Rainfall Index and Margin Protection Insurance Plans

2017 Ag Lenders Conference
Manhattan, KS
October 2017

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KSU Extension Agricultural Economist

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PRF Insurance: background

- ***Pasture, Rangeland, and Forage*** coverage
- Program of Risk Management Agency (USDA)
- Started as a pilot program in 2007
- Available in Kansas since 2009

- Insures land for grazing or haying
  - Established acreage of perennial forage
  - Intended for grazing by livestock OR haying
  - Acreage must be suitable for intended use

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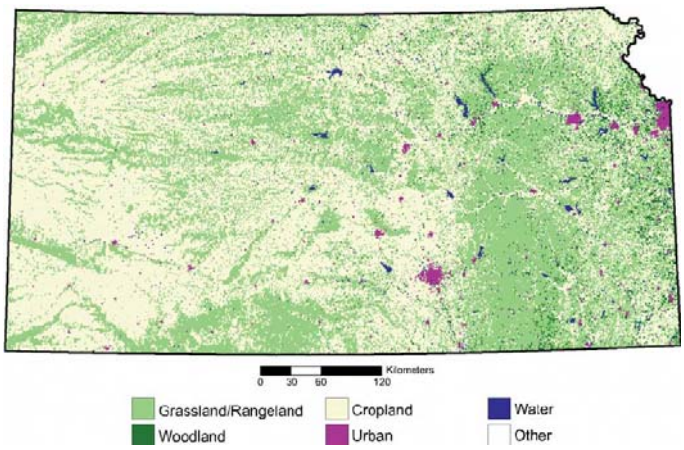
The PRF numbers for Kansas…

15.5 million acres of permanent pasture

308,000 acres of woodland pastures

2.2 million acres of alfalfa, tame & wild hay

18.0 million acres eligible for PRF



Source: 2012 Census of Agriculture

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How much is 18 million acres?

Crop	Acres planted In 2016	Acres insured In 2016	% insured In 2016
Wheat	8.3 million	7.6 million	92
Grain sorghum	2.8 million	2.5 million	90
Corn	5.0 million	4.7 million	93
Soybeans	4.0 million	3.2 million	81
Total BIG 4 crops	**20.1 million**	**18.0 million**	**90**
Pasture & perennial forages	18.0 million	808,026	4.5

Source: Risk Management Agency, USDA

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PRF Insurance: background

- Sold by private insurance agents
- Significant premium subsidy
  - 51-59% paid by USDA
- Uses dollar coverage per acre
  - Intended to pay for replacement feed
- Area-based: uses a grid system

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PRF Insurance: coverage features

- Single peril: only insures precipitation
- Other perils aren't insured
  - Fire
  - Heat
  - Disease
  - Hail
  - Insects
  - Plant vigor
- Guarantee from 70% to 90% of normal precip

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PRF uses a rainfall index

- Convert precipitation amounts to an index:
  - Simply express actual rainfall amount as a *percent of long-term normal* rainfall

Example:
- long term normal rain for two-month period is 6 inches
- actual rain is 4.5 inches for that time
- your index is 75 (= 4.5/6 x 100)

- If actual rainfall index falls below guaranteed level, the insurance pays an indemnity

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But why insure precipitation?

- *PROBLEM*: how can we insure forage production when we usually don't measure pasture / forage output?

- *ANSWER*: use another measure as a proxy for forage production
  - "Meaningful" - will closely reflect forage production
  - "Measureable" – feasible to obtain, understandable, even have "official" values

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Whose rainfall?

- Uses NOAA Climate Prediction Center data
  - Minimum of 6,000 stations reporting daily, usually over 15,000 stations report daily across US
- Uses multiple stations to calculate a composite precip value for each grid area
  - 4 closest reporting stations used
  - Don't rely on just 1 station
  - NOAA performs grid calculations

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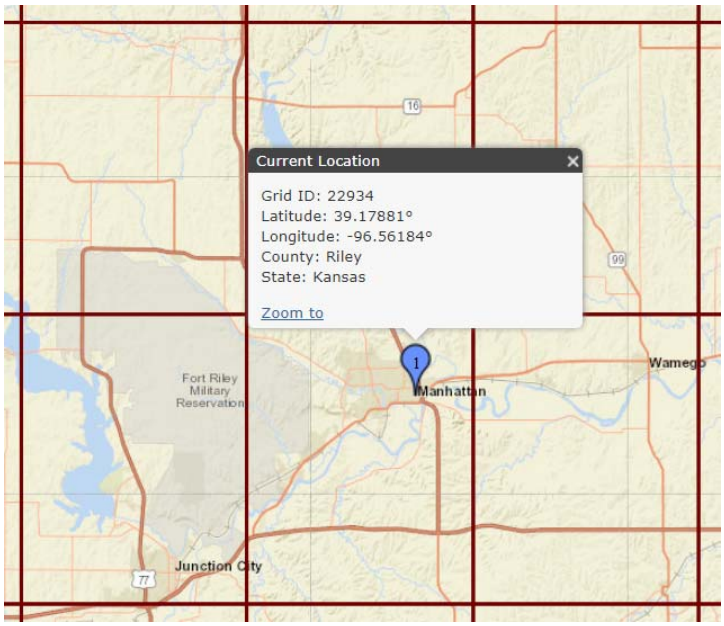
Area-based coverage: find your grid

- 0.25 degrees longitude x 0.25 degrees latitude
- If your land lies in 2 adjacent grids, you can insure it in one or the other, or split it into both
- Only one composite rainfall value for entire grid



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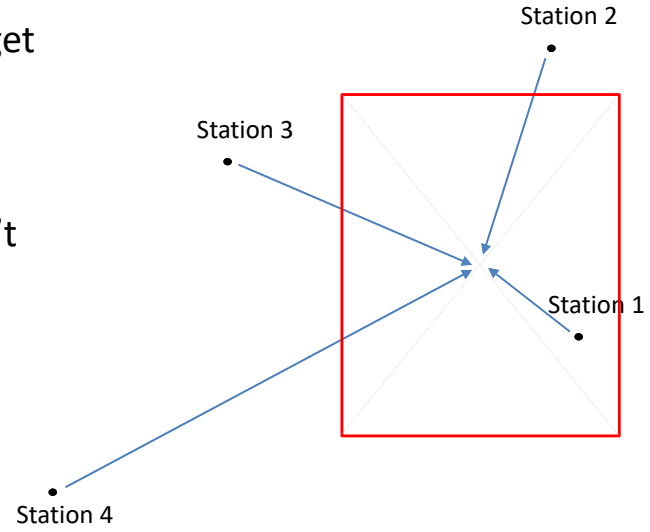
Precipitation amount weighted by distance from grid center

