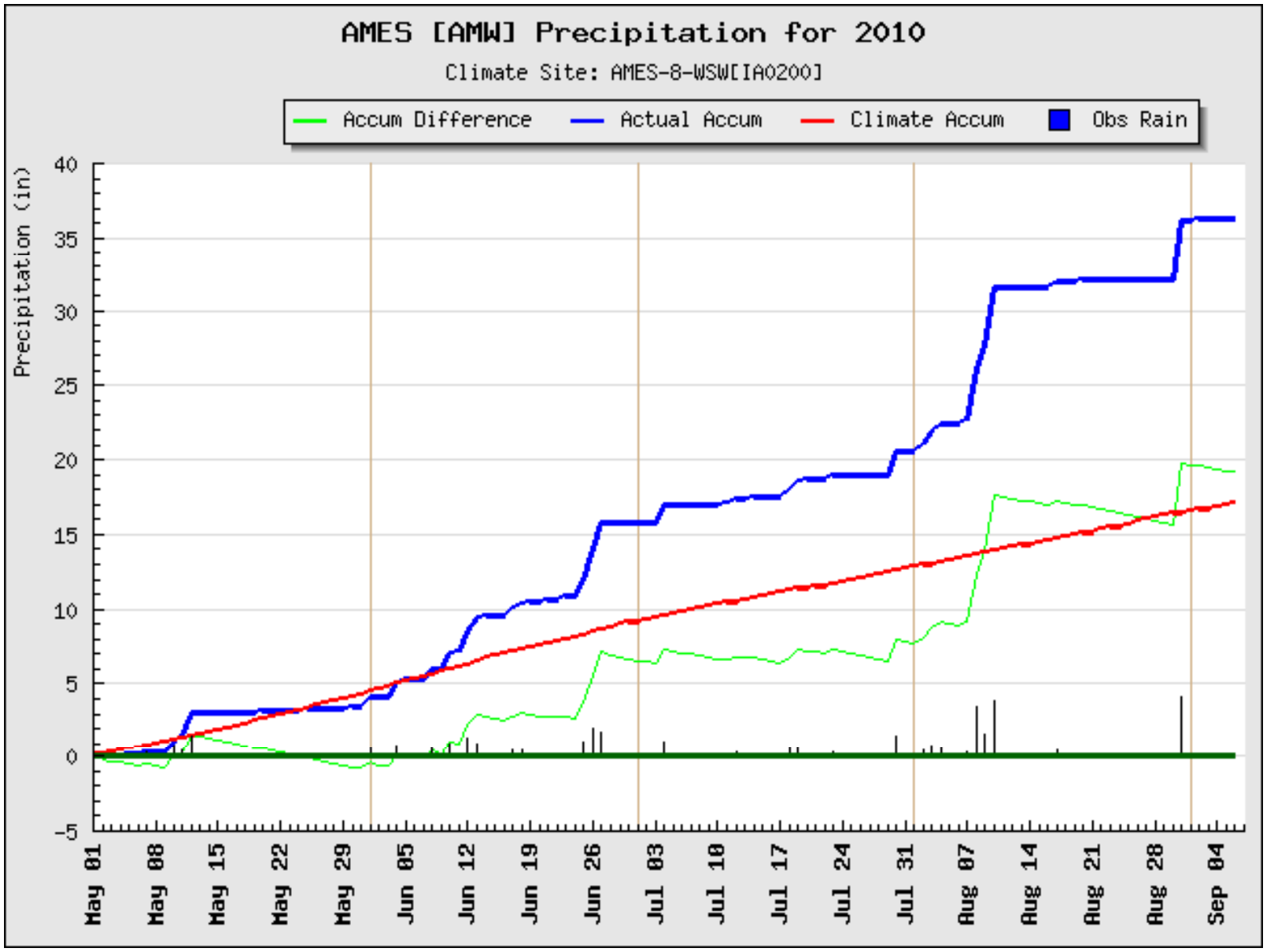
Corn, yellow dent (Wet Basis)

RELATIVE HUMIDITY

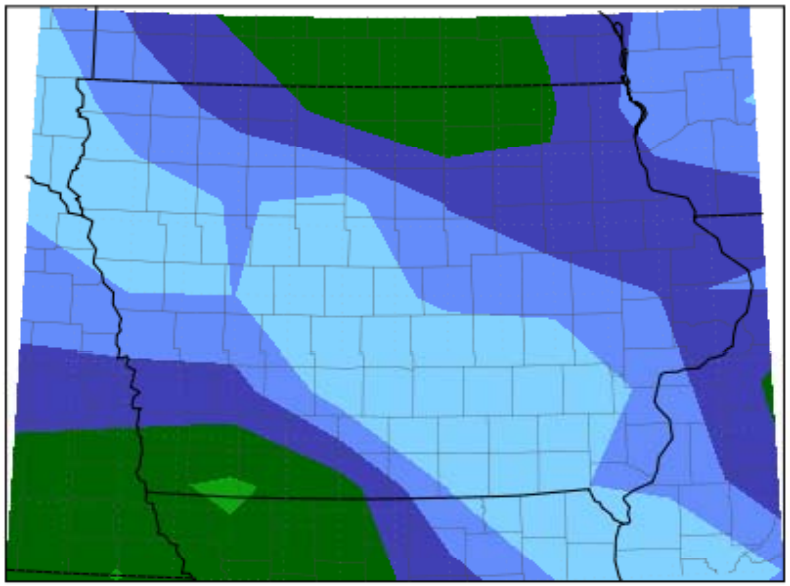
	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%
35°	11.0	11.6	12.3	12.9	13.5	14.2	14.8	15.6	16.3	17.2	18.2	19.5	21.1
40°	10.6	11.3	11.9	12.5	13.1	13.8	14.5	15.2	16.0	16.9	17.9	19.1	20.8
45°	10.2	10.9	11.5	12.2	12.8	13.5	14.1	14.9	15.7	16.6	17.6	18.8	20.5
50°	9.9	10.6	11.2	11.8	12.5	13.1	3.8	14.6	15.4	16.3	17.3	18.6	20.2
55°	9.6	10.2	10.9	11.5	12.2	12.8	13.5	14.3	15.1	16.0	17.0	18.3	20.0
60°	9.3	9.9	10.6	11.2	11.9	12.6	13.3	14.0	14.8	15.7	16.8	18.1	19.7
65°	9.0	9.7	10.3	11.0	11.6	12.3	13.0	13.8	14.6	15.5	16.5	17.8	19.5
70°	8.7	9.4	10.0	10.7	11.4	12.0	12.7	13.5	14.3	15.3	16.3	17.6	19.3
75°	8.5	9.1	9.8	10.4	11.1	11.8	12.5	13.3	14.1	15.0	16.1	17.4	19.1
80°	8.2	8.9	9.6	10.2	10.9	11.6	12.3	13.1	13.9	14.8	15.9	17.2	18.9

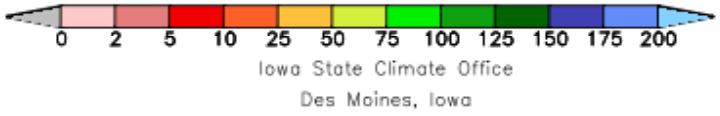
Any time you have EMC balanced with 65% RH, Blue Eye is possible


