Excessive spring rain will be more frequent (except this year). Will it be more manageable?

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89th Annual Soil Management and Land Valuation Conference

May 18, 2016

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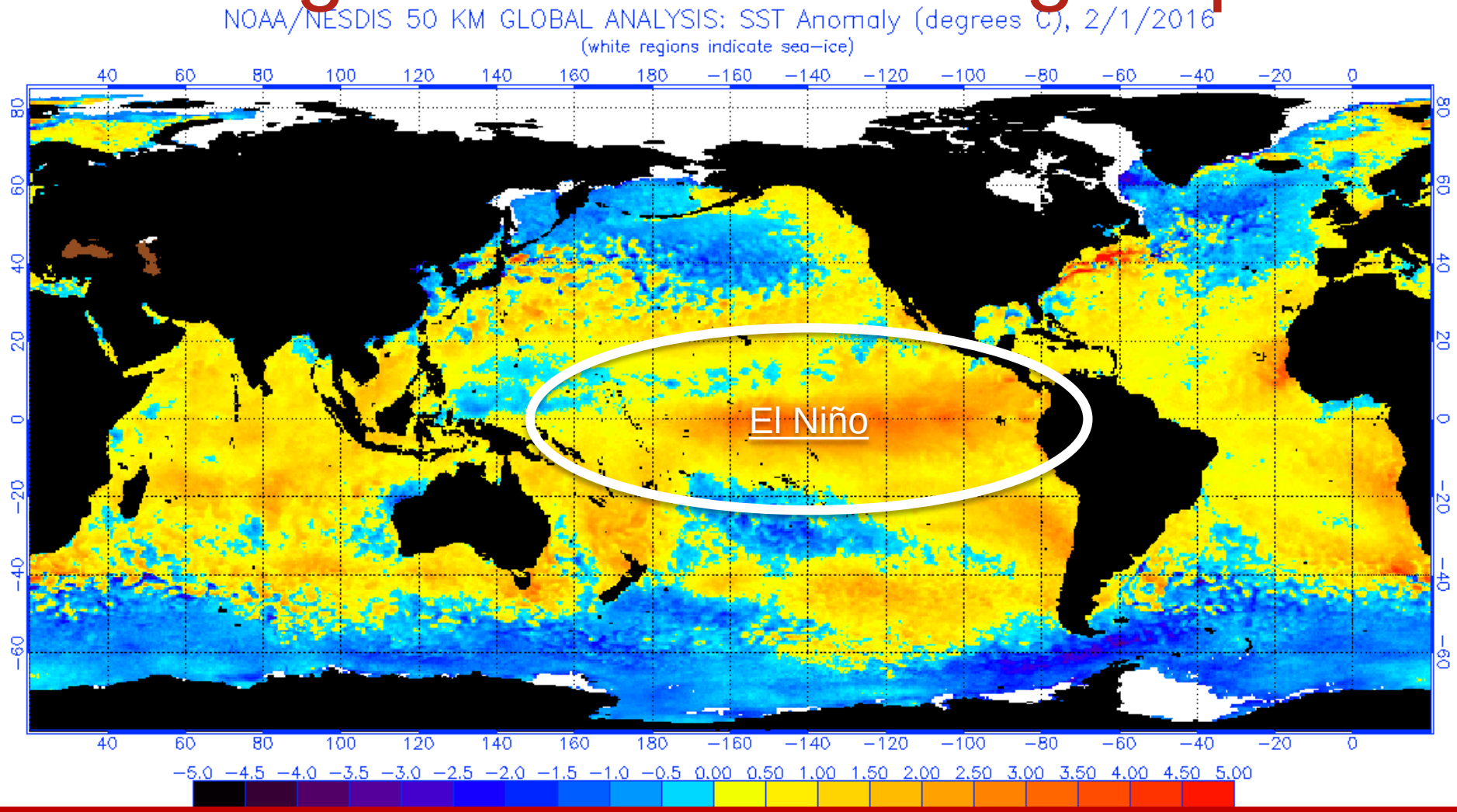
Today's Topics

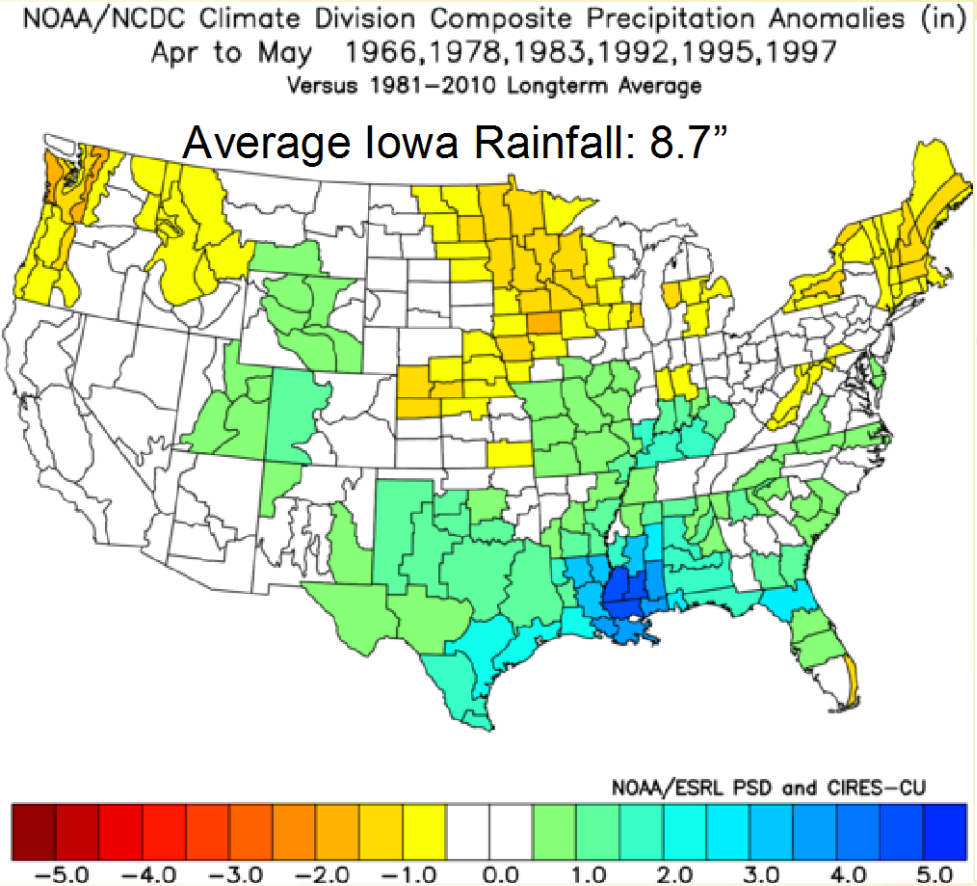
- Near-term Management: Summer Drought
- Long-term Management: Rainfall Trend and Yield Effects
- Field Management: Limitations
- Solutions