- Closer stations get bigger weights
- Your location in the grid doesn't matter



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PRF Insurance: time periods

- Policy runs January to December
- Pick time periods you want to insure
  - at least two 2-month intervals (no overlap)
- Allocate $ coverage across selected intervals
  - maximum allocation of 60%, minimum of 10%

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Online resources

- RMA info on PRF

  www.rma.usda.gov/policies/pasturerangeforage/

- Grid locator, Decision Support Tool

  https://prodwebnlb.rma.usda.gov/apps/prf

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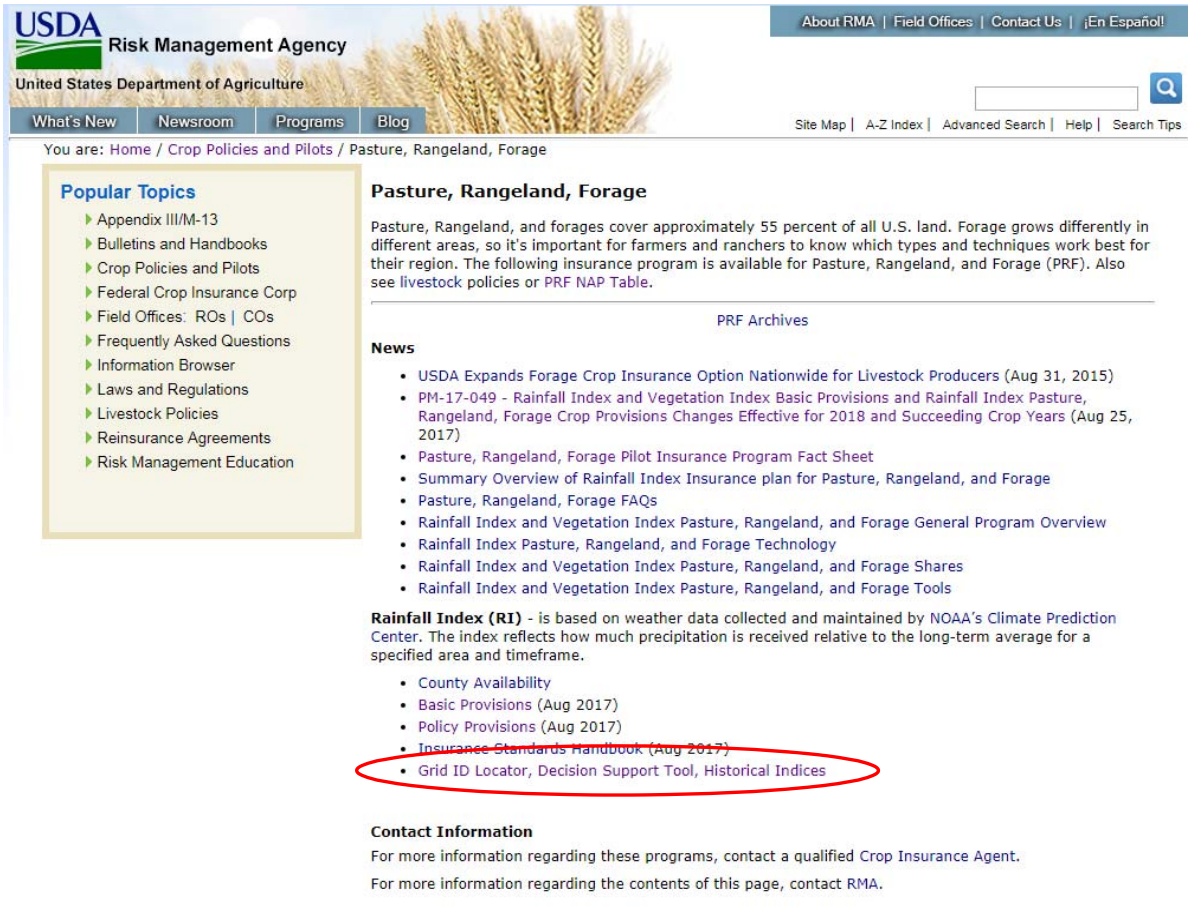
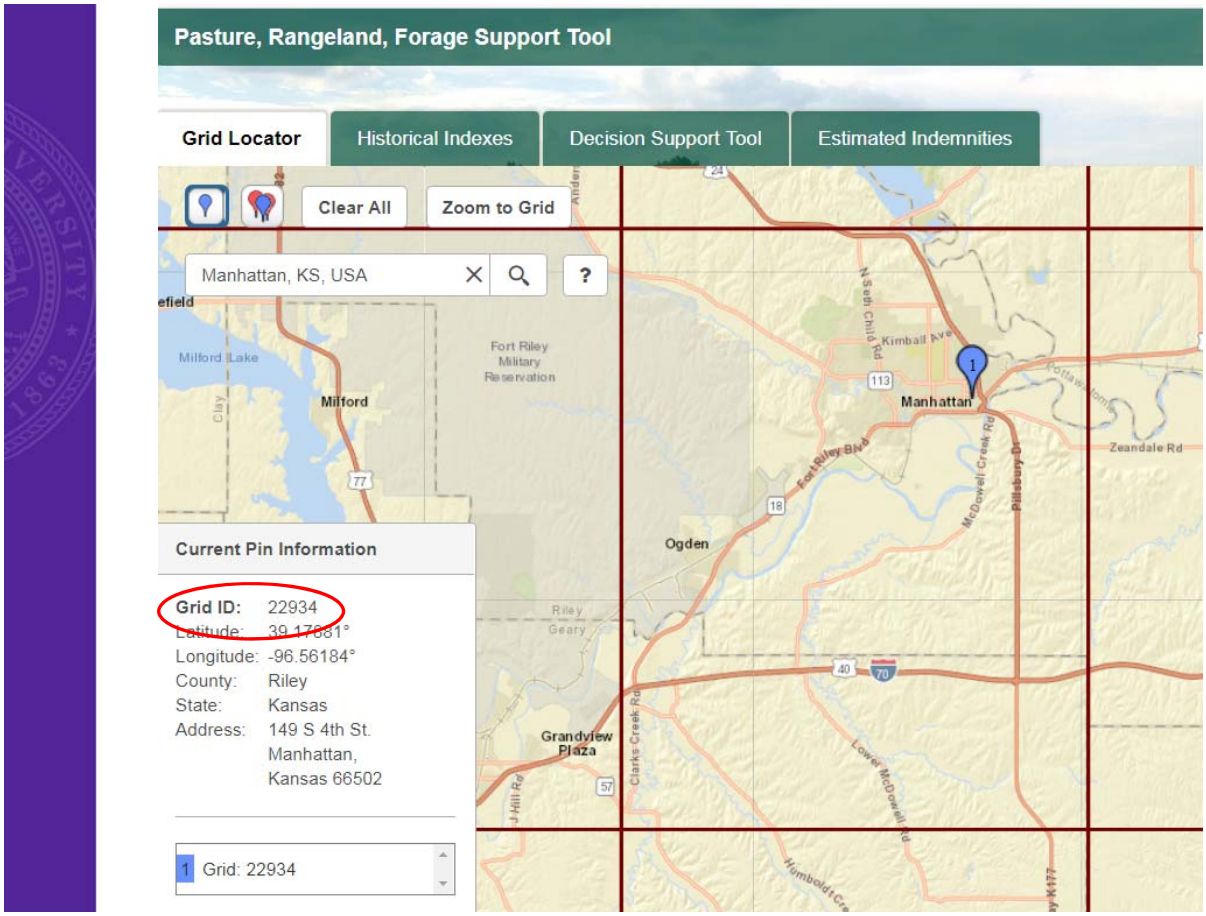
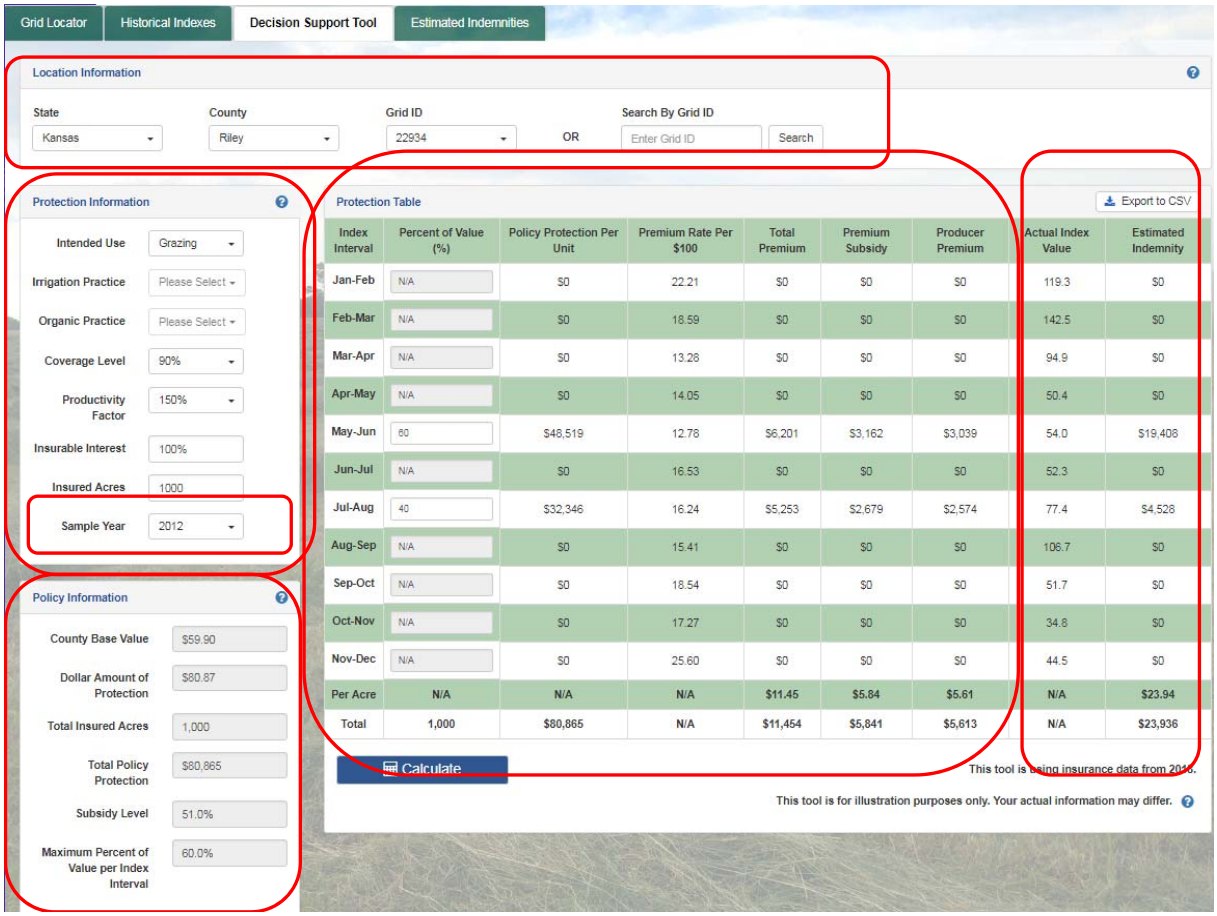
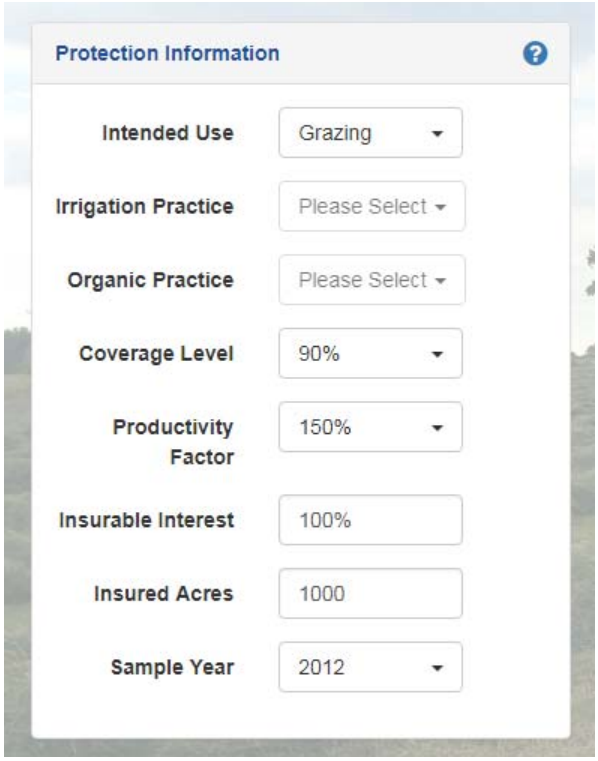