SIOUX CITY [SUX] Precipitation for 2010
Climate Site: SIOUX-CITY-WSO-AP[IA7708]
Accum Difference
Actual Accum
Climate Accum
Obs Rain
Precipitation (in)
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
May 01
May 08
May 15
May 22
May 29
Jun 05
Jun 12
Jun 19
Jun 26
Jul 03
Jul 10
Jul 17
Jul 24
Jul 31
Aug 07
Aug 14
Aug 21
Aug 28
Sep 04

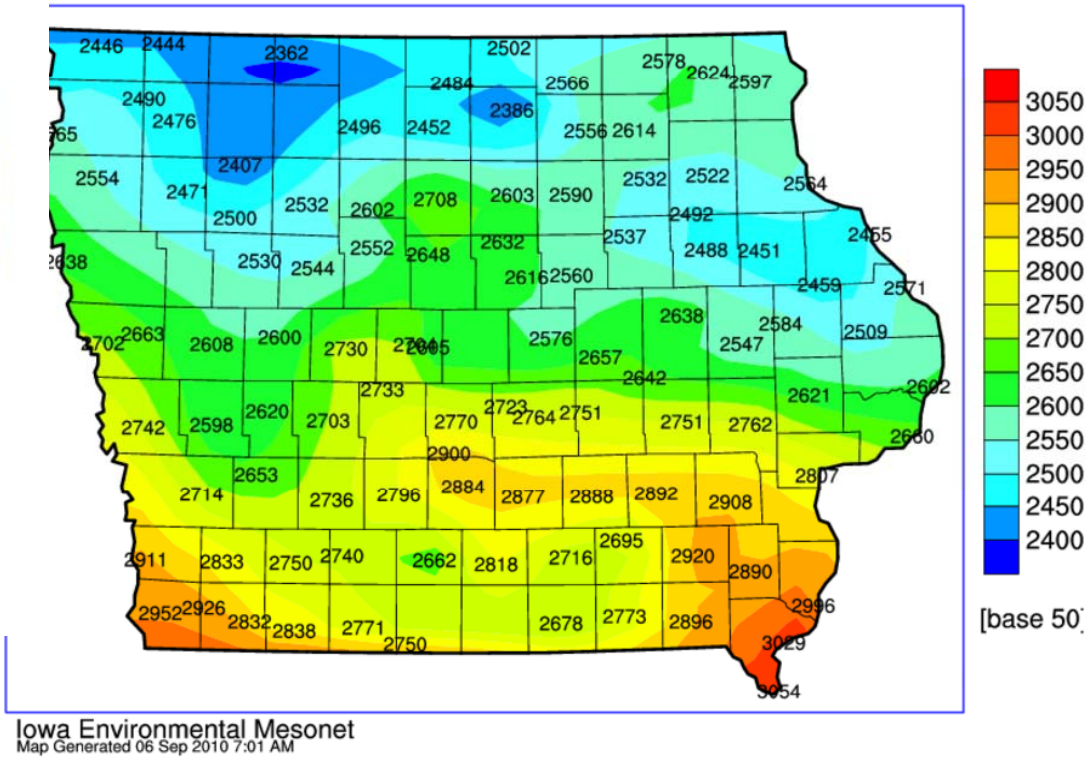

AMES [AMW] Precipitation for 2010
Climate Site: AMES-8-WSW[IA0200]
Accum Difference
Actual Accum
Climate Accum
Obs Rain
Precipitation (in)
40
35
30
25
20
15
10
5
0
-5
May 01
May 08
May 15
May 22
May 29
Jun 05
Jun 12
Jun 19
Jun 26
Jul 03
Jul 10
Jul 17
Jul 24
Jul 31
Aug 07
Aug 14
Aug 21
Aug 28
Sep 04

Total Precipitation: Percent of Mean
June 8, 2010 to September 5, 2010



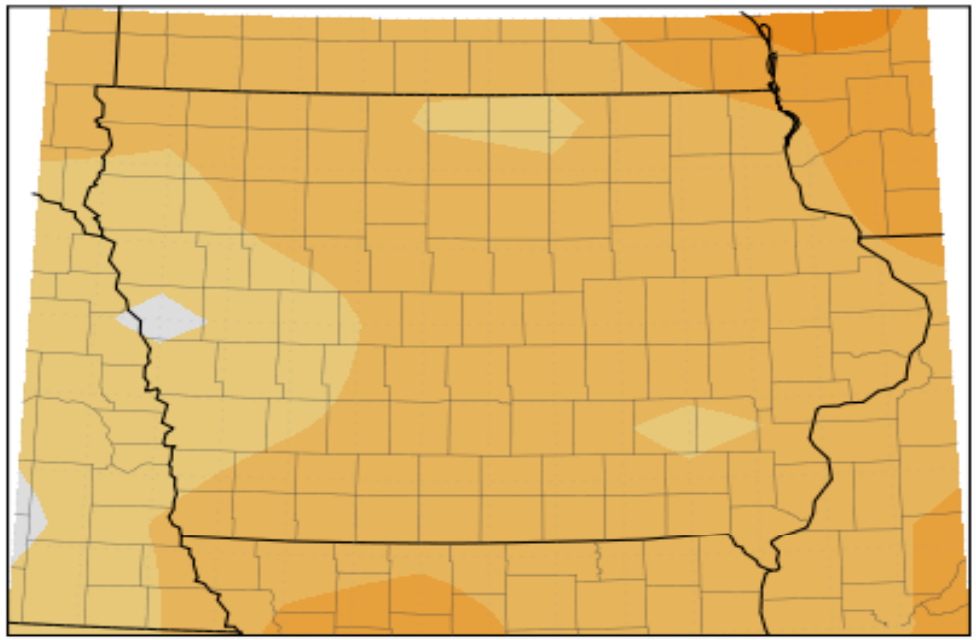


wa 1 May - 06 September 2010 GDD Accumulation



Iowa Environmental Mesonet
Map Generated 06 Sep 2010 7:01 AM

Average Min Temperature (°F): Departure from Mean
June 8, 2010 to September 5, 2010



Iowa State Climate Office
Des Moines, Iowa

Flooded Corn

- A health hazard –flood waters not clean.
- Cob soaks up; gets moldy and soft.
- Spreads mold to ear; likely A. Flavus.
- Threat of toxins; a mess after shelling
- Destroy (FDA, IDALS October 1, 2010).
- Not in elevators or handling systems!

