

Crop Insurance: Reserving Methodologies and Issues

**Casualty Loss Reserving Seminar
2014 – San Diego, CA**

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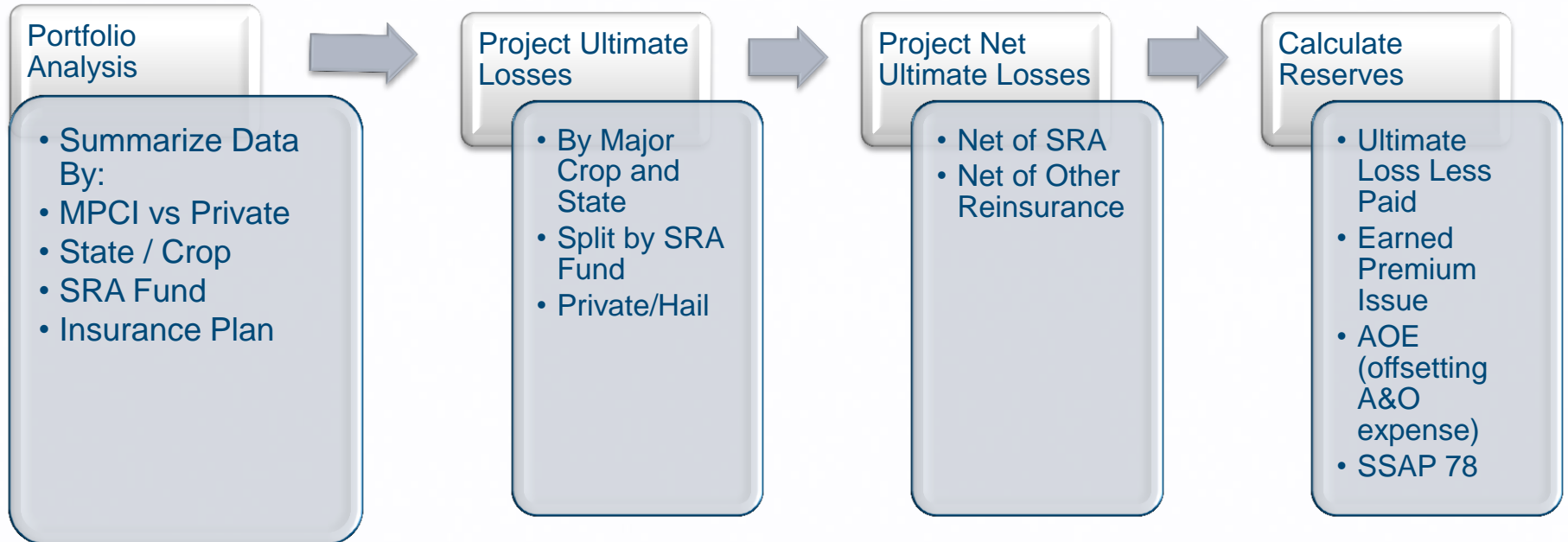
September 16, 2014



Overview of Presentation

- Primary Insurance Company Reserving
 - Reserving Steps
 - Overview of Crop Policies
 - Discussion of SRA
 - Forecasting Models
- Future outlook of US crop insurance and Implications on Reserving

Crop Insurance Reserving Steps



OVERVIEW OF US CROP INSURANCE POLICIES

PORTFOLIO ANALYSIS

Federal vs. Private Crop Insurance

■ Federal

- Premium subsidy to encourage participation
- Rates administered by RMA, no rate competition between AIPs
- Insured on a unit or farm level basis
- Named peril coverage; typically only “in the field”
- Designed to be an all encompassing risk management tool
- Most payments after harvest

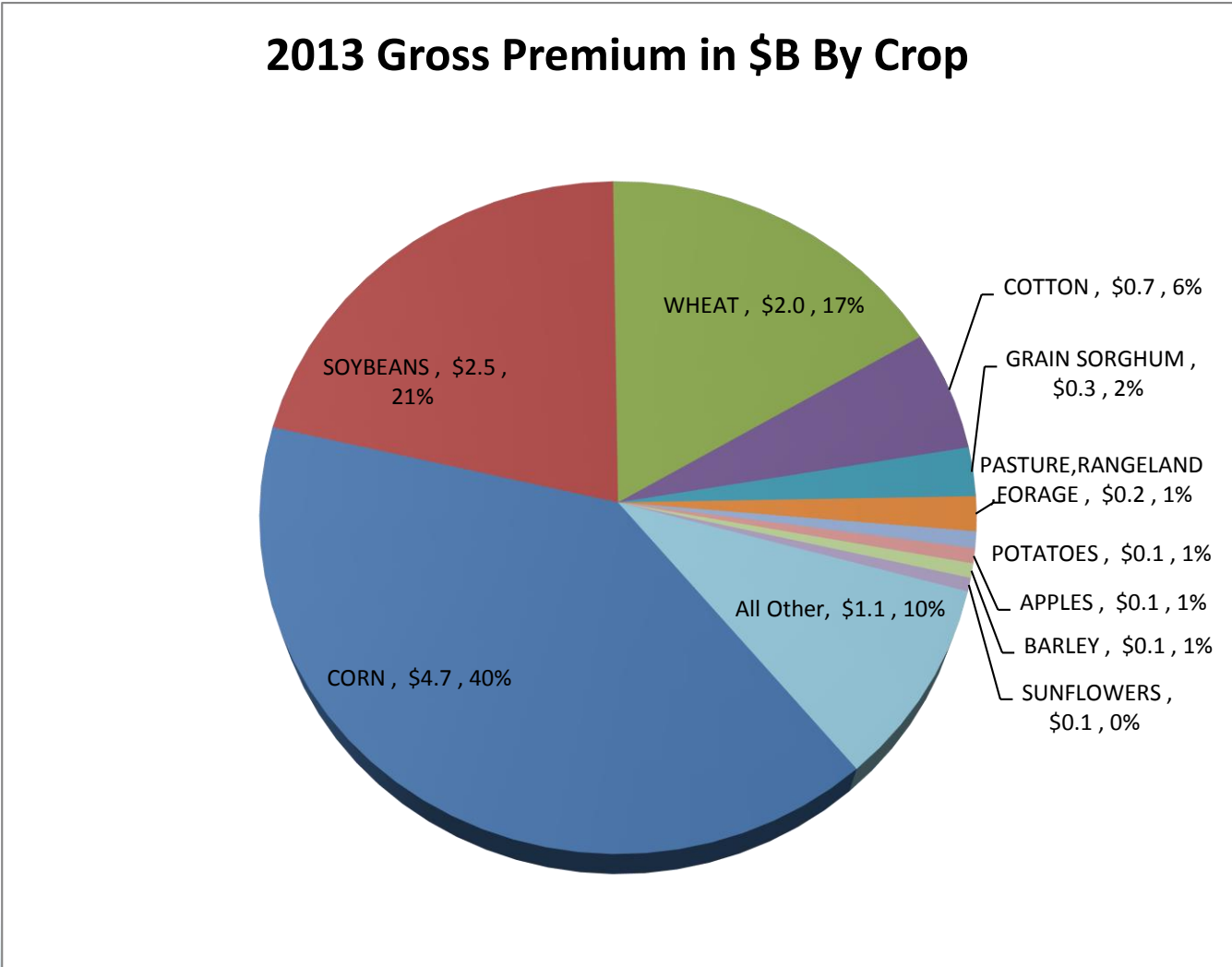
■ Private/Hail

- No subsidy provided
- Rates may be regulated by states; competition between AIPs
- Hail typically insured on an acre basis
- Named perils (hail, fire, freeze, transport, storage)
- Designed to fill gaps from MPCl
- Payments made quickly after peril (although some plans pay after harvest)