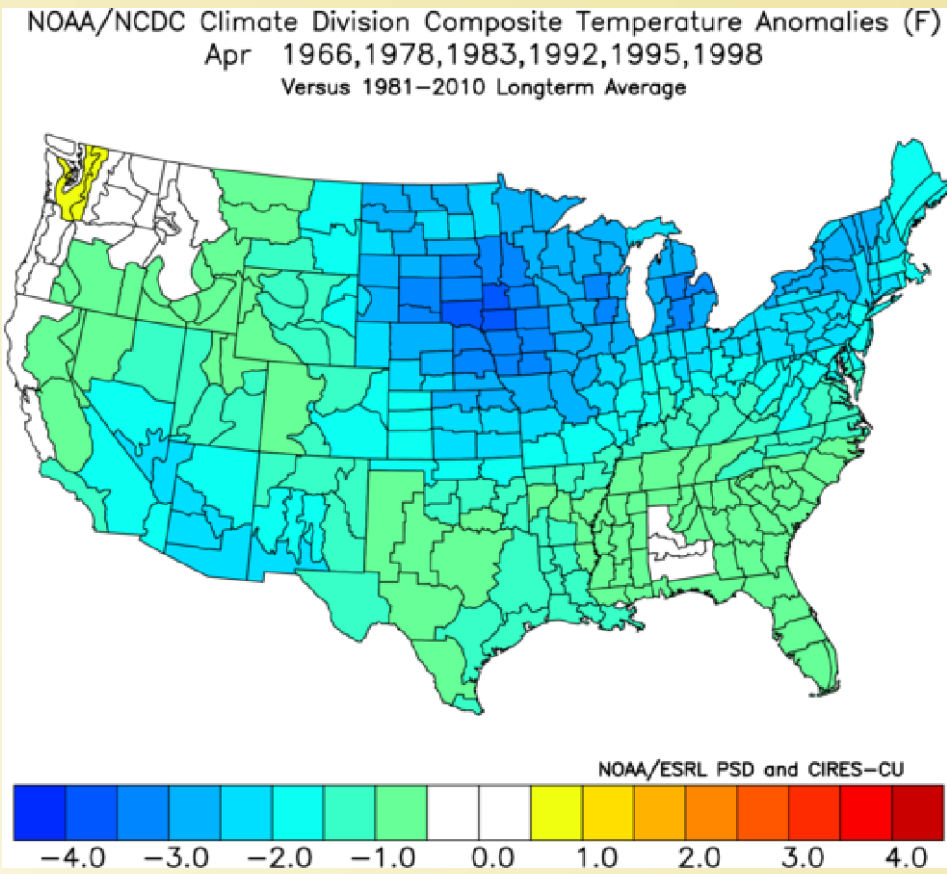
El Niño provides predictability during December through April



NOAA NESDIS:
http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/index.html

December – March Outlook: Should producers hedge with short-season variety?



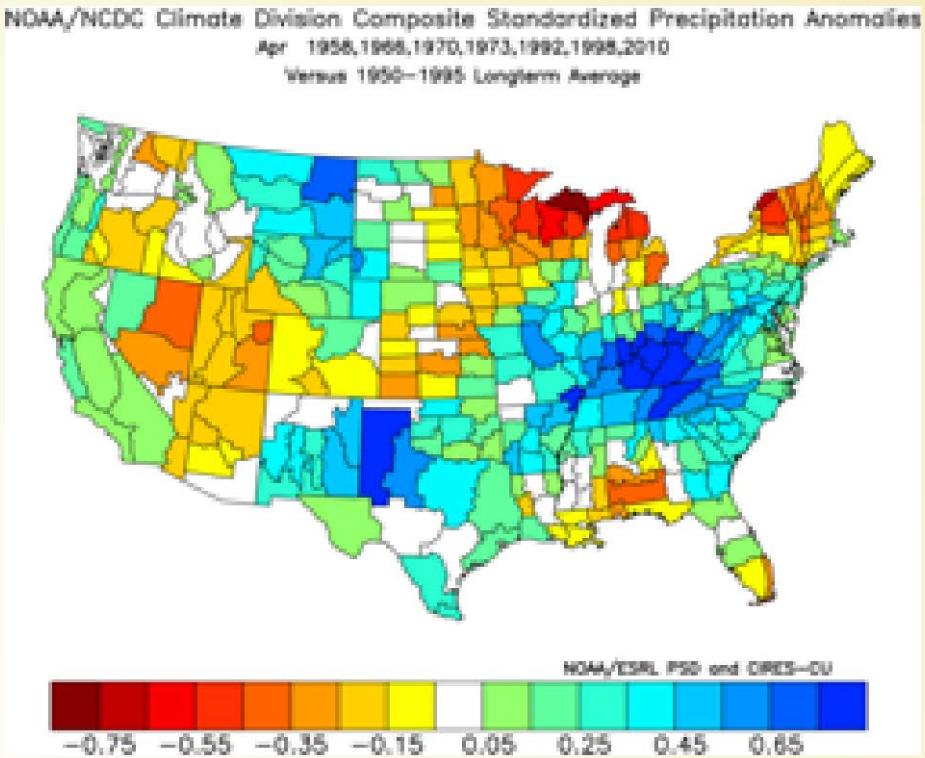


Past Big El Niño years had average to dry April – May but substantially cooler April.