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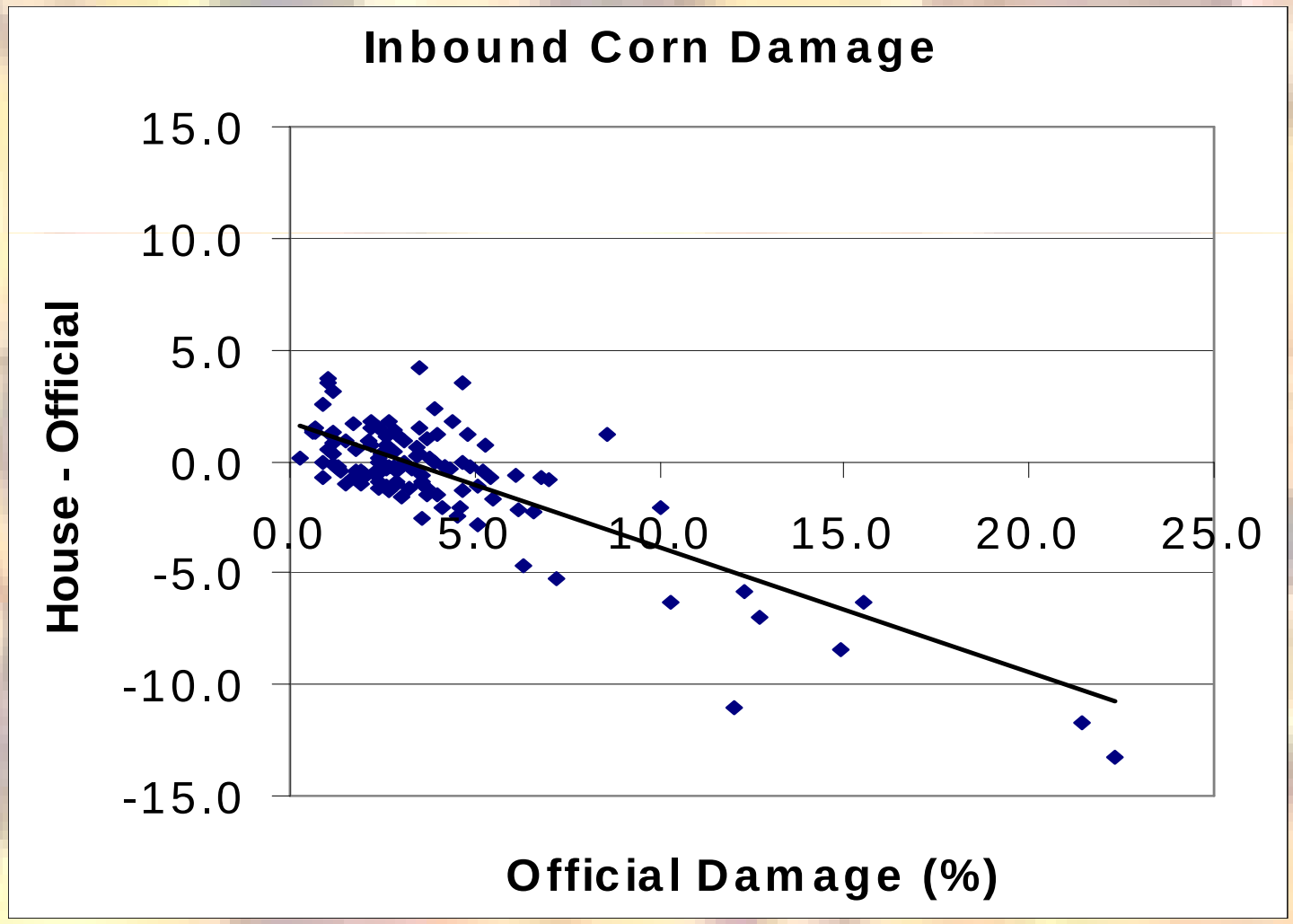
Flooded Corn

Inbound Grading- Corn Damage



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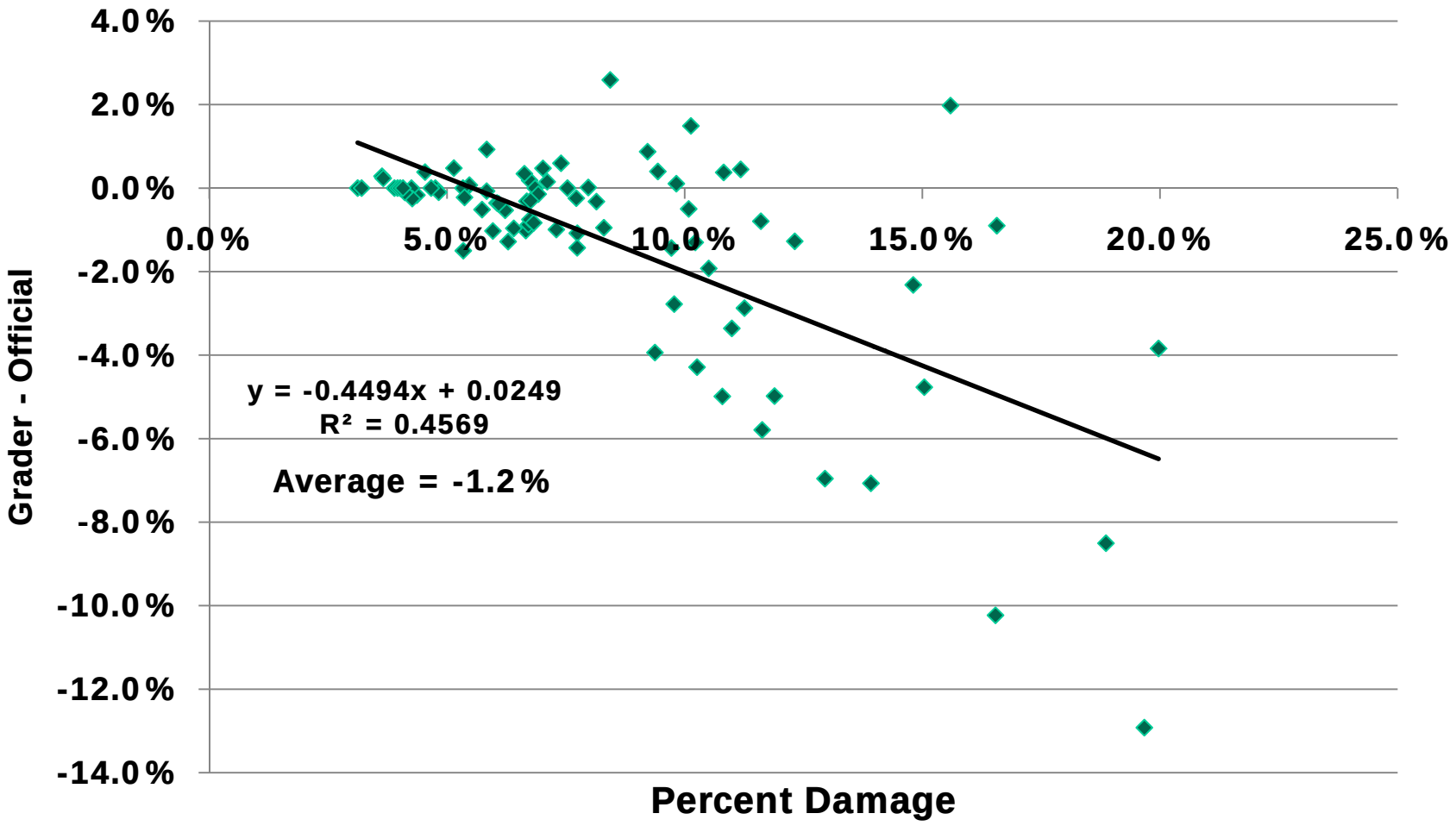
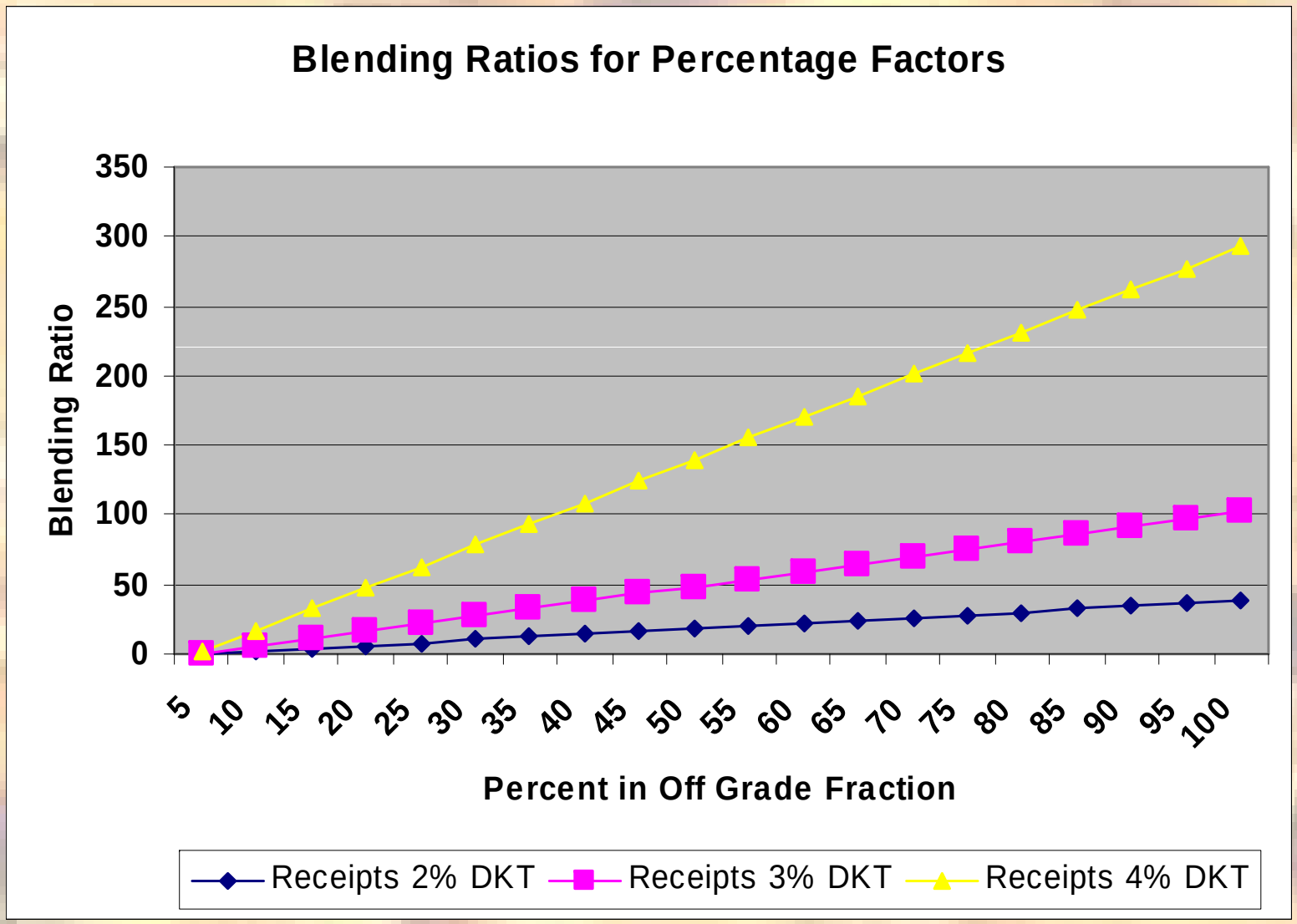
Net Error of Corn Damage Grading