Crop Insurance Annual Timeline

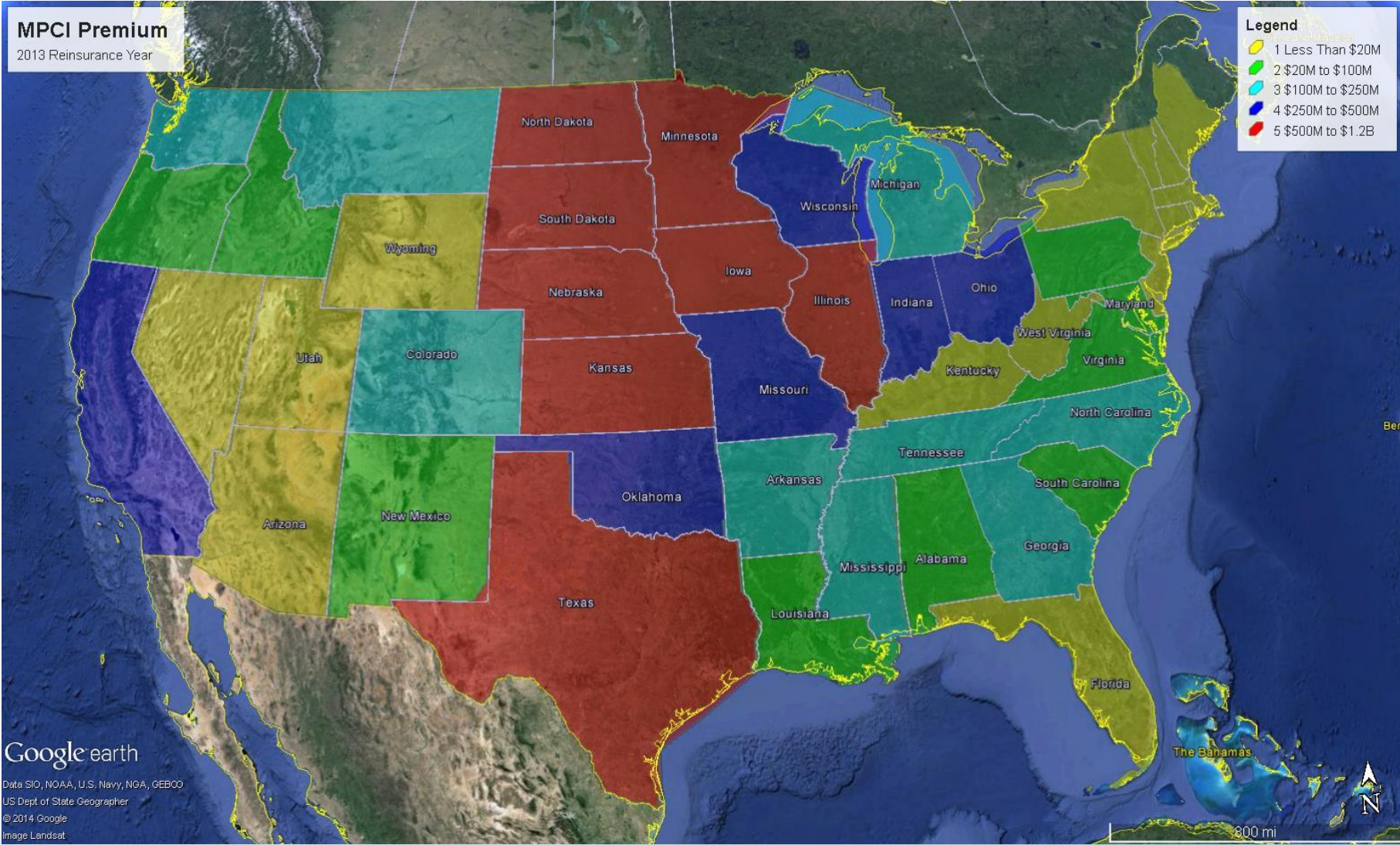


MPCI 2013 Gross Premium By Crop



Source: RMA – Summary of Business as of July 15, 2014

MPCI Gross Premium By State

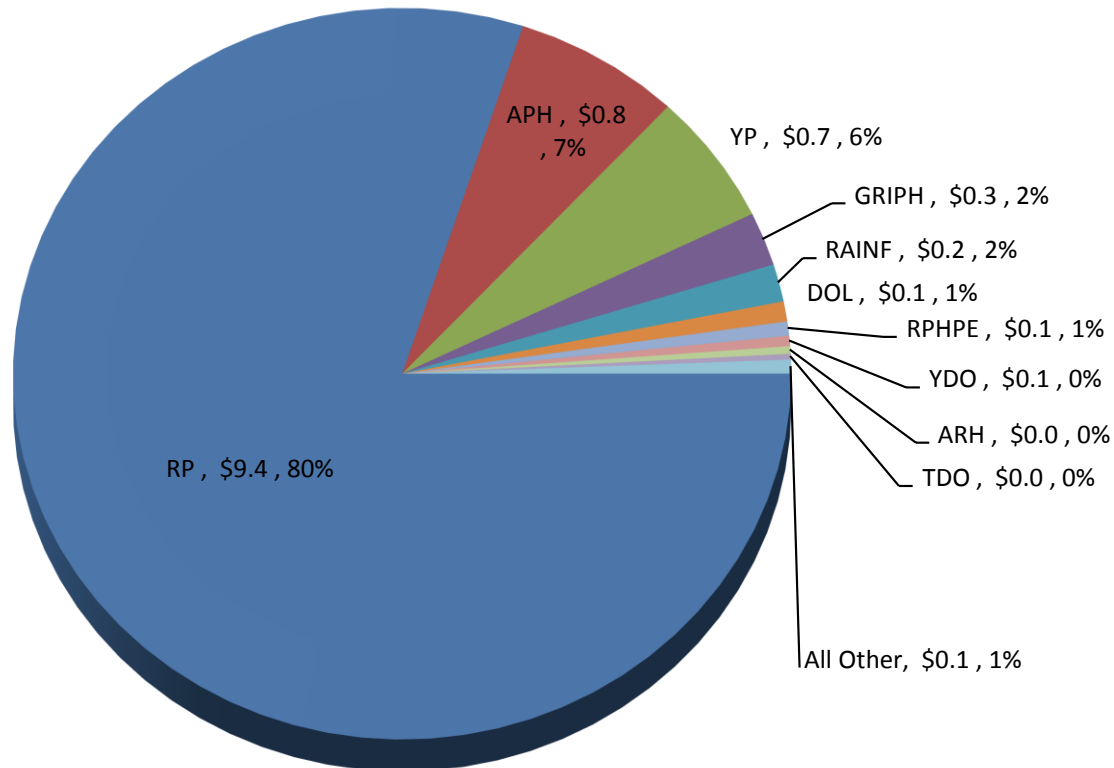


Source: RMA – Summary of Business as of July 15, 2014



MPCI 2013 Gross Premium By Plan

2013 Gross Premium in \$B By Insurance Plan



Source: RMA – Summary of Business as of July 15, 2014

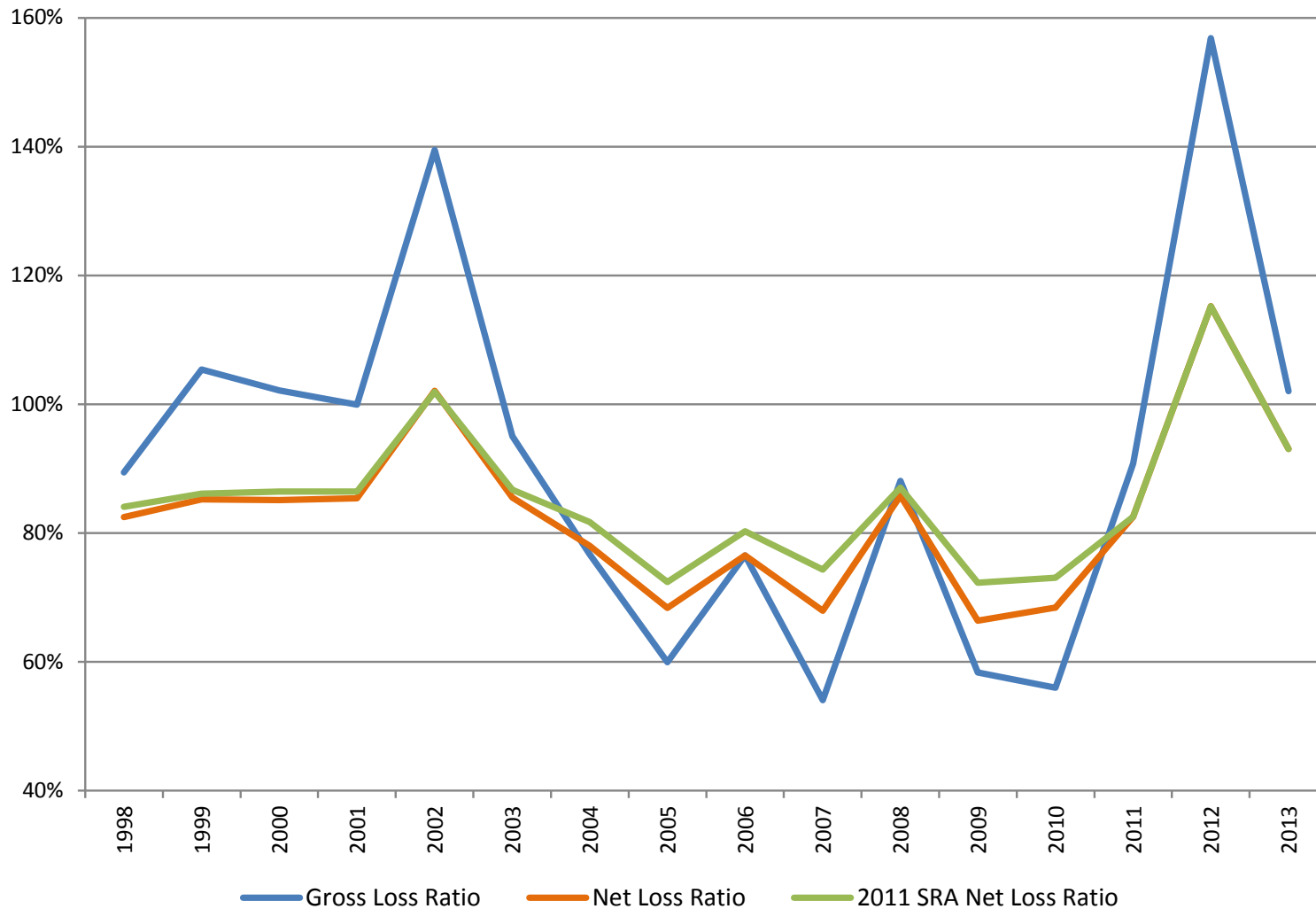
DISCUSSION OF MAJOR INSURANCE PLANS

- Why is Revenue Protection (RP) most popular plan?

		Notes	YP	High Price Example		Low Price Example	
				RP	RPE	RP	RPE
(A)	Spring Price	given	\$ 6.00	\$ 6.00	\$ 6.00	\$ 6.00	\$ 6.00
(B)	APH	given	150	150	150	150	150
(C)	Coverage Level	given	75%	75%	75%	75%	75%