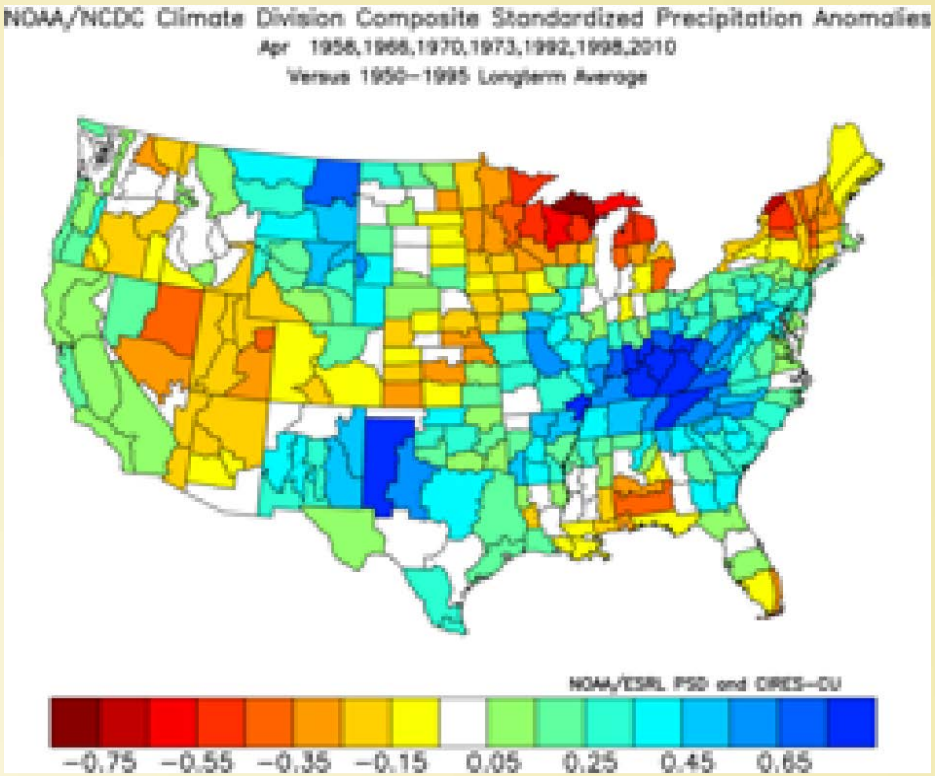
<u>Interpretation:</u> You may be able to plant early, but your crops may develop slowly.

What additional details would you need to see to help with planting date and relative maturity choice in a specific field, if any at all?