Generally graders underpicked more as damage increased



Target = 4.5% Damage

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40°	10.6	11.3	11.9	12.5	13.1	13.8	14.5	15.2	16.0	16.9	17.9	19.1	20.8
45°	10.2	10.9	11.5	12.2	12.8	13.5	14.1	14.9	15.7	16.6	17.6	18.8	20.5
50°	9.9	10.6	11.2	11.8	12.5	13.1	3.8	14.6	15.4	16.3	17.3	18.6	20.2
55°	9.6	10.2	10.9	11.5	12.2	12.8	13.5	14.3	15.1	16.0	17.0	18.3	20.0
60°	9.3	9.9	10.6	11.2	11.9	12.6	13.3	14.0	14.8	15.7	16.8	18.1	19.7
65°	9.0	9.7	10.3	11.0	11.6	12.3	13.0	13.8	14.6	15.5	16.5	17.8	19.5
70°	8.7	9.4	10.0	10.7	11.4	12.0	12.7	13.5	14.3	15.3	16.3	17.6	19.3
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80°	8.2	8.9	9.6	10.2	10.9	11.6	12.3	13.1	13.9	14.8	15.9	17.2	18.9

In September and October, 2010 we had extremely dry air.

Summary – Crop Quality

- 2009 crop continued to deteriorate.
- It will take a long time to clear out all the off grade inventories.

  GRADE YOUR CORN!

  Toxins don't go away!

  Mixed feed will be an issue!
- 2010 corn crop quality is better, but not great. 54-56 lb/bu; dry but small kernels.

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Allowable Storage Time

Maximum storage time (months) for corn and soybeans*							
Corn temperature ° F	Corn, soybeans moisture content						
	13%, 11%	14%, 12%	15%, 13%	16%, 14%	17%, 15%	18%, 16%	24% N/A
40	150	61	29.0	15.0	9.4	6.1	1.3
50	84	34	16.0	8.9	5.3	3.4	0.5
60	47	19	9.2	5.0	3.0	1.9	0.3
70	26	11	5.2	2.8	1.7	1.1	0.2
80	15	6	2.9	1.6	0.9	0.9	0.06

*Based on 0.5% maximum dry matter loss—calculated on the basis of USDA research at Iowa State University. Corresponds to one grade number loss; 2-3% pts in damaged seeds Soybeans approximated at 2% lower moisture than corn.

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Storage Choices

Choose which grain for less flexible storage.

- Clean
- **Uniform moisture**; means has been aerated
- Higher test weight; as possible (56+ for corn)
- **From one crop year**
- No history of problems; under your control for as long as possible.

- **Sort on Test Weight.**
- **Remove the center core.**

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Shrink – Handling and Storage

- Lost kernels, dust, mold, increased FM
- Some Estimates:
  - 0.5% (0.005) weight loss per in and out. Out to Pile counts double. More if multiple turns.
  - 0.2% FM Increase per rotation (15% corn); 0.4% if 13%, etc. More with dryer stress cracks or low TW (2x)
  - 0.5% weight loss per 3% pt damage increase.
    - Example: 3% to 12% is 9% pts = 1.5% shrink

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Aeration Phases

- **Phase 1: Fall Cool Down**
  - **Lower grain temperatures stepwise**
    - **September 50-55 F!!! 2010 warm grain.**
    - **October 40-45 F**
    - **November 35-40 F**
    - **December 28-35 F**
- **Phase 2: Winter Maintenance**
  - **Maintain temperatures with intermittent aeration**
    - **January, February 28-35 F**
- **Phase 3: Spring Holding**
  - **Keep cold grain cold**
    - **Seal fans**
    - **Ventilate headspace intermittently**

Source: Purdue Univ.