Pasture, Rangeland, Forage Support Tool
Grid Locator
Historical Indexes
Decision Support Tool
Estimated Indemnities
Clear All
Zoom to Grid
Manhattan, KS, USA
Current Pin Information
Grid ID: 22934
Latitude: 39.17881°
Longitude: -96.56184°
County: Riley
State: Kansas
Address: 149 S 4th St.
Manhattan,
Kansas 66502
1 Grid: 22934
Milford
Fort Riley
Military
Reservation
Manhattan
Ogden
Grandview
Plaza
Zeandale Rd


Grid Locator
Historical Indexes
Decision Support Tool
Estimated Indemnities
Location Information
State
Kansas
County
Riley
Grid ID
22934
OR
Search By Grid ID
Enter Grid ID
Search
Protection Information
Intended Use
Grazing
Irrigation Practice
Please Select
Organic Practice
Please Select
Coverage Level
90%
Productivity Factor
150%
Insurable Interest
100%
Insured Acres
1000
Sample Year
2012
Policy Information
County Base Value
$59.90
Dollar Amount of Protection
$80.87
Total Insured Acres
1,000
Total Policy Protection
$80,865
Subsidy Level
51.0%
Maximum Percent of Value per Index Interval
60.0%
Protection Table
Export to CSV
Index Interval
Percent of Value (%)
Policy Protection Per Unit
Premium Rate Per $100
Total Premium
Premium Subsidy
Producer Premium
Actual Index Value
Estimated Indemnity
Jan-Feb N/A $0 22.21 $0 $0 $0 119.3 $0
Feb-Mar N/A $0 18.59 $0 $0 $0 142.5 $0
Mar-Apr N/A $0 13.28 $0 $0 $0 94.9 $0
Apr-May N/A $0 14.05 $0 $0 $0 50.4 $0
May-Jun 60 $48,519 12.78 $6,201 $3,162 $3,039 54.0 $19,408
Jun-Jul N/A $0 16.53 $0 $0 $0 52.3 $0
Jul-Aug 40 $32,346 16.24 $5,253 $2,679 $2,574 77.4 $4,528
Aug-Sep N/A $0 15.41 $0 $0 $0 106.7 $0
Sep-Oct N/A $0 18.54 $0 $0 $0 51.7 $0
Oct-Nov N/A $0 17.27 $0 $0 $0 34.6 $0
Nov-Dec N/A $0 25.60 $0 $0 $0 44.5 $0
Per Acre N/A N/A N/A $11.45 $5.84 $5.61 N/A $23.94
Total 1,000 $80,865 N/A $11,454 $5,841 $5,613 N/A $23,936
Calculate
This tool is for illustration purposes only. Your actual information may differ.



Intended Use:
- *haying or grazing*

Coverage Level:
- *70% to 90%*

Productivity Factor:
- *60% to 150%*

Insurable interest:
- *100% = full ownership*

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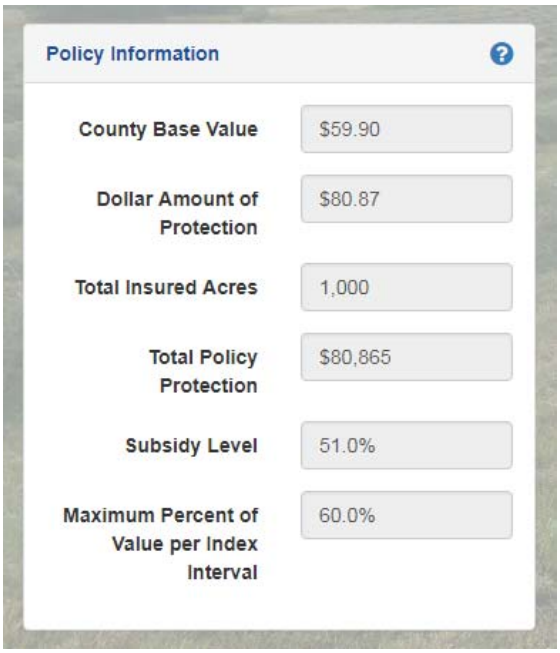

County Base Value
= *base $ value of production per acre; set by RMA*

Dollar Amount of Protection
= *County Base Value*
x *Productivity Factor %*
x *Guarantee Level %*

Total Policy Protection
= *Dollar Amount of Protection*
x *Total Insured Acres*

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Protection Table

Index Interval	Percent of Value (%)
Jan-Feb	N/A
Feb-Mar	N/A
Mar-Apr	N/A
Apr-May	N/A
May-Jun	60
Jun-Jul	N/A
Jul-Aug	40
Aug-Sep	N/A
Sep-Oct	N/A
Oct-Nov	N/A
Nov-Dec	N/A

INDEX INTERVALS

- *Time periods for which you insure rainfall*
- *Must choose at least two intervals*
- *Must allocate % of dollar coverage to each (max 60%, min 10%)*

Which periods? What allocation?

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Protection Table

Index Interval	Percent of Value (%)	Policy Protection Per Unit	Premium Rate Per $100	Total Premium	Premium Subsidy	Producer Premium
Jan-Feb	N/A	$0	22.21	$0	$0	$0
Feb-Mar	N/A	$0	18.59	$0	$0	$0
Mar-Apr	N/A	$0	13.28	$0	$0	$0
Apr-May	N/A	$0	14.05	$0	$0	$0
May-Jun	60	$48,519	12.78	$6,201	$3,162	$3,039
Jun-Jul	N/A	$0	16.53	$0	$0	$0
Jul-Aug	40	$32,346	16.24	$5,253	$2,679	$2,574
Aug-Sep	N/A	$0	15.41	$0	$0	$0
Sep-Oct	N/A	$0	18.54	$0	$0	$0
Oct-Nov	N/A	$0	17.27	$0	$0	$0
Nov-Dec	N/A	$0	25.60	$0	$0	$0
Per Acre	**N/A**	**N/A**	**N/A**	**$11.45**	**$5.84**	**$5.61**
Total	**1,000**	**$80,865**	**N/A**	**$11,454**	**$5,841**	**$5,613**