April Reality: Dry except NW IA

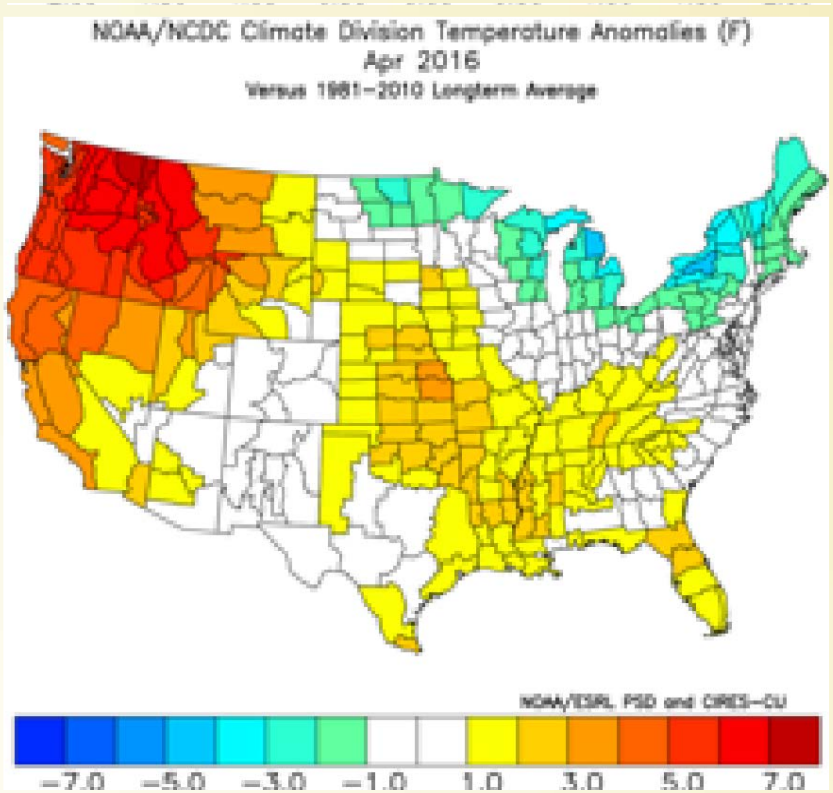


Composite April Rainfall of transition El Nino years

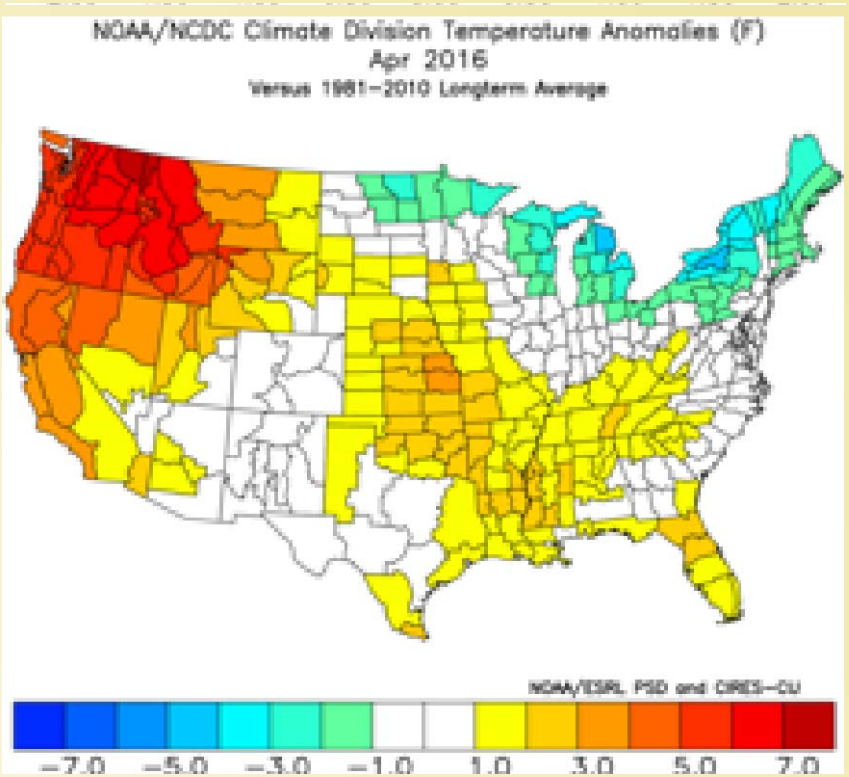


April 2016 Rainfall

April Reality: Warm

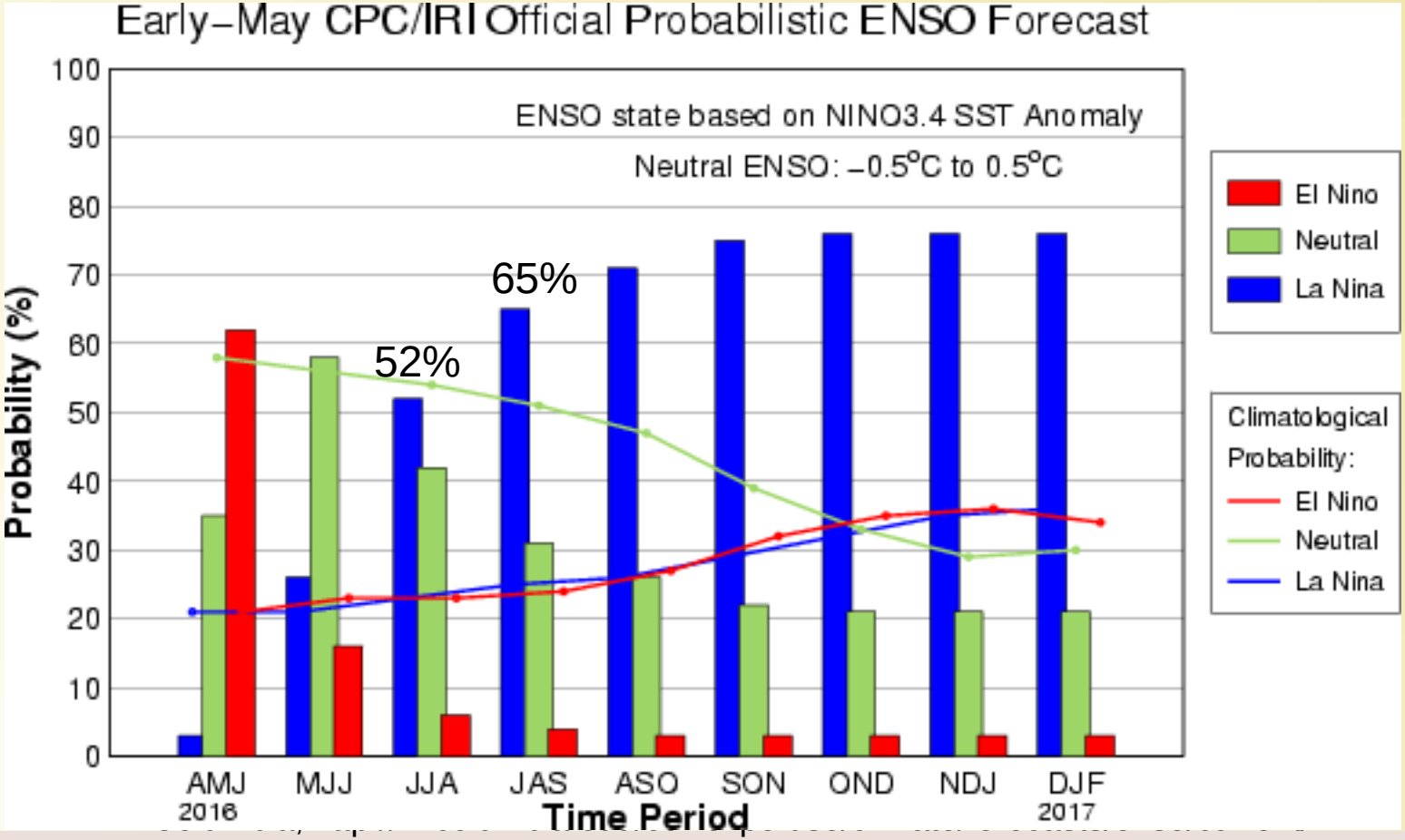


Composite April Temperature of transition El Nino years



April 2016 Temperature

Likelihood of Summer Drought is 39%



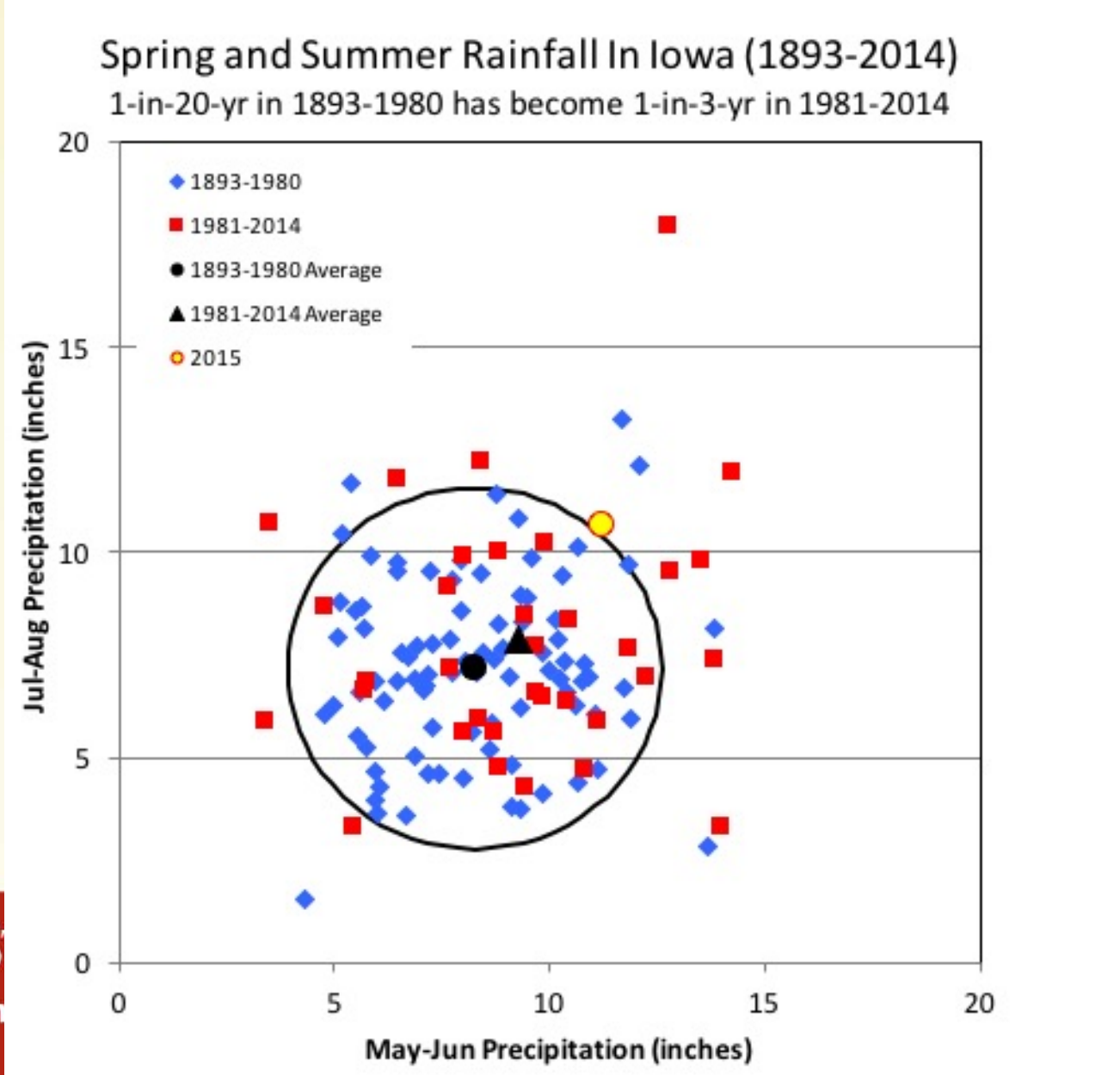