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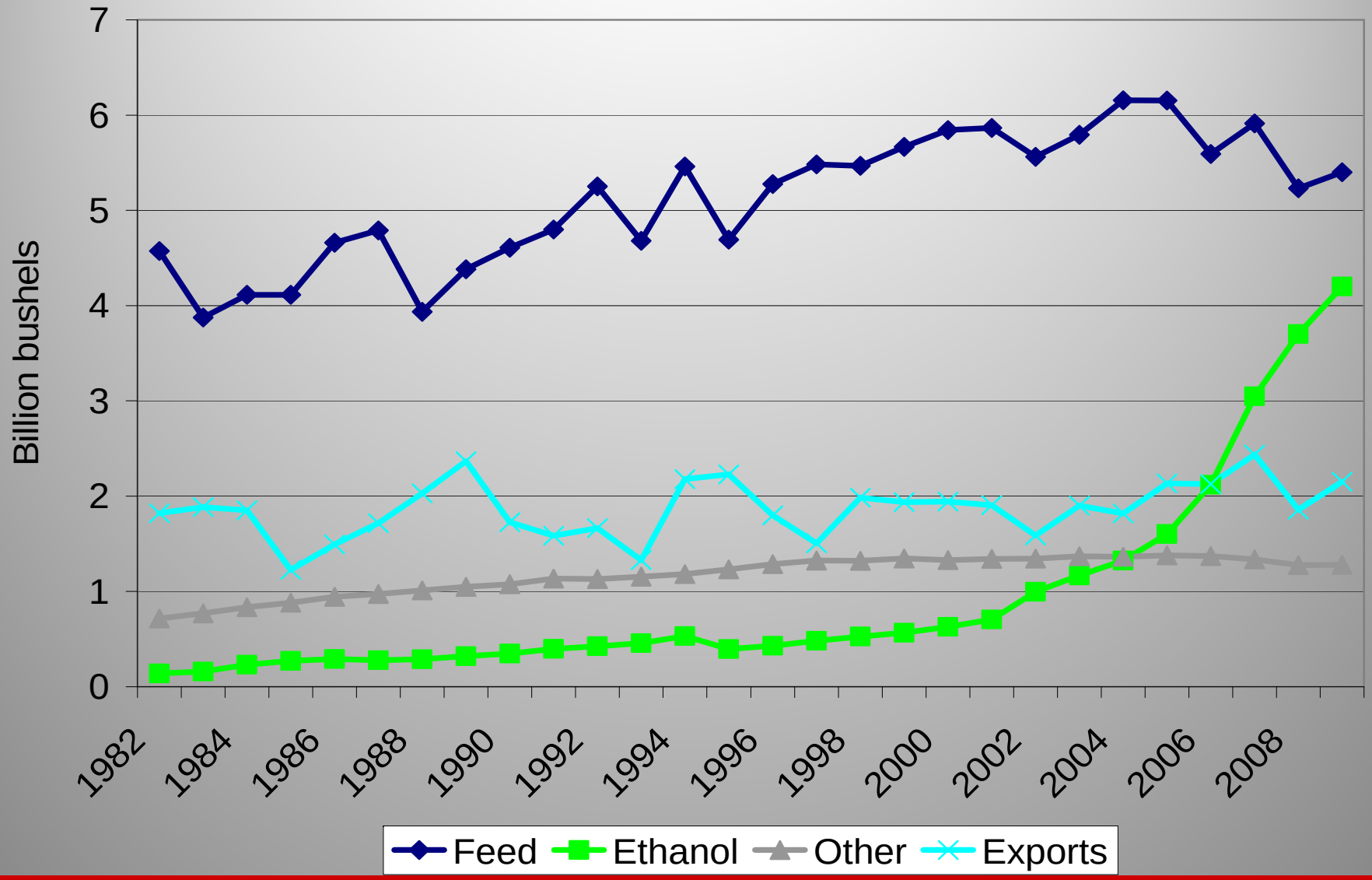
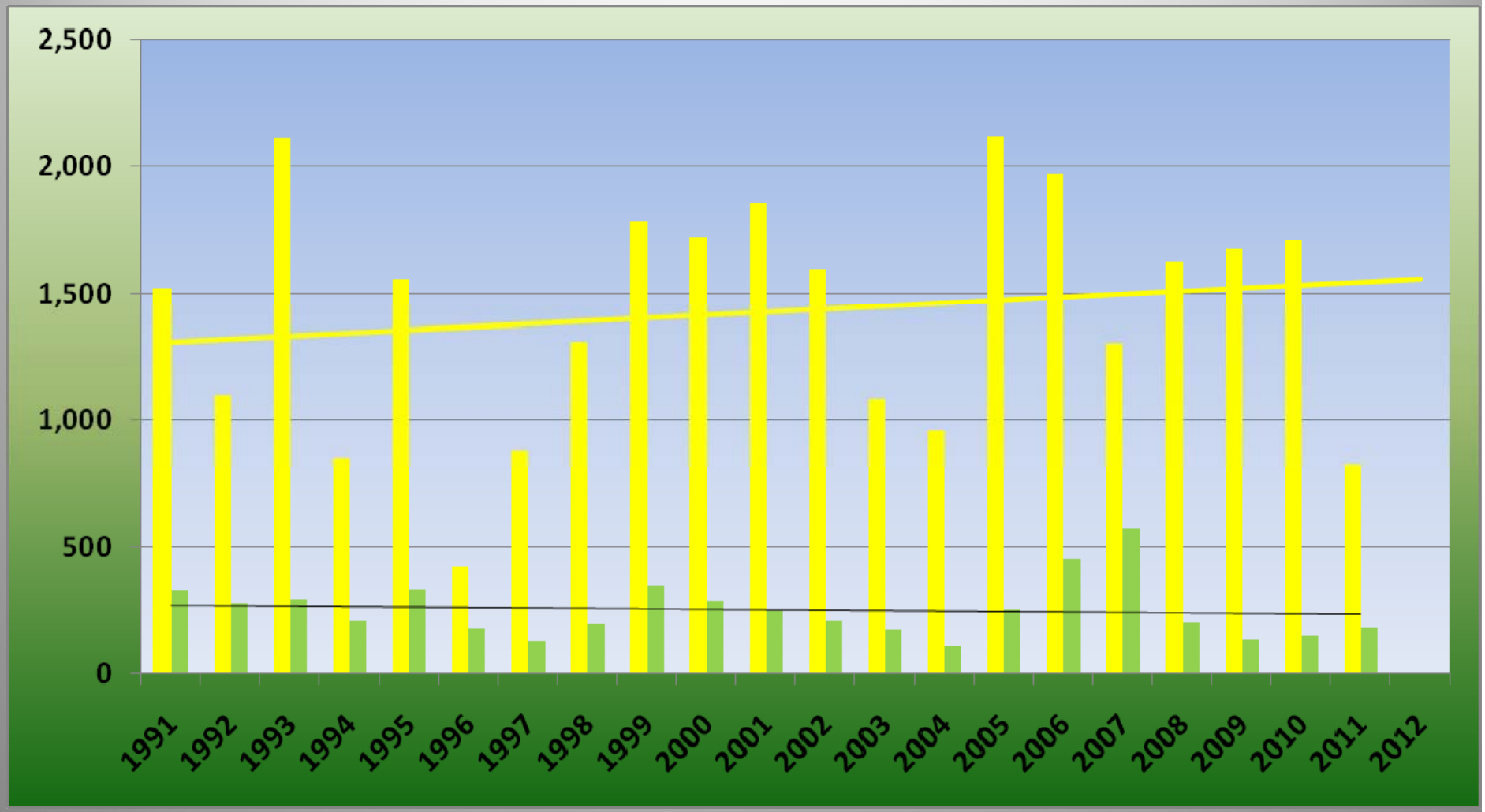
Corn Use


Billion bushels
0
1
2
3
4
5
6
7
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
Feed
Ethanol
Other
Exports