(D)	Liability	$=(A) \times (B) \times (C)$	\$ 675	\$ 675	\$ 675	\$ 675	\$ 675
(E)	Actual Yield	given	50	50	50	50	50
(F)	Fall/Harvest Price	given	\$ 6.00	\$ 8.00	\$ 8.00	\$ 4.00	\$ 4.00
(G)	Guarantee	$=(D) \text{ or } \max(A, F) \times B \times C$	\$ 675	\$ 900	\$ 675	\$ 675	\$ 675
(H)	Production to Count	$=(E) \times (F)$	\$ 300	\$ 400	\$ 400	\$ 200	\$ 200
(I)	Indemnity	$=\text{Max} \{0, (G) - (H) \}$	\$ 375	\$ 500	\$ 275	\$ 475	\$ 475

- In 2012, estimated at \$3.2B (20% of all indemnity and 30% gross loss ratio) additional payout for RP coverage

MPCI Loss Ratios



Source: RMA – Summary of Business (July 15, 2014); Reinsurance Reports online (August 12, 2014)



DISCUSSION OF THE STANDARD REINSURANCE AGREEMENT (SRA)

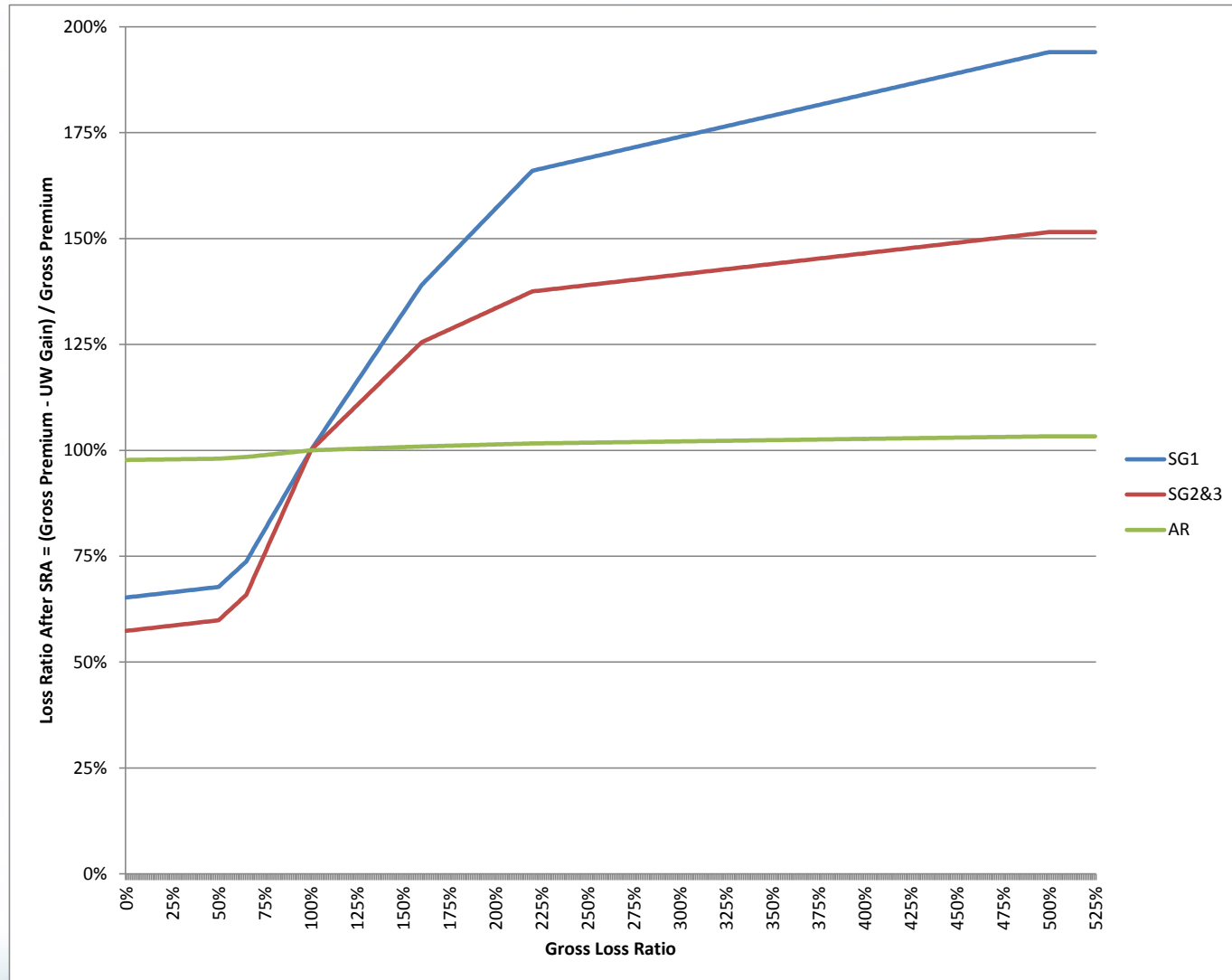
Overview of 2011 (Current) SRA Provisions