Blue bars indicate probability for La Niña in June-July-August (JJA) or July-August-September (JAS). Drought is 60% likely during La Niña.
65% times 60% equals 39%.

Yield during past El Niño transitions

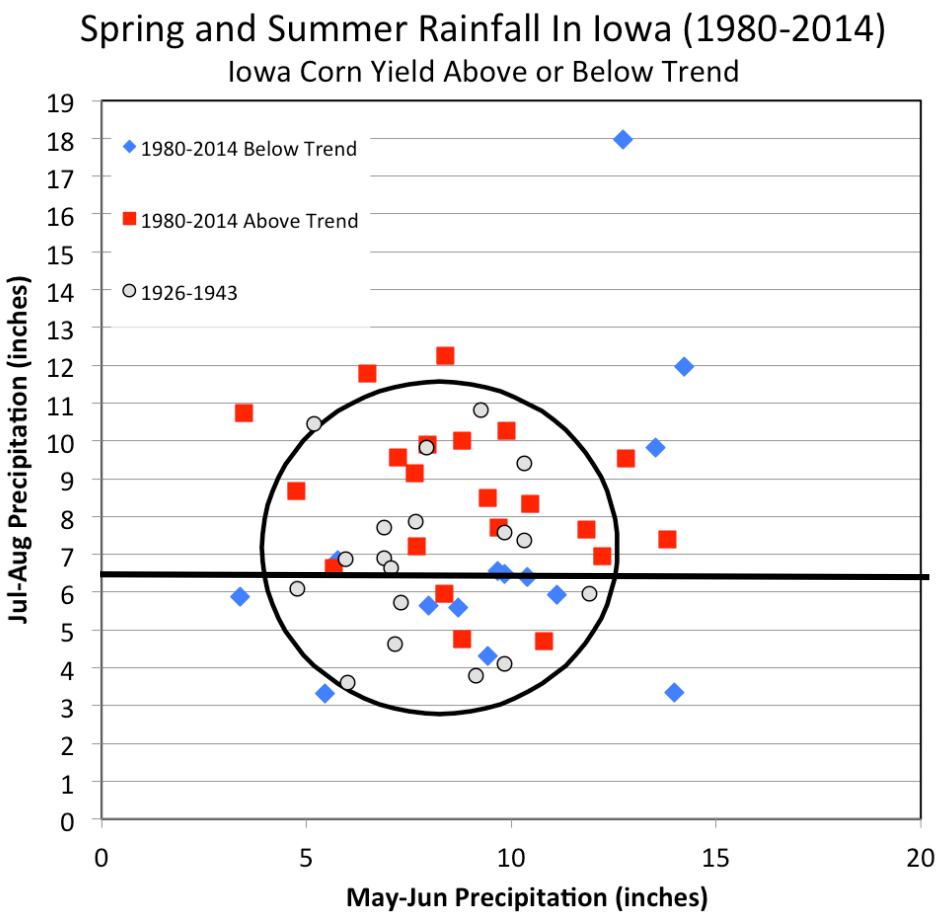
Year	1958	1966	1970	1973	1992	1998	2010	AVG
Soybean Yield	110%	105%	104%	102%	116%	105%	103%	**107%**
Corn Yield	121%	113%	95%	108%	128%	115%	95%	**110%**