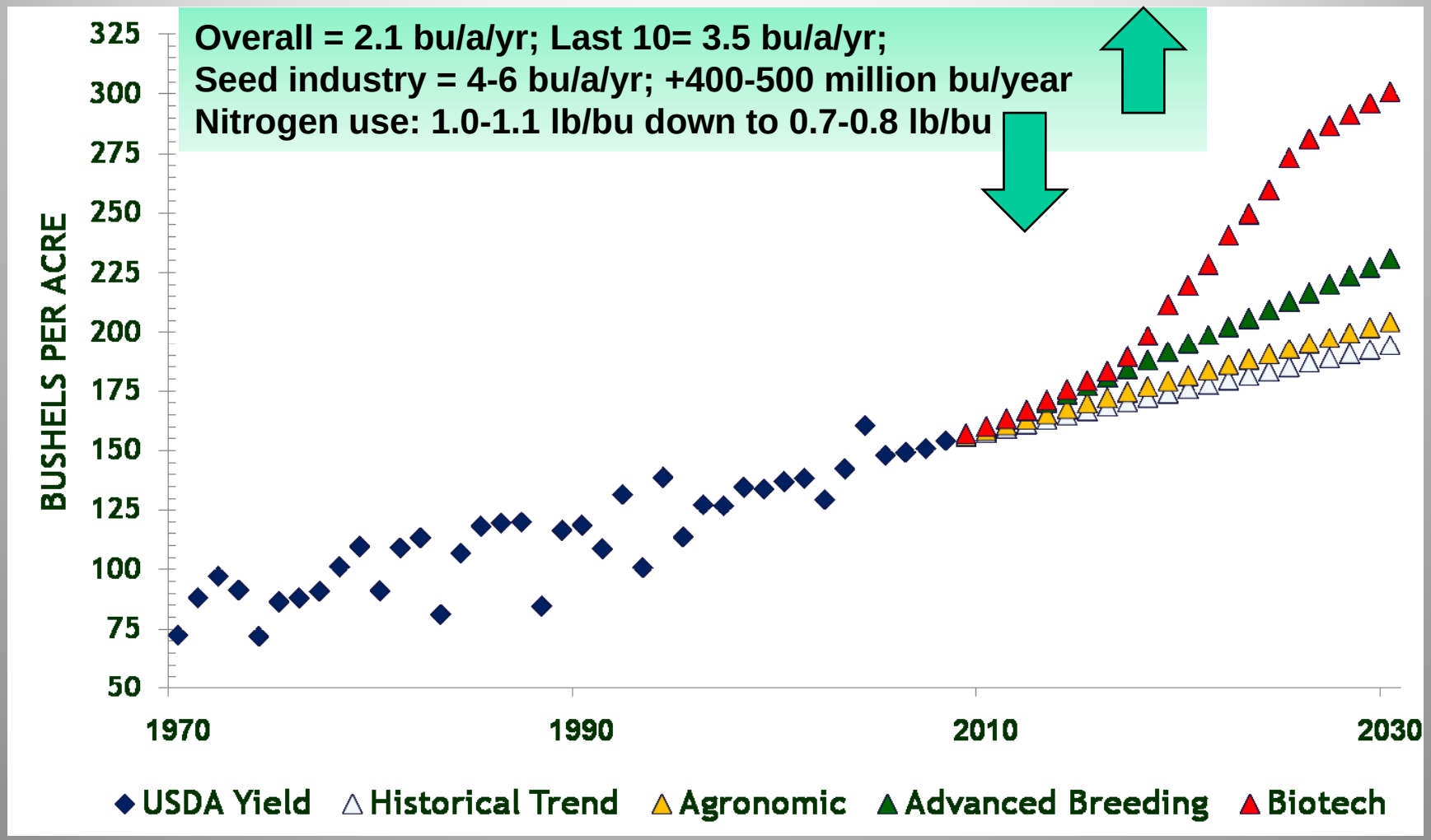
Corn and Soybean Ending Stocks, 1991 - 2011