- Standard Reinsurance Agreement between AIP and FCIC
 - SRA applies first before any third party reinsurance
 - Includes reinsurance protections and A&O subsidies
- AIP places each policy into Assigned Risk or Commercial Fund
 - Maximum 75% premium can be placed in AR for each state
 - AR cedes quota share 80% to FCIC
 - AIP can cede up to 65% QS to FCIC for Commercial Fund by state
- UW gain/loss calculated for each AR or CF by state
- Underwriting gain/(loss) shared between AIP and FCIC
- Additional 6.5% quota share after total UW gain/loss calculated by fund/state
- Encouragement to write in underserved states (Group 3)

Current SRA Example

		SRA Example							
		Net Underwriting Gain/Loss							
		per 2011 SRA							
		Reinsurance Year YYYY							
		A	B	C	D	E	F	G	H
					=A*C	=B*C	=E/D	From SRA	=(D - G)/D
		Net Book Premium	Indemnity	AIP Retention	Retained Net Book Premium	Retained Net Book Indemnity	Loss Ratio	Net Underwriting Gain/(Loss)	Net Effective Loss Ratio
SG	State	Premium	Indemnity	Retention	Premium	Indemnity	Ratio	Gain/(Loss)	Loss Ratio
Commercial Fund									
2	Arkansas	90	150	100%	90	150	167%	(24.2)	127%
1	Illinois	525	305	100%	525	305	58%	152.3	71%
1	Iowa	580	650	100%	580	650	112%	(45.5)	108%
2	Texas	250	140	65%	163	91	56%	61.3	62%
	CF Total	1,445	1,245		1,358	1,196	88%	144.0	89%
Assigned Risk Fund									
	Arkansas	20	75	20%	4	15	375%	(0.5)	113%
	Illinois	40	25	20%	8	5	63%	0.7	92%
	Iowa	20	80	20%	4	16	400%	(0.5)	114%
	Texas	300	400	20%	60	80	133%	(1.5)	103%
	AR Total	380	580		76	116	153%	(1.9)	102%
	Grand Total	1,825	1,825		1,434	1,291		142.1	90%
	6.5% QS to FCIC				-93	-84		(9.2)	
	Net to AIP				1,340	1,207		132.8	90%
					Net Underwriting Gain/(Loss):			9.9%	

Current SRA Gross/Net LR Comparison



FORECASTING MODELS

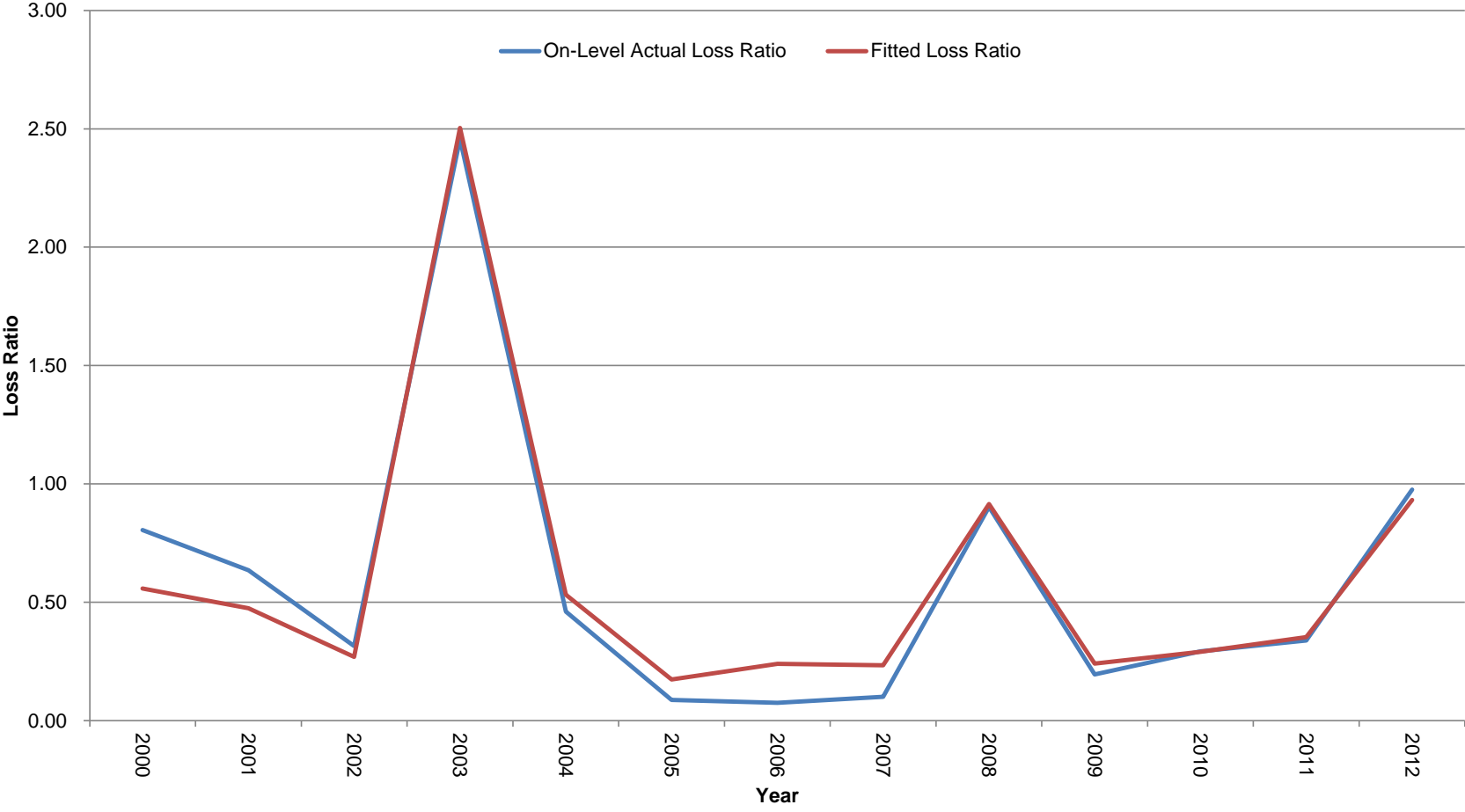
Revenue Protection Policy Example



If Revenue to Count (RTC) < Guarantee:
Indemnity = Guarantee Less RTC

Indemnity: Function of difference in actual yield to approved (historical) yield **and** difference in spring versus harvest price

**Fitted Historic Loss Ratios
Revenue Protection - CRC/RP
Iowa - Soybeans**



Fitted Loss Ratio = [A * [1 / (PriceΔ X YieldΔ)^B] + Low Yield Ind * C] * [1 + MAX(PriceΔ, 0)]