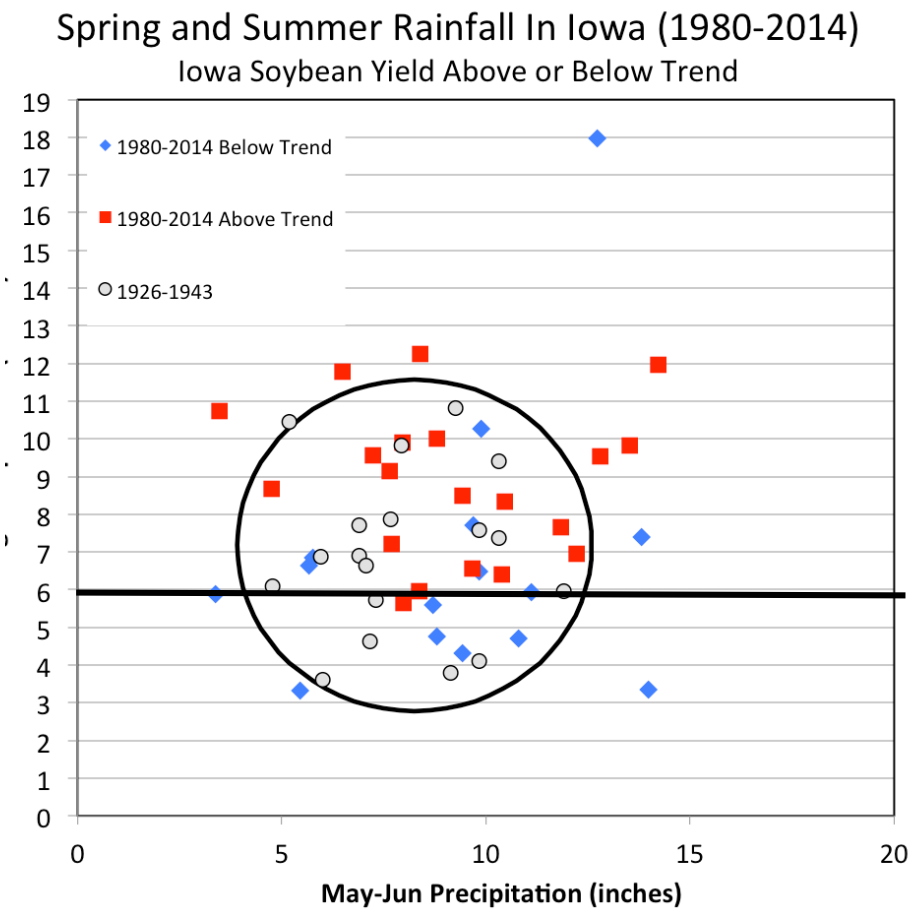
Spring 2016 is a brief reprieve from the longer trend of increasing Spring rainfall