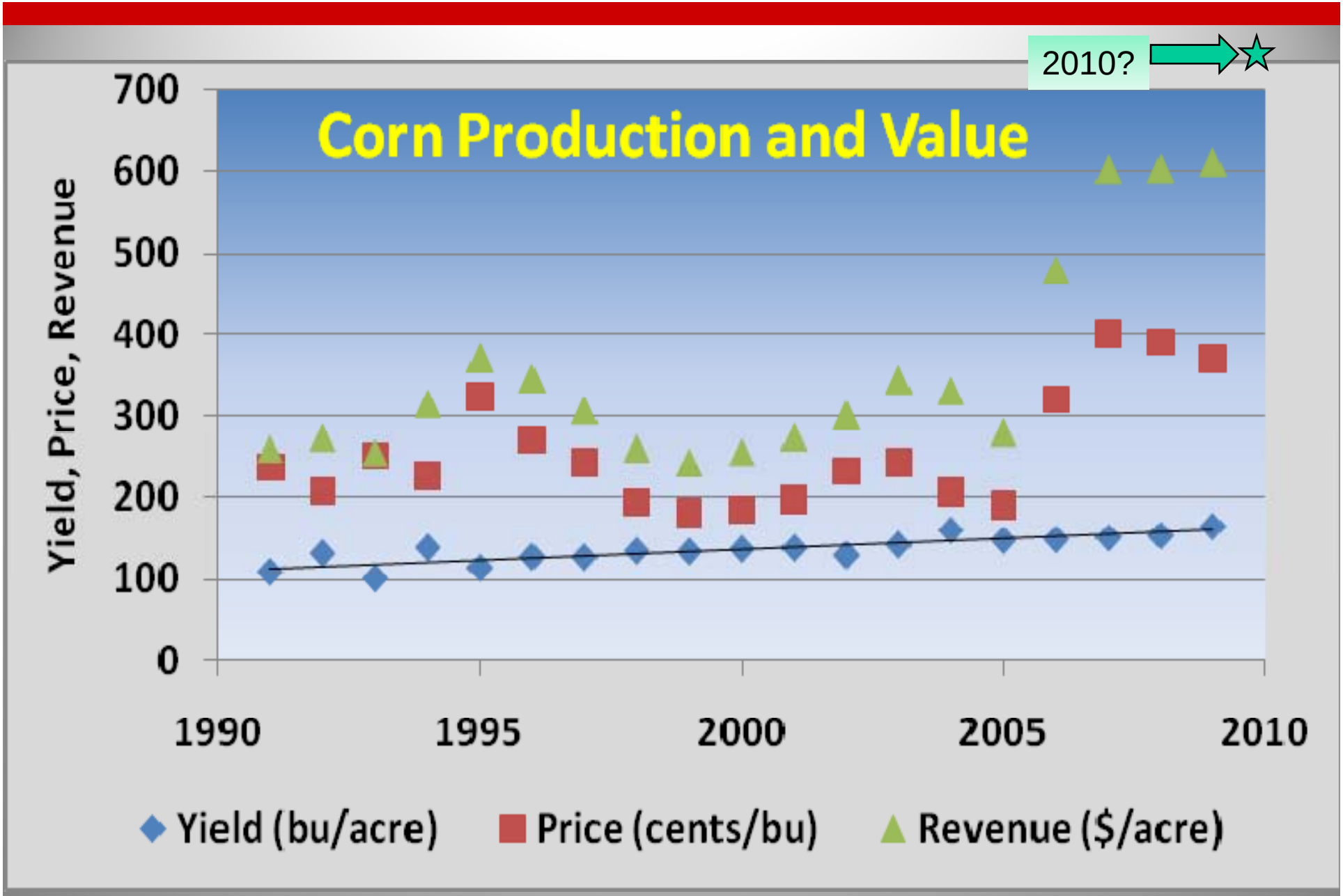
Iowa Ethanol Production and Corn Usage

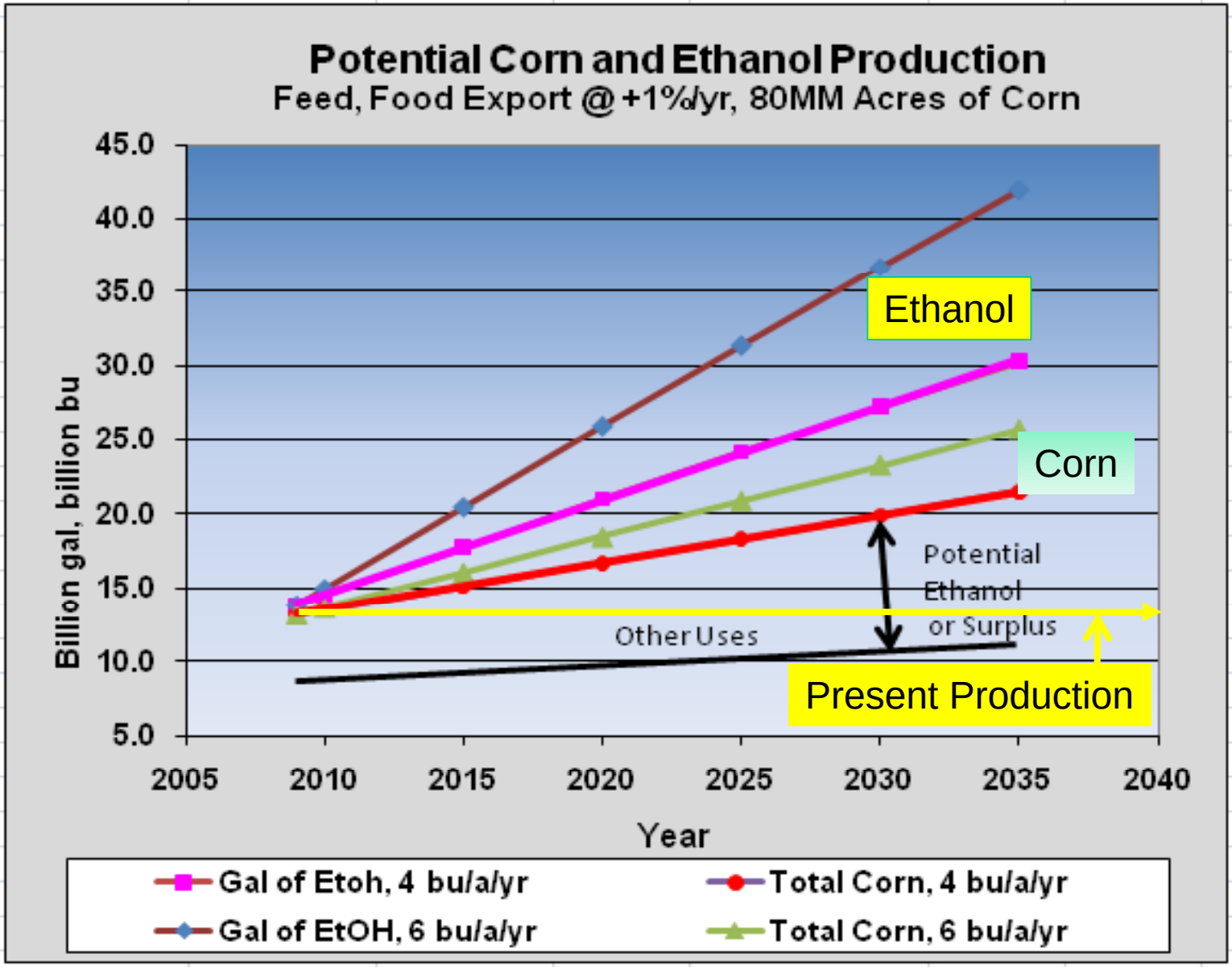
Summary Statistics May-2010	n	Ethanol Produced mil gal/yr	Corn Used mil bu/yr	DGS 000 tons/yr
Current Dry-grind Plants	34	3,280	1170	10,237
Expansions and new construction	1	277	98	857
Wet Mills	4	500	178	1,557
Nearby Iowa	11	636	227	1,986
Total	50	4,693	1,673 (69% of 2009)	14,637