Loss Ratio Forecasting Model Issues

Summary Level

- State, District, County
- Availability of Information

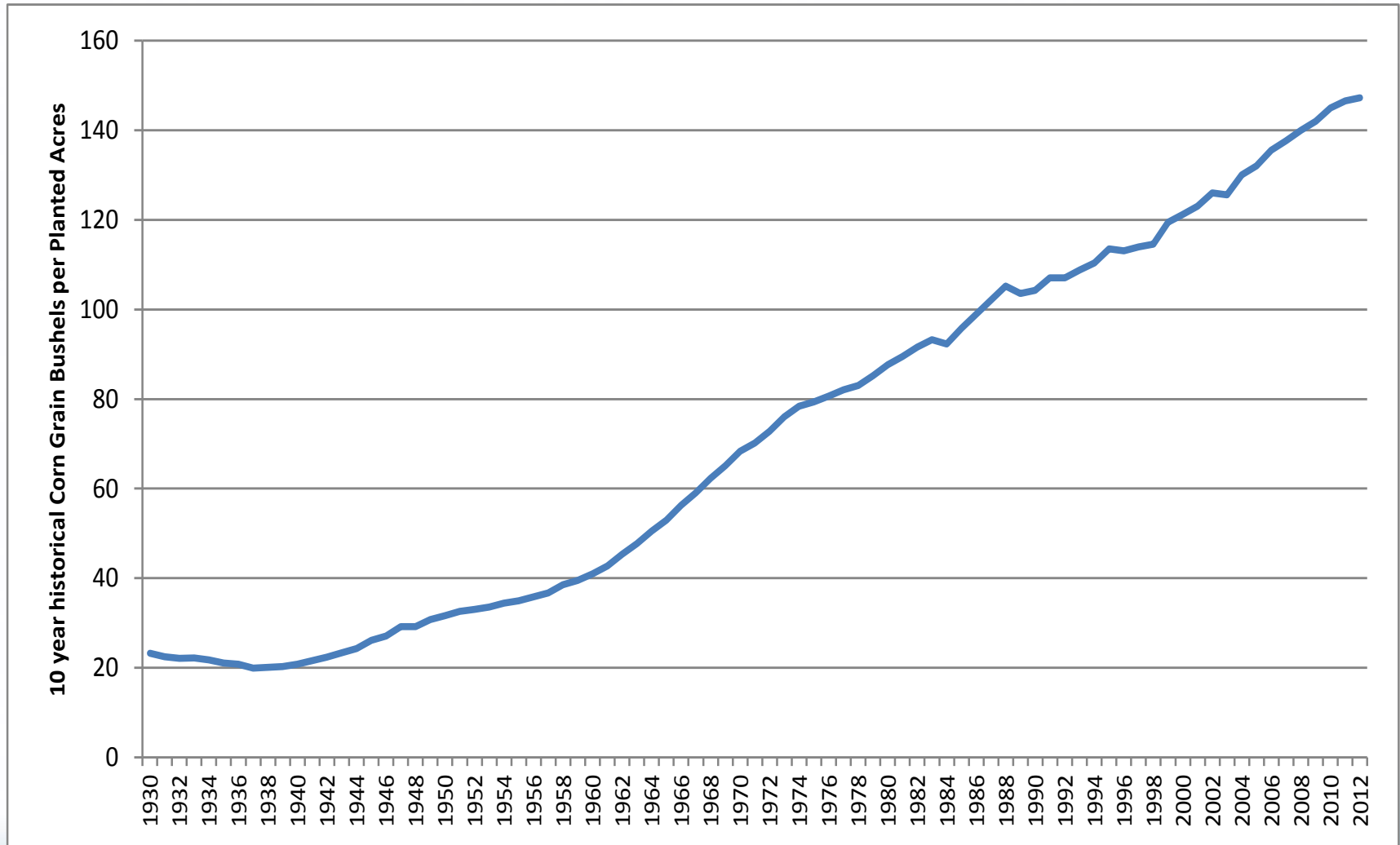
Adjust For:

- Prevented Planting
- Replant
- Policy and Rating Changes

Other Crops and Plans

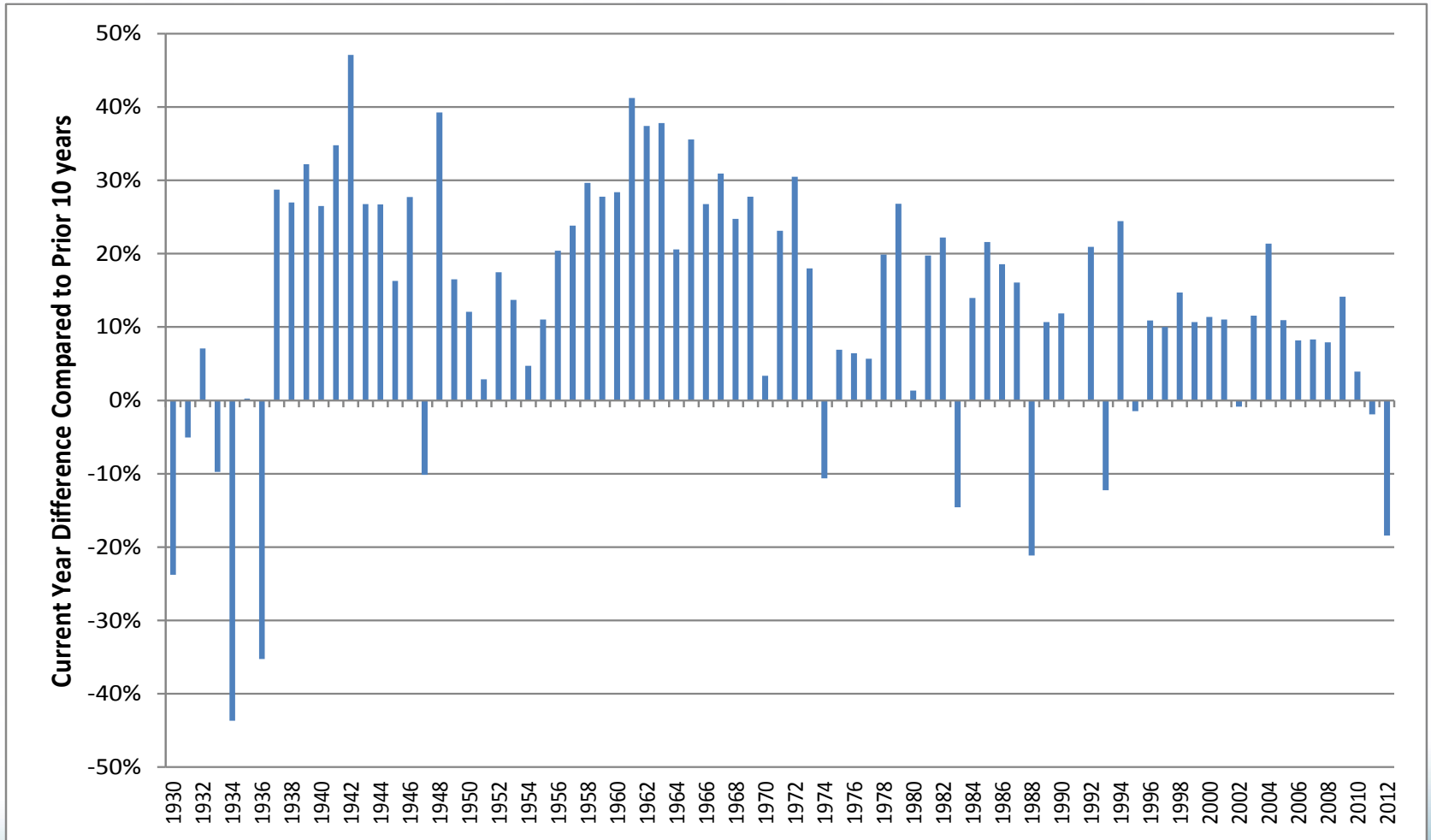
- Relative Loss Ratios
- Area Risk (will be more common due to SCO coverage)