Weird Spring-Summer Rainfall Combinations are much more frequent

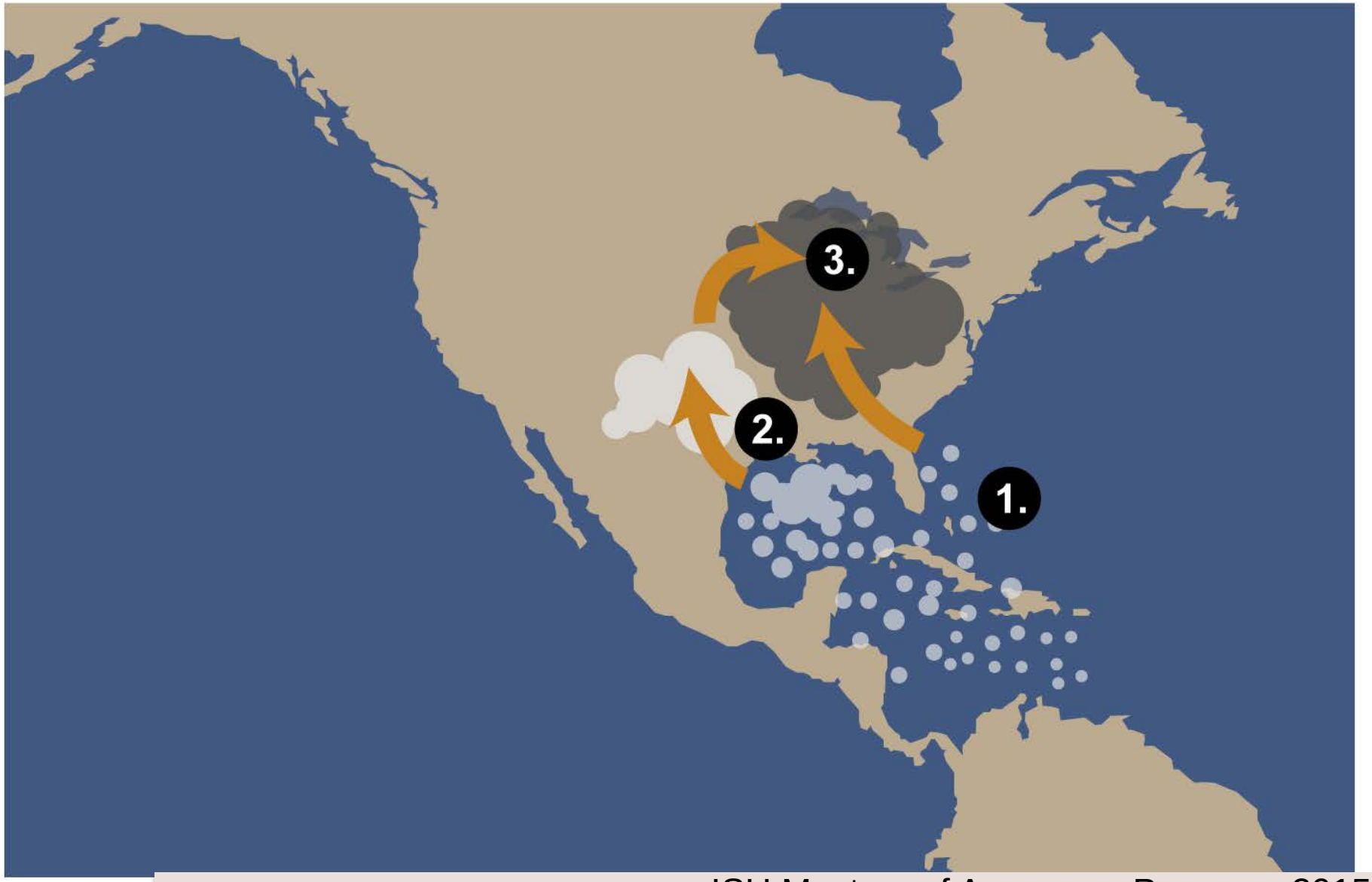


Yield Effect of Weird Spring-Summer Rainfall Combinations



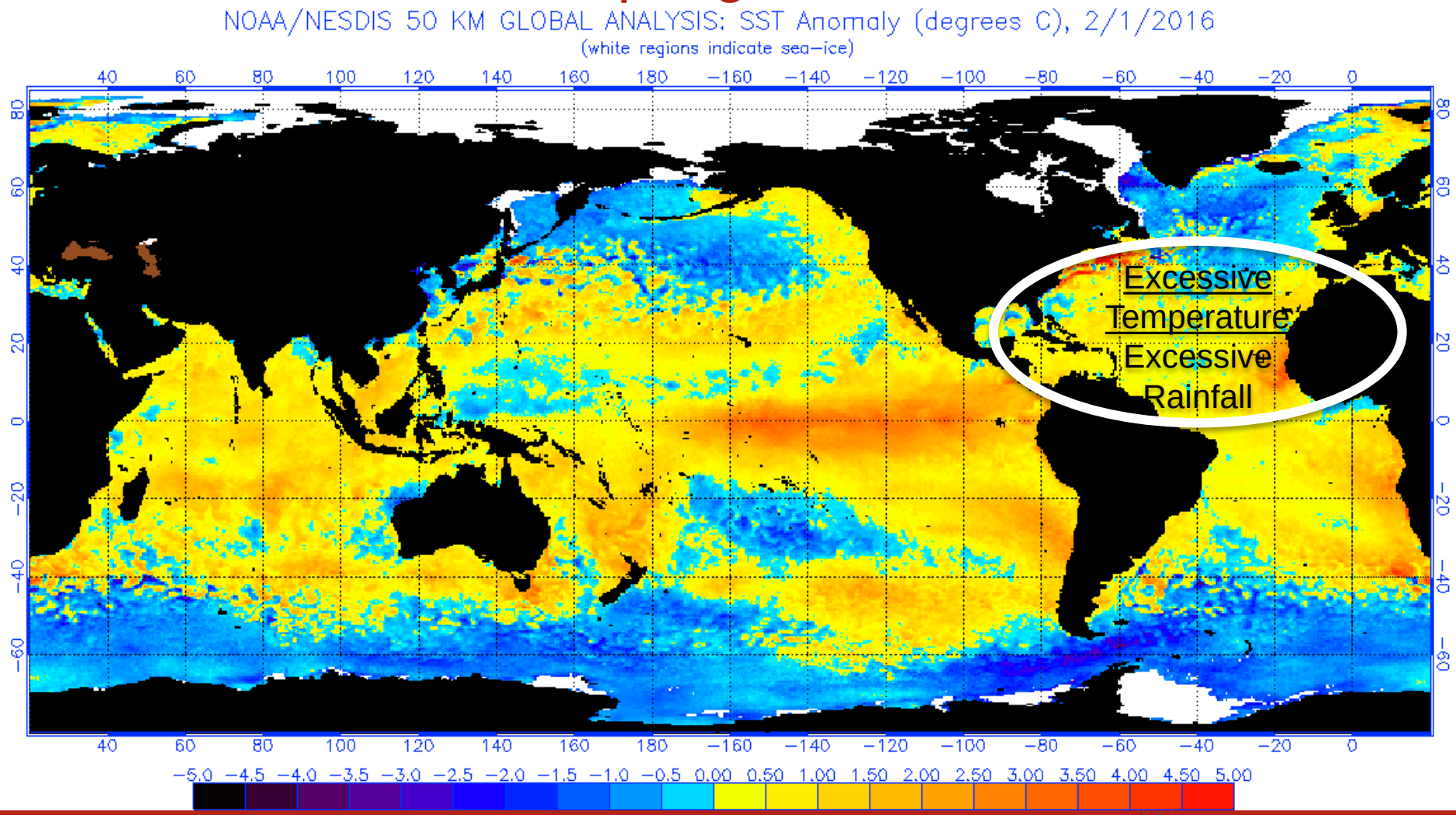