Protection Table

Export to CSV

Index Interval	Percent of Value (%)	Policy Protection Per Unit	Actual Index Value	Estimated Indemnity
Jan-Feb	N/A	$0	119.3	$0
Feb-Mar	N/A	$0	142.5	$0
Mar-Apr	N/A	$0	94.9	$0
Apr-May	N/A	$0	50.4	$0
May-Jun	60	$48,519	54.0	$19,408
Jun-Jul	N/A	$0	52.3	$0
Jul-Aug	40	$32,346	77.4	$4,528
Aug-Sep	N/A	$0	106.7	$0
Sep-Oct	N/A	$0	51.7	$0
Oct-Nov	N/A	$0	34.8	$0
Nov-Dec	N/A	$0	44.5	$0
Per Acre	N/A	N/A	N/A	$23.94
Total	1,000	$80,865	N/A	$23,936

RESULTS FOR 2012

Coverage level = 90%

May-Jun:
Actual Index = 54.0

Payment Factor =
(90 – 54.0) = .4000
90

Indemnity =
Payment Factor
x $ Policy Protection

= .4000 x $48,519
= $19,408

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Insuring Haying Lands

- Perennial hay crops can be insured
  - Alfalfa
  - Grass hay meadows
  - Much higher $ value per acre
- Irrigated or non-irrigated
  - Non-irrigated dollar coverage based on value of forage, like pasture
  - Irrigated dollar coverage based on additional cost of pumping needed to obtain ordinary production

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Would PRF be a good risk management tool for me?

- How accurately do the PRF indices reflect actual drought in my location?
- Which index intervals and coverage allocations should I use? Which guarantee levels? Dollar amount per acre?
- Would PRF provide adequate funds to purchase replacement feed during bad years?

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Historical Index Values: do they reflect your drought experience?

Index Values - Percent of Normal

Export to CSV

Year	Jan-Feb	Feb-Mar	Mar-Apr	Apr-May	May-Jun	Jun-Jul	Jul-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov-Dec
2016	63.1	30.3	158.5	182.7	77.0	73.3	139.8	143.2	123.1	72.7	59.9
2015	87.5	53.0	67.9	174.3	157.1	112.7	117.2	102.8	69.0	142.1	329.5
2014	95.0	61.0	101.1	85.1	107.2	101.5	47.5	71.9	91.5	81.7	86.8
2013	124.3	78.4	98.2	104.3	85.1	95.1	116.2	111.7	119.2	106.7	42.2
2012	119.3	142.5	94.9	50.4	54.0	52.3	77.4	106.7	51.7	34.8	44.5
2011	78.9	68.8	93.3	109.6	98.5	78.3	75.9	66.2	61.9	158.7	300.4
2010	41.7	85.8	105.6	87.3	109.8	125.7	96.1	95.2	86.9	81.0	75.3
2009	34.7	113.7	169.5	88.9	88.7	150.3	142.4	111.4	117.0	134.3	134.8
2008	118.7	142.4	115.8	100.7	132.9	131.1	110.4	143.6	135.7	95.1	68.5
2007	101.3	168.6	139.9	194.5	173.0	110.0	101.5	72.2	118.8	121.2	145.4
2006	25.1	80.5	110.5	72.5	43.3	56.9	152.5	151.5	70.3	50.4	58.5
2005	194.7	109.4	47.6	47.6	138.4	150.0	117.6	156.6	119.4	87.4	60.9
2004	118.4	198.7	127.4	64.9	100.2	145.0	156.6	91.6	42.6	68.7	72.2
2003	88.1	93.5	109.8	89.5	91.2	81.4	87.3	111.4	79.0	76.6	76.3
2002	76.8	31.4	76.6	118.1	66.8	45.2	79.6	79.3	131.6	137.6	17.0
2001	223.6	152.4	92.3	105.5	122.7	103.4	103.9	138.3	102.2	58.5	34.1
2000	139.0	152.3	82.7	57.4	87.1	88.7	42.3	25.0	63.0	102.5	65.0

Index intervals? Allocation?

- When does the pasture need the rain?
  - Pasture composition: warm season vs. cool season
- Selecting more periods: reduces chances of collecting no indemnity
- Premium cost
  - Rainfall is least variable (in % terms) in warmer months → lower premiums

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Premium costs

- Rates vary by month and guarantee level
  - Figures shown are pre-subsidy rates

Premium rates for grid 22934

	90%	85%	80%	75%	70%
Jan-Feb	22.21	20.34	18.57	16.84	15.12
Feb-Mar	18.59	16.88	15.33	13.86	12.47
Mar-Apr	13.28	11.33	9.31	7.36	5.62
Apr-May	14.05	11.84	9.74	8.12	6.70
May-Jun	12.78	10.62	8.59	6.75	5.33
Jun-Jul	16.53	14.31	12.17	10.11	8.20
Jul-Aug	16.24	14.53	12.94	11.33	9.35
Aug-Sep	15.51	13.59	11.98	10.10	8.16
Sep-Oct	18.54	16.81	15.26	13.43	11.38
Oct-Nov	17.27	15.65	13.82	11.77	9.79
Nov-Dec	25.60	23.53	21.41	19.50	18.03

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Guarantee levels?

- Probability of loss varies by month and guarantee level

- Probability of payment: Grid 22934

Index											
Value	Jan-Feb	Feb-Mar	Mar-Apr	Apr-May	May-Jun	Jun-Jul	Jul-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov-Dec
< 90	0.493	0.478	0.435	0.406	0.435	0.435	0.420	0.449	0.464	0.449	0.551
< 85	0.449	0.435	0.406	0.319	0.348	0.406	0.406	0.406	0.435	0.435	0.522
< 80	0.420	0.362	0.362	0.304	0.333	0.348	0.362	0.362	0.420	0.377	0.522
< 75	0.362	0.333	0.304	0.290	0.246	0.290	0.304	0.348	0.391	0.319	0.478
< 70	0.362	0.290	0.246	0.232	0.217	0.246	0.290	0.304	0.319	0.275	0.420

Source: Historical Indices, PRF Decision Support Tool
Years 1948-2016, checked September 2017

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$$$ for feed

- Risk reduction: less need for culling herd in bad years

- Hay price, transportation cost are both factors

- How much extra feed might I need?
  - Feed price
  - Number of head, daily consumption
  - Days of feed provided by insurance indemnity

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How much feed could I buy?