Corn Yield Potential



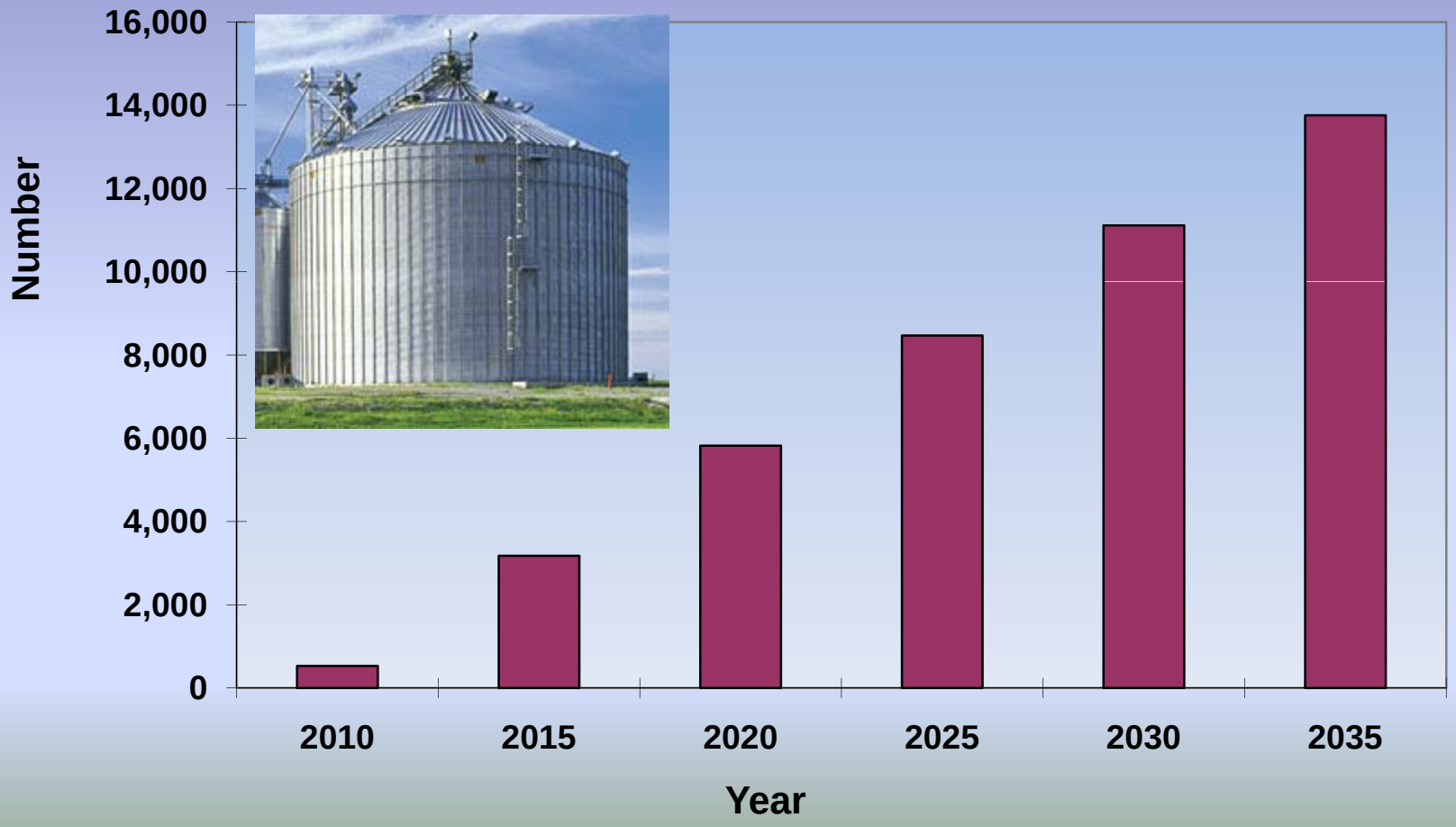
Source: Monsanto, June 2010

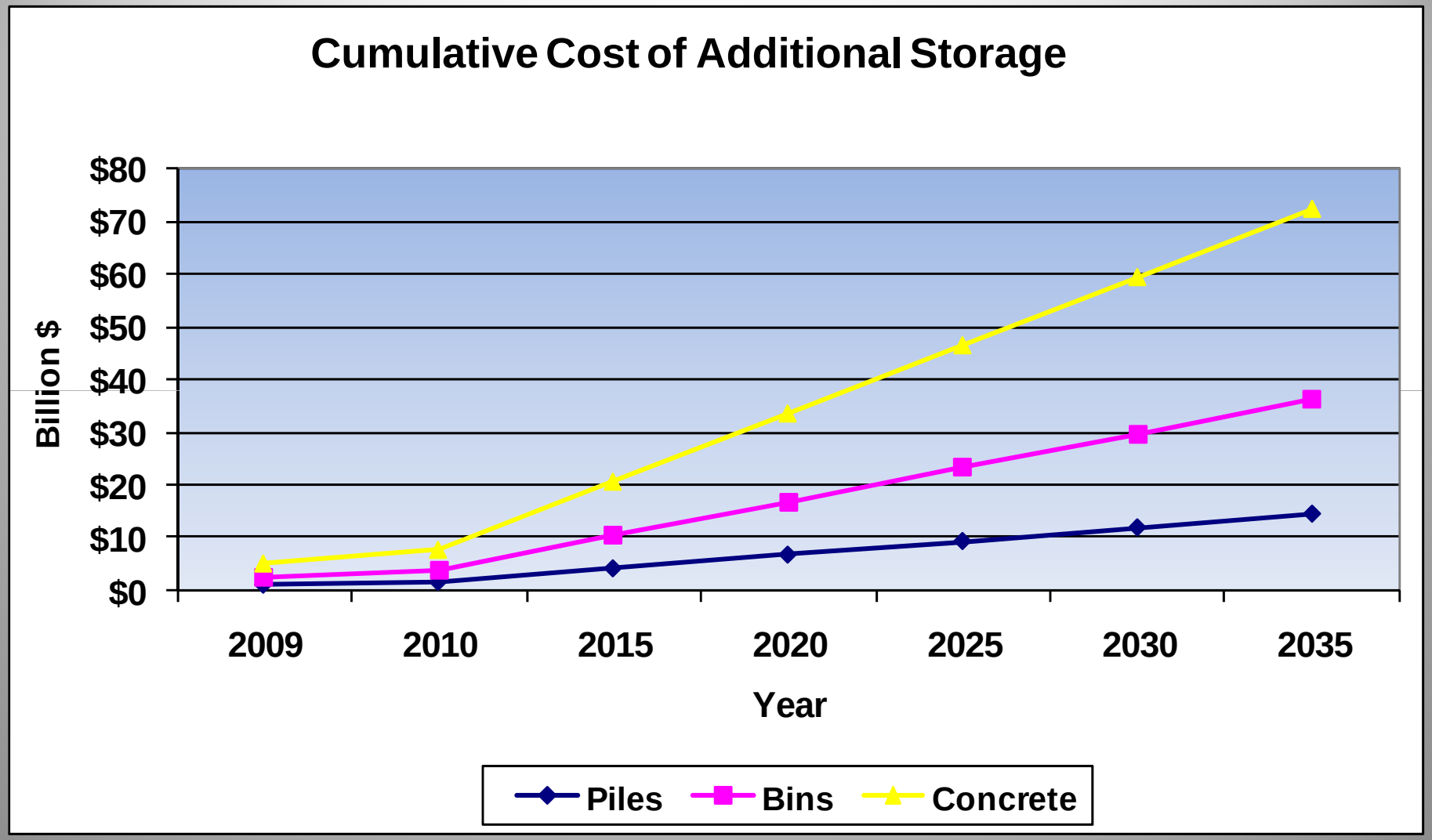

2010?
Corn Production and Value
Yield, Price, Revenue
700
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
Yield (bu/acre)
Price (cents/bu)
Revenue ($/acre)


Potential Corn and Ethanol Production
Feed, Food Export @ +1%/yr, 80MM Acres of Corn
Billion gal, billion bu
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
2005
2010
2015
2020
2025
2030
2035
2040
Year
Ethanol
Corn
Potential
Ethanol
or Surplus
Other Uses
Present Production
Gal of Etoh, 4 bu/a/yr
Total Corn, 4 bu/a/yr
Gal of EtOH, 6 bu/a/yr
Total Corn, 6 bu/a/yr

New Corn Storage as "105s"

"105"= 650,000 bu; 4 bu/acre/yr increase




Cumulative Cost of Additional Storage
$80
$70
$60
$50
$40
$30
$20
$10
$0
Billion $
2009
2010
2015
2020
2025
2030
2035
Year
Piles
Bins
Concrete

Infrastructure Investments

- 4-8 new 100mgy plants per year ($200MM/plant+$50MM fractionation)
- Storage and Handling ($3-$4/bu cap'y)
- Drying ($250K/dryer)
- Related support
  - Railcars, trucks
  - Roads, other…

$100 Bln+ is conservative

Summary - Storage

- **Attention to longstanding storage principles will be more necessary as volumes increase.**
- **Ethanol use is holding grain locally.**
- **Use has to increase to avoid surpluses.**
- **Significant infrastructure investment will follow corn production.**

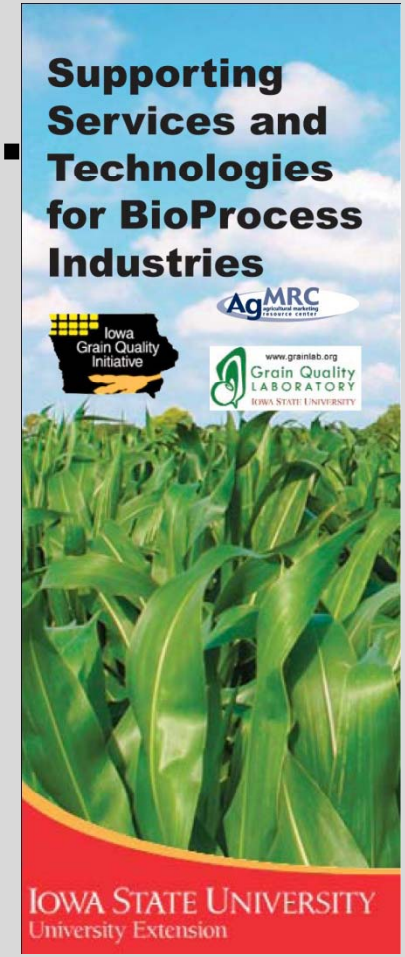
Where To Find Us…

Iowa Grain Quality Initiative

Grain Quality LABORATORY

www.iowagrain.org

www.grainlab.org



Analytical Programs
Quality Management Systems

IOWA STATE UNIVERSITY
University Extension

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