NASS CORN YIELDS ROLLING 10 YEAR AVE



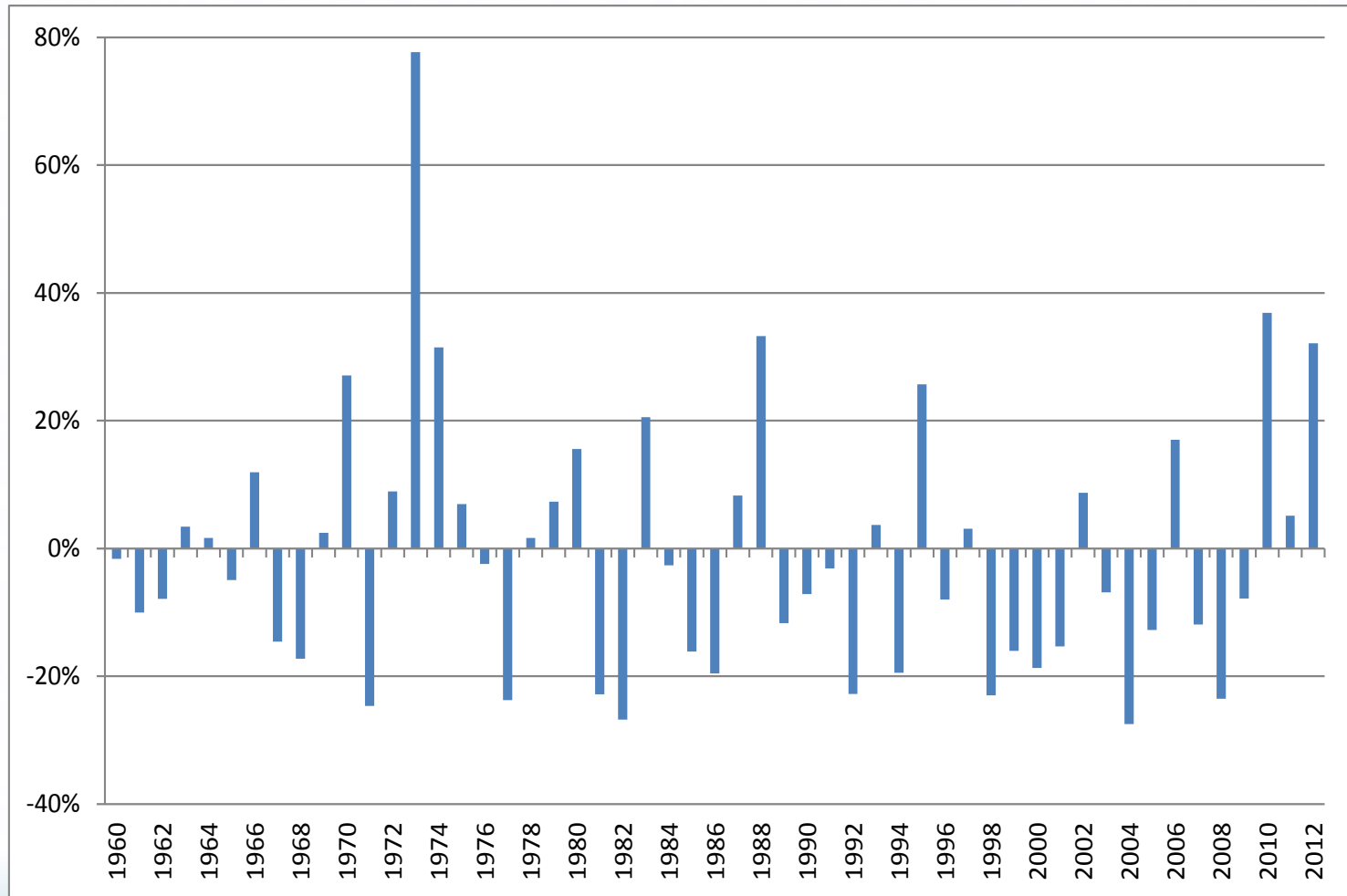
Source: USDA - NASS

CURRENT YEAR NASS CORN YIELD COMPARED TO ROLLING 10 YEAR AVE



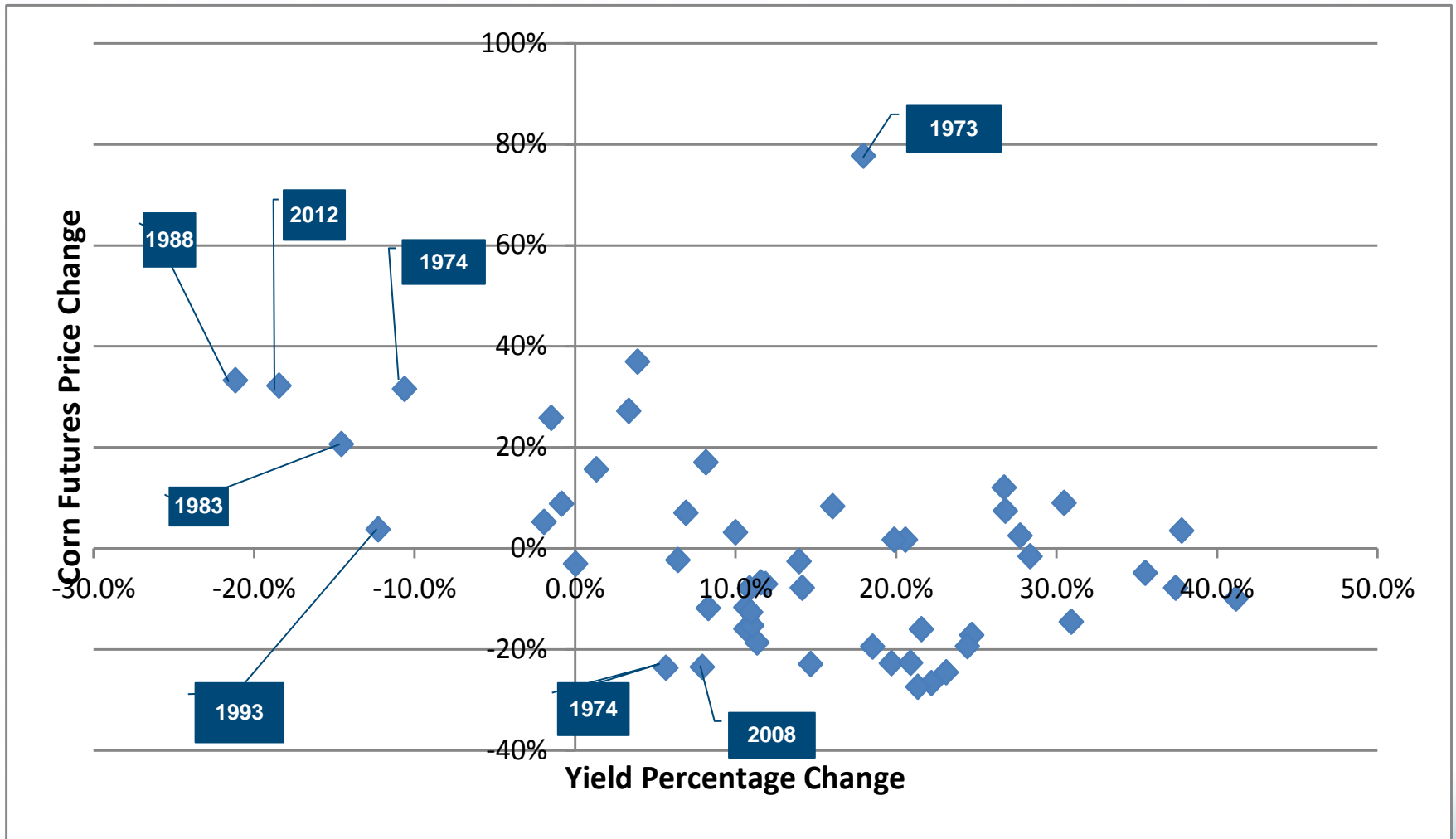
Source: USDA - NASS

DECEMBER CORN FUTURES PRICE OCTOBER COMPARED TO FEBRUARY



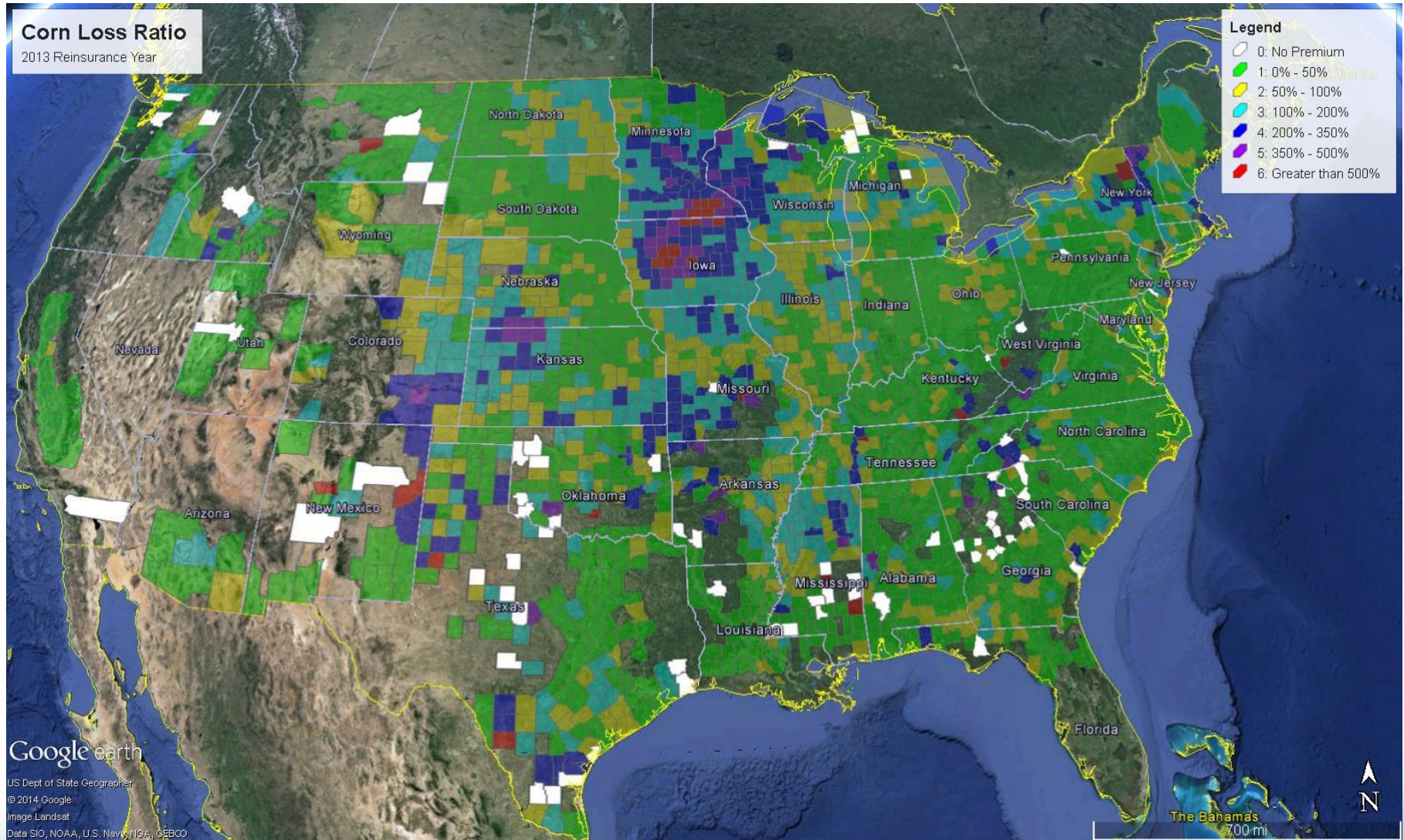
Source: Bloomberg

CORN PRICE / YIELD CORRELATION



Source: USDA-NASS and Bloomberg
 1960 – 2013 correlation = -0.40; 1983-2013 correlation = -75%

2013 Corn Loss Ratio

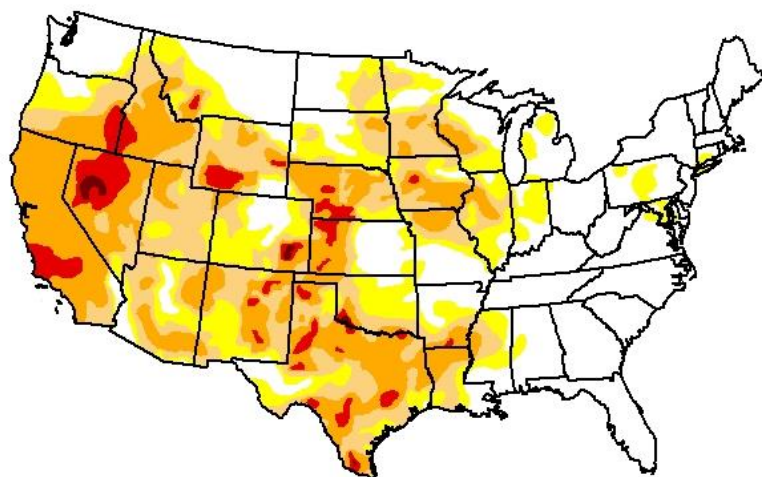


Corn Price Declined 22% from \$5.65 to \$4.39 (for March 15 SCD)

2013 Drought Monitor

U.S. Drought Monitor CONUS

September 24, 2013