Insurance indemnity	$23,936			
No. of acres	1,000			
Stocking rate: acres/head	6			
No. of head	167			
Daily lbs consumed / head	30			
Hay price per ton	$75	$100	$125	$150
Tons of hay purchased	319.1	239.4	191.5	159.6
Days of feed provided	128	96	77	64

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Long-term perspective on PRF

- Most KS locations will have good protection in widespread drought, may have hit-or-miss experience in spotty years
- Will come out ahead in long run due to premium subsidy
  - Most grids: about $1.50 - $2.00 back for every $1.00 paid in

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Use the Decision Support Tool to evaluate your options

- Compare your experience with the historical indices
- Consider $$ needed for replacement feed
- Compare coverage options

- November 15 is sales deadline

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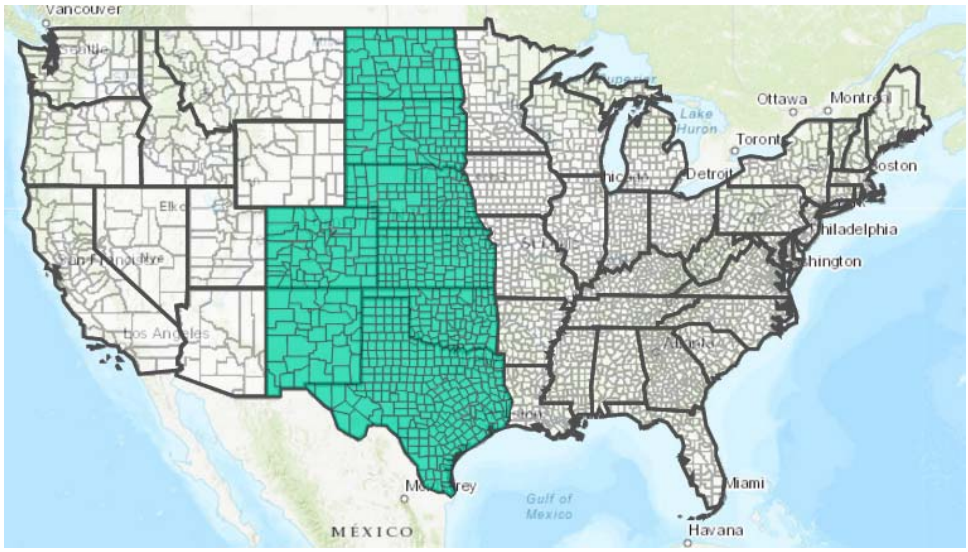
Annual Forage Rainfall Index coverage available here in 2018



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Annual Forage coverage

- Crop's intended use is feed or fodder, including:
  - Grazing, haying, silage, green chop
  - Any other method that results in livestock feed
  - Required to cover all insurable acres (unlike PRF)
  - Don't need yield history
- Similar product to PRF
  - Uses same grid areas, index values, premium rates, guarantee levels, etc.

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Annual Forage: coverage features

- Coverage levels
  - Rainfall guarantees: 70% to 90% of normal
  - County Base Values: higher $$$ amounts (>$200/a)
- Also has a low level "catastrophic" level
  - Called CAT coverage (vs. buy-up)
  - Trigger is 65% of normal rainfall over *entire growing season*
  - $$$ coverage = CBV x 65% covg level x 45% prod factor
  - Fee is $300 per county
  - No CAT coverage for grazing

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Growing seasons and dates

Sales Closing Date is July 15 each year
Index intervals and allocations must be selected at this time

Growing Season	Planting Dates	Rainfall months	Acreage reporting date
1	Jul 16 – Oct 15	September to March	Oct 15
2	Oct 16 – Jan 15	December to June	Jan 15
3	Jan 16 – Apr 15	March to September	Apr 15
4	Apr 16 – Jul 15	June to November	Jul 15

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Annual Forage: coverage decisions

- 6 or 7 months in growing season
- 5 or 6 index intervals in each growing season

- Maximum allocation of 40% to any interval (in Kansas)
  - Must select at least 3 intervals (e.g., 40-40-20)
  - All or nearly all growing season months will be covered

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Online resources

- RMA info on Annual Forage

  www.rma.usda.gov/policies/ri-vi/annualforage.html

- Grid locator, Decision Support Tool

  http://maps.agforceusa/af/ri/

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Margin Protection Plan: BACKGROUND

- Authorized by the 2014 Farm Bill
- RMA pilot program: stage of testing and refinement
- Sold by private insurance companies, subsidized premium
- Area-based: uses county yields
- Offered for first time in 2016
  - CORN and SOYBEANS: only available in Iowa
  - WHEAT (spring wheat areas of Northern Plains; not in KS)
  - RICE
- Major expansion for 2018 crop year
  - Available for corn and soybeans in KS for most counties

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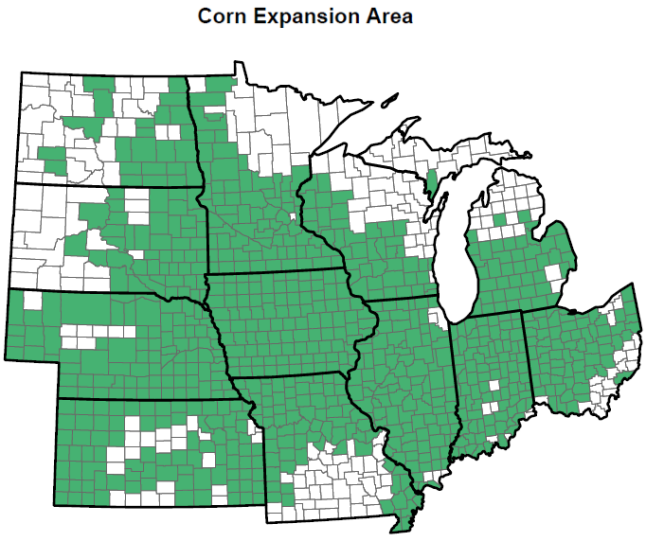
Corn Expansion in 2018



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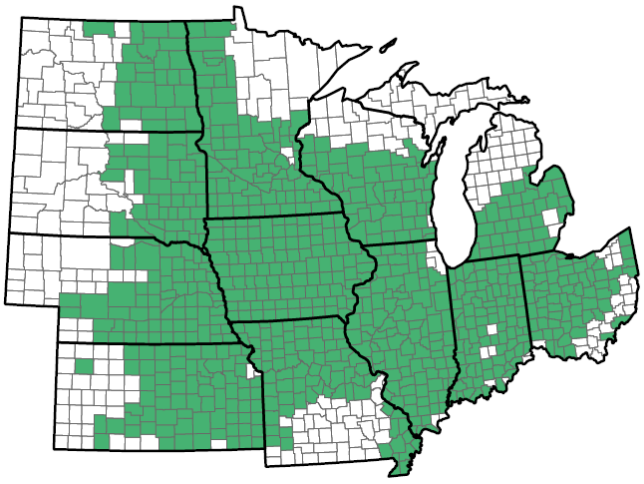
Soybeans Expansion in 2018



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What is Margin Protection?