(Released Thursday, Sep. 26, 2013)
Valid 7 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	38.06	61.94	45.46	25.33	4.33	0.31
Last Week <i>9/17/2013</i>	35.91	64.09	48.19	28.35	6.85	0.43
3 Months Ago <i>6/25/2013</i>	48.67	51.33	43.84	32.04	13.14	4.37
Start of Calendar Year <i>1/1/2013</i>	27.22	72.78	61.09	42.05	21.31	6.75
Start of Water Year <i>9/25/2012</i>	23.41	76.59	65.45	42.12	21.48	6.12
One Year Ago <i>9/25/2012</i>	23.41	76.59	65.45	42.12	21.48	6.12

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

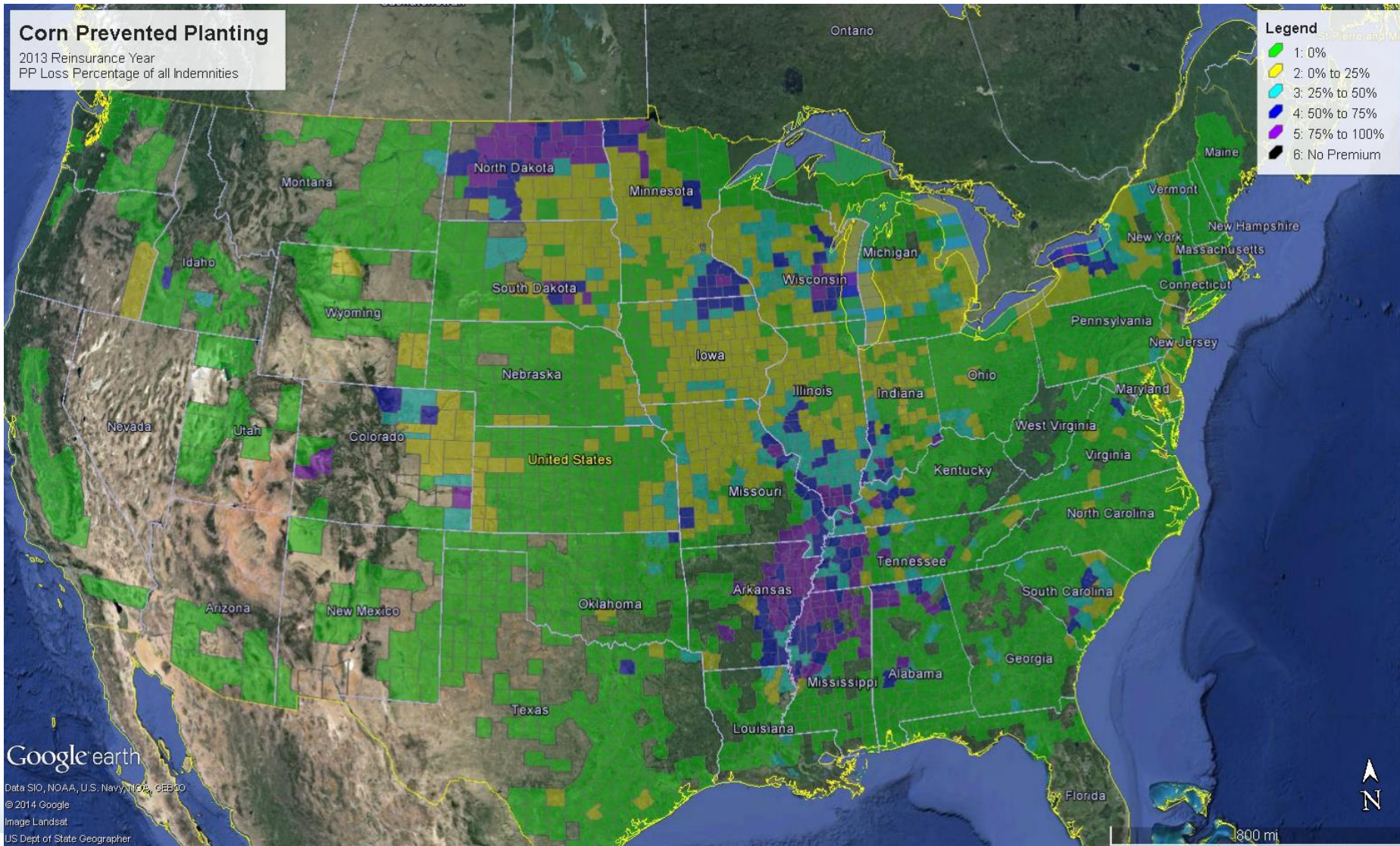
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author(s):
Brad Rippey
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

2013 Corn Prevented Planting



Alternative Forecasting Models

Ground-Up

- Use policy specific information on more granular level

Loss Development

- How to summarize (crop/state)?
- Issues with policy terms

Case OS runoff

- Some AIPs do not set up case reserves

Claim Count

- Average % liability per claim
- Claim reporting varies greatly

Ground-Up Forecasting Model Issues

Policy Level Detail

- Calculate expected indemnity with forecasted yield and distribution
- Include prices for revenue policies

Yield Distribution?

- Research is unclear about distributions
- Yield trend issues
- One distribution / different crops /regions /years

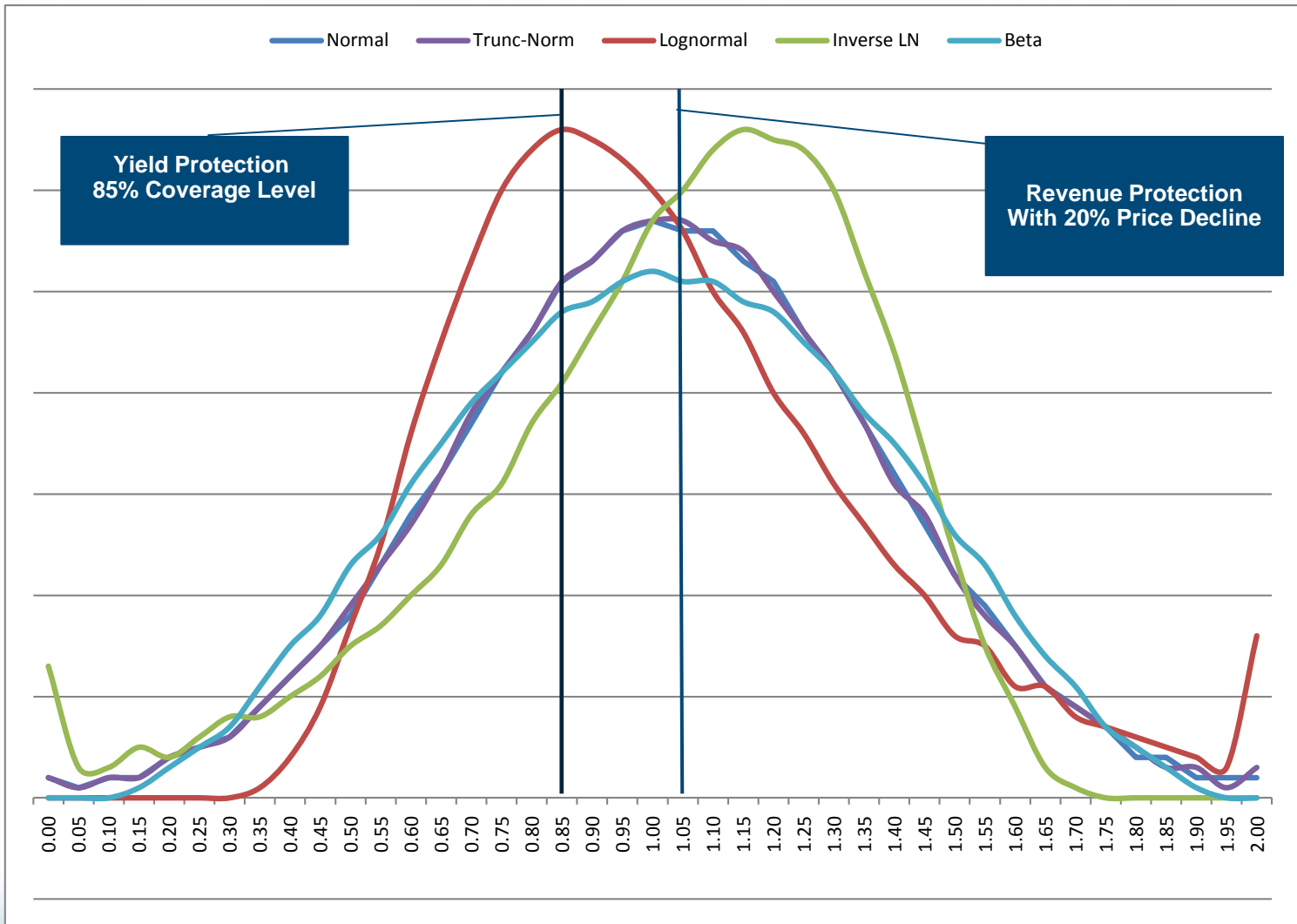
Practices

- Irrigated vs. Non-Irrigated
- Different distributions in different years

Policy Issues

- Enterprise and whole farm units
- Near-zero yields (silage or abandonment)

Ground-Up Yield Distribution Example



Note: Each distribution has CV of 35%. Assumes no yield trend.

Private / Hail Insurance

Traditional Hail (Named Peril) Policies

- Pays out quickly after event

Production Plans Policies

- Indemnity is a function of MPCCI losses
- Slower payout than traditional hail

Development methods used

- Paid and/or Incurred Loss development
- B-F Methods
- Majority of loss paid before 12/31/YY

FUTURE OUTLOOK ON U.S. CROP INSURANCE AND IMPLICATIONS ON RESERVING

FUTURE OUTLOOK - U.S. CROP INSURANCE

- Farm Bill 2014
 - Elimination of direct payments from FSA; Farmer must choose to enroll in Agriculture Risk Coverage (ARC) or be eligible for Supplemental Coverage Option (SCO).
 - Farmer can buy traditional MPCl policy plus area risk coverage on top: SCO or STAX
 - May change purchasing behavior of traditional MPCl policies
- Continued expansion into underserved markets
 - Group 3 States
 - Fruit and Vegetables
 - Livestock/aquaculture
 - Organic
 - Revenue Plans

FUTURE OUTLOOK - U.S. CROP INSURANCE

- Increase in farmers' coverages/guarantees
 - Trend Adjusted APH (introduced in 2012)
 - Personal T-Yield history
 - Low Yield Exclusion in APH
 - Addition of Area Risk coverage (SCO) combined with MPCl
 - Split Irrigation and Non-Irrigation Practices for enterprise units
- Reserving Implications
 - More exposure to Area Risk Plans
 - Area Risk Plans typically not paid until April following crop year
 - Lower deductibles = more frequent payments
 - Split practices = increase overall indemnity

Questions