- MP is an insurance plan that provides coverage against an ***unexpected decrease in operating margin***

Margin = revenue – input costs

- Loss could be triggered by:
  - decline in crop price
  - decline in yield
  - increase in costs
  - some combination of these

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Some MP coverage features

- Guarantee levels: 70% to 95%
  - Very low deductible is available
- Protection Factors: 0.80 to 1.20
  - Similar to area coverage plans (Area Yield Protection or Area Revenue Protection)
- Harvest Price Option available
  - If October (Harvest) price is higher than Projected Price, use Harvest Price in calculating Expected Margin

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What input costs are covered?

- Diesel
- Urea (N)
- Diammonium phosphate, or DAP (P)
- Potash (K)
- Interest
- Other costs: includes seed, lubrication, herbicides, machinery

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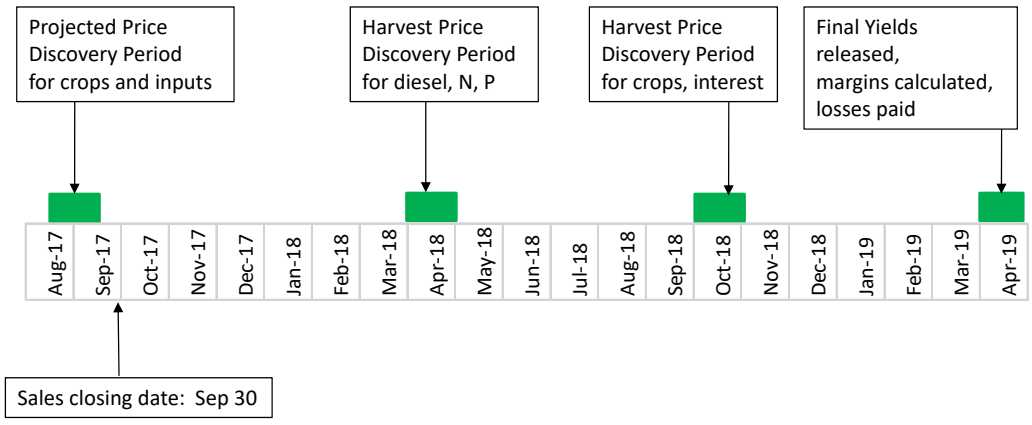
Margin Protection timeline



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MP is area-based

- MP does not use your own yield and input information
- For yield, MP uses the county yield
  - Effective coverage: how well does your yield track with the county average yield?
- Input amounts for diesel, N-P-K are a function of the county yield
  - Plug your Expected County Yield into formulas to get input quantities
  - All growers in a county are assumed to have the same input costs

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Example cost calculations: CORN

Non-irrigated corn

Expected County Yield = 140 bu/a

INPUT	QUANTITY	PRICE	COST
Diesel	8.1 gal	$1.507 /gal	$12.20/a
Urea	252.6 lbs	$175.00 /ton	$22.10/a
DAP	106.5 lbs	$315.00 /ton	$16.78/a
Potash	58.3 lbs	$327.25 /ton	$9.54/a
Other costs	-----	-----	$206.90/a
Sub-total			$267.53/a
Interest		7.49%	$10.02/a
TOTAL			$277.55/a

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Example cost calculations: SOYBEANS

Non-irrigated soybeans

Expected County Yield = 40 bu/a

INPUT	QUANTITY	PRICE	COST
Diesel	6.5 gal	$1.507 /gal	$9.79/a
Urea	-----	-----	-----
DAP	63.5 lbs	$315.00 /ton	$10.00/a
Potash	73.3 lbs	$327.25 /ton	$12.00/a
Other costs	-----	-----	$111.50/a
Sub-total			$143.29/a
Interest		7.49%	$5.37/a
TOTAL			$148.66/a

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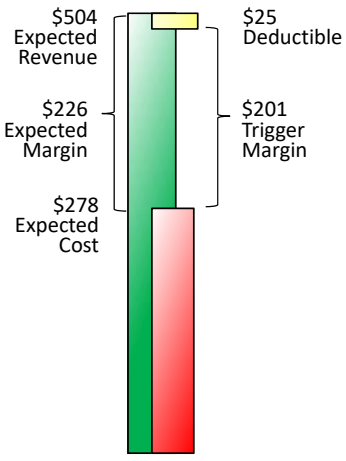
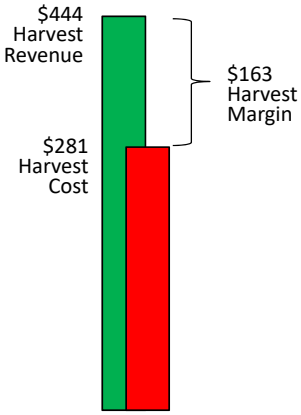
MP, graphically (no HPO)

Expected Yield = 140 bu/a
Projected Price = $3.60/bu
Expected Cost = $278/a

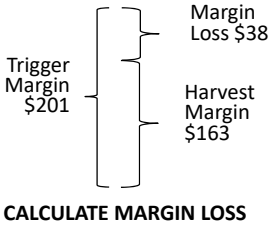
Final Yield = 120 bu/a
Harvest Price = $3.70/bu
Harvest Cost = $281/a



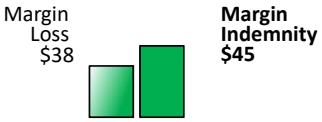
EXPECTED



HARVEST



CALCULATE MARGIN LOSS



APPLY PROTECTION FACTOR

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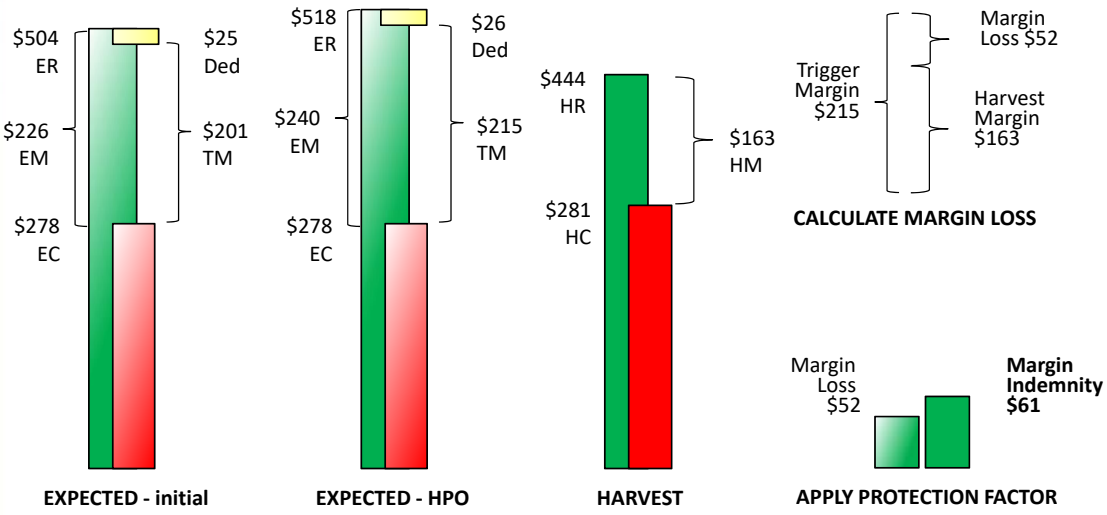
MP, with Harvest Price Option



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Nemaha County: non-irrigated corn, MP + RP

	95%	90%	85%	80%	75%	70%
MP premiums, $/a	$49.39	$41.01	$30.81	$22.42	$18.39	$13.66

RP* premiums, $/a		**Premium credits, $/a**					
85%	$40.61	$23.70	$23.70	$21.57	$15.70	$12.87	$9.56
80%	$27.84	$19.38	$19.38	$17.65	$15.57	$12.87	$9.56
75%	$20.37	$15.76	$15.76	$14.35	$12.66	$12.66	$9.56
70%	$15.52	$12.65	$12.65	$11.52	$10.17	$10.17	$9.26
65%	$12.75	$9.74	$9.74	$8.87	$7.83	$7.83	$7.13

Assumes farm yield of 130 bu/a, Expected County Yield = 131.5 bu/a, 2018 corn price of $3.95*; RP premiums estimated using RMA Cost Estimator*, other values downloaded from ***MarginProtection.com*** on September 26, 2017

75% **RP** + 85% **MP** = $20.37 + $30.81 - $14.35 = $36.83

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How does MP stack up vs. other plans?

- Very low deductible available
- More frequent payouts
- Protects against rising input costs

- More expensive
- Based on county yield
- Longer coverage period
- Price changes for only a few inputs covered

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For more information…

- Risk Management Agency, USDA: Margin Protection page
  www.rma.usda.gov/policies/mp/

- MarginProtection.com: price discovery, estimates for premiums, credits
  www.marginprotection.com

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Questions?
Comments?
Thank you!

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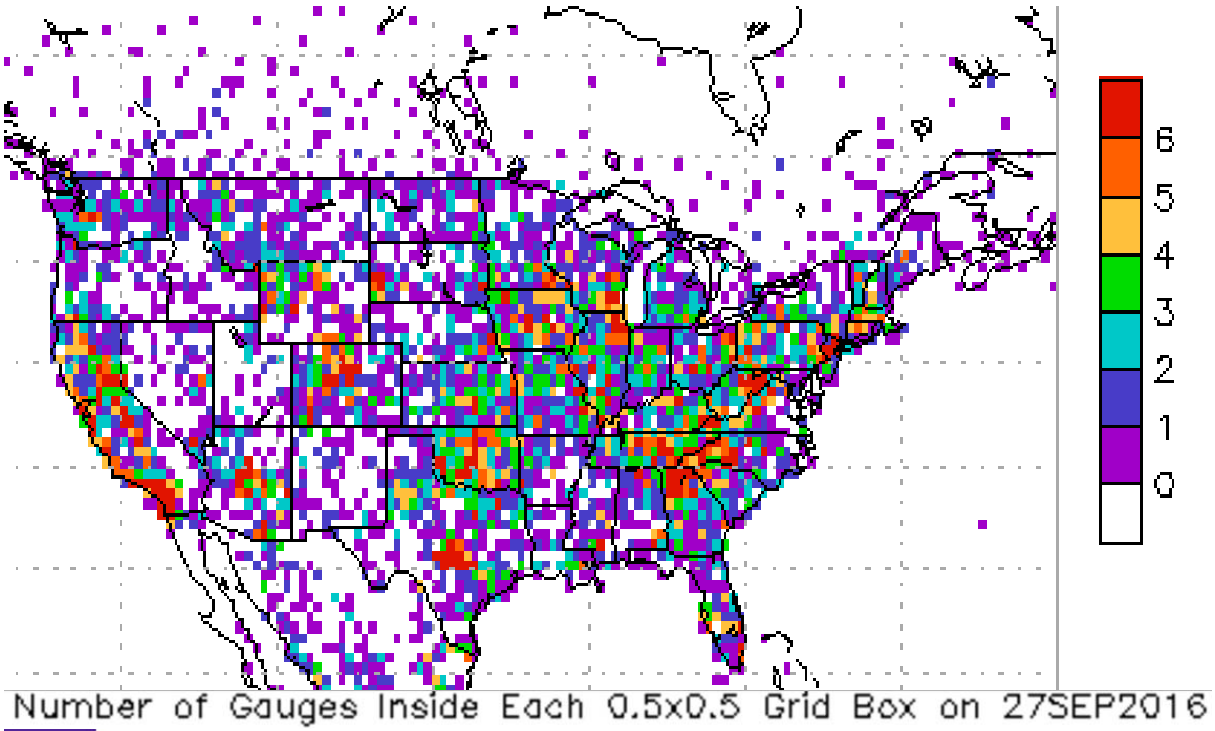

Location of reporting NOAA CPC weather stations
http://www.cpc.ncep.noaa.gov/products/Precip_Monitoring/Figures/NAMS/NAMS_curr.p.gnum.gif

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