HOW WARM ATLANTIC OCEAN AND MIDWEST RAINFALL ARE LINKED



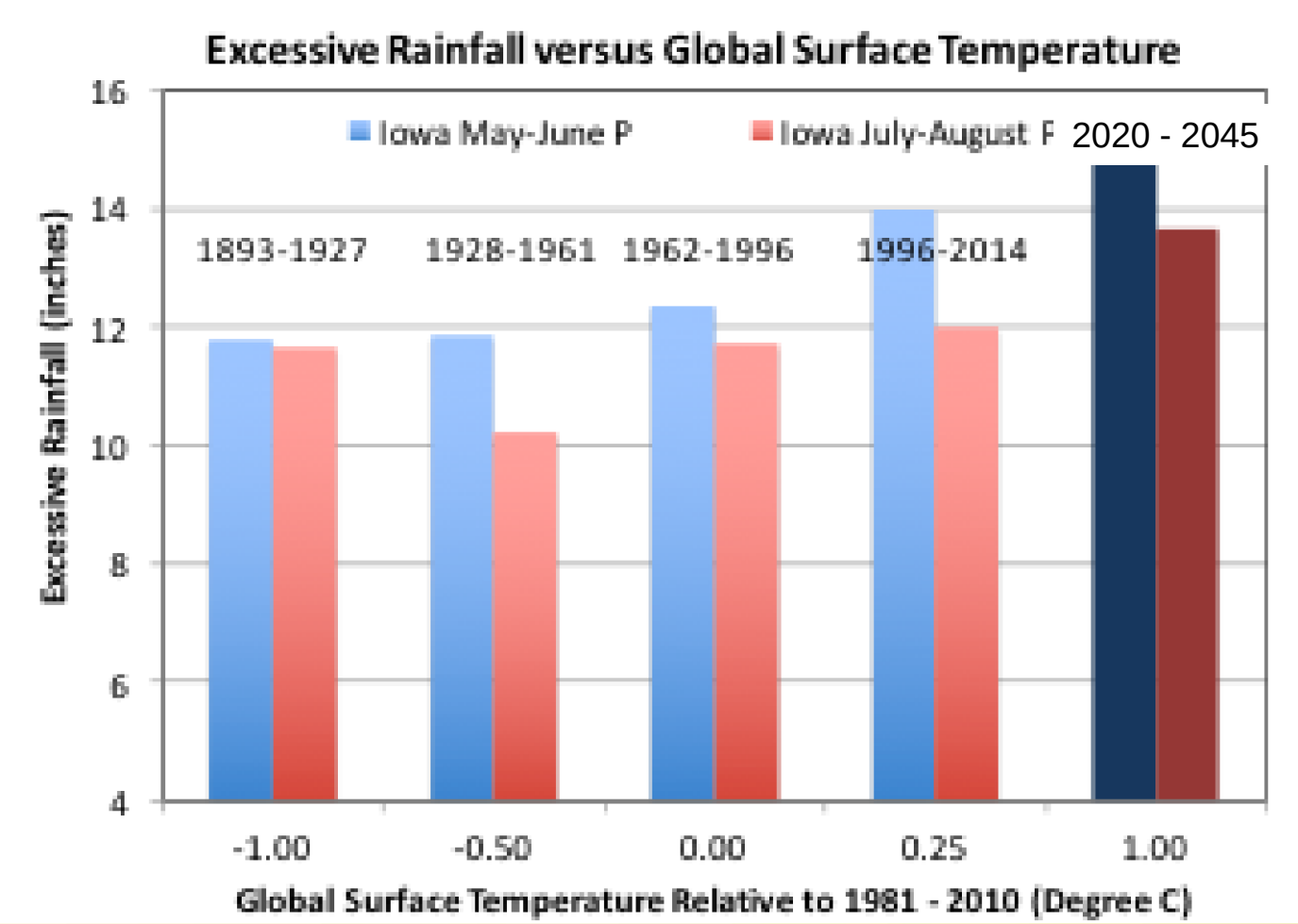
ISU Masters of Agronomy Program, 2015

Excessively Warm Atlantic means Excessive Spring Rainfall in Iowa

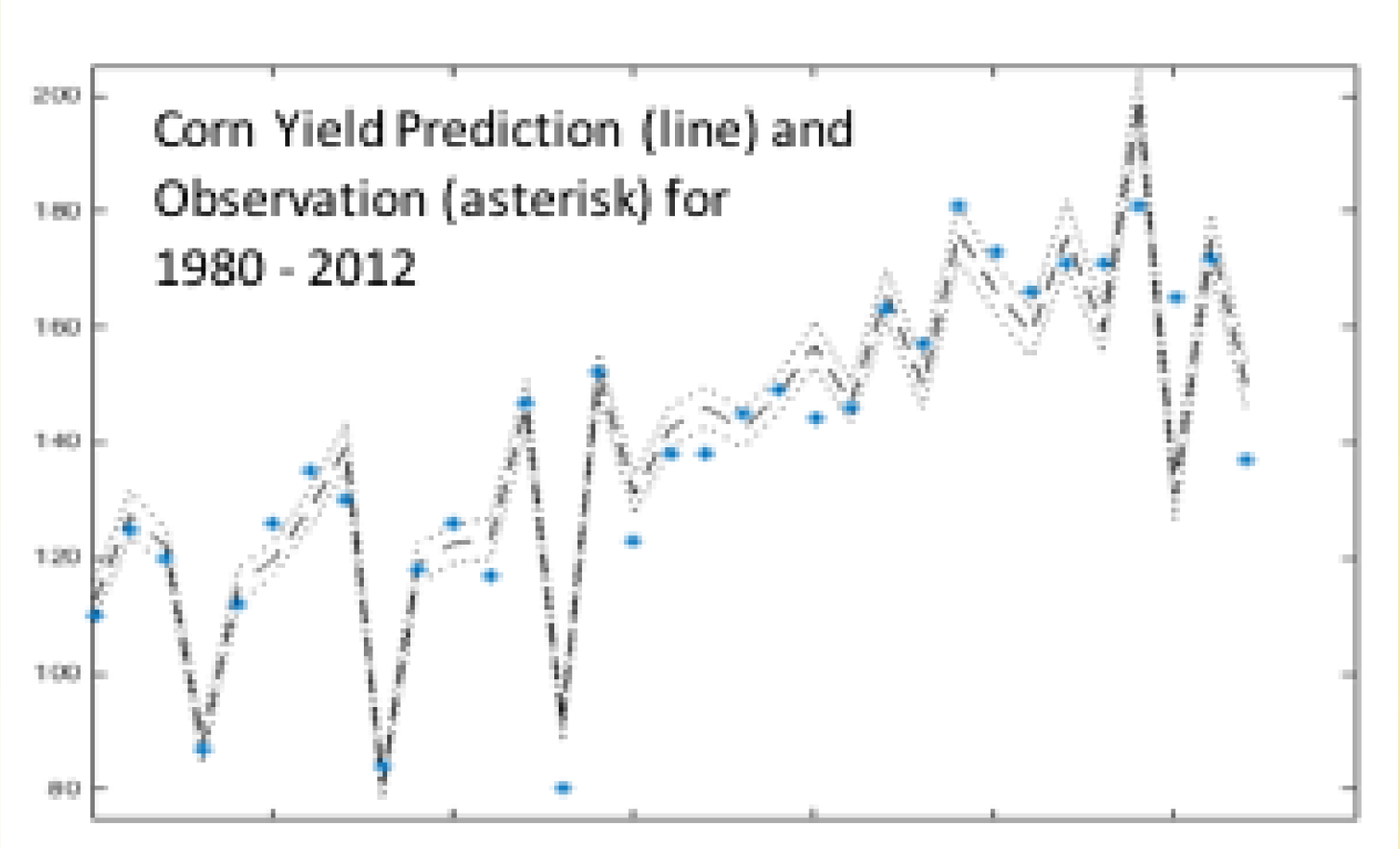


NOAA NESDIS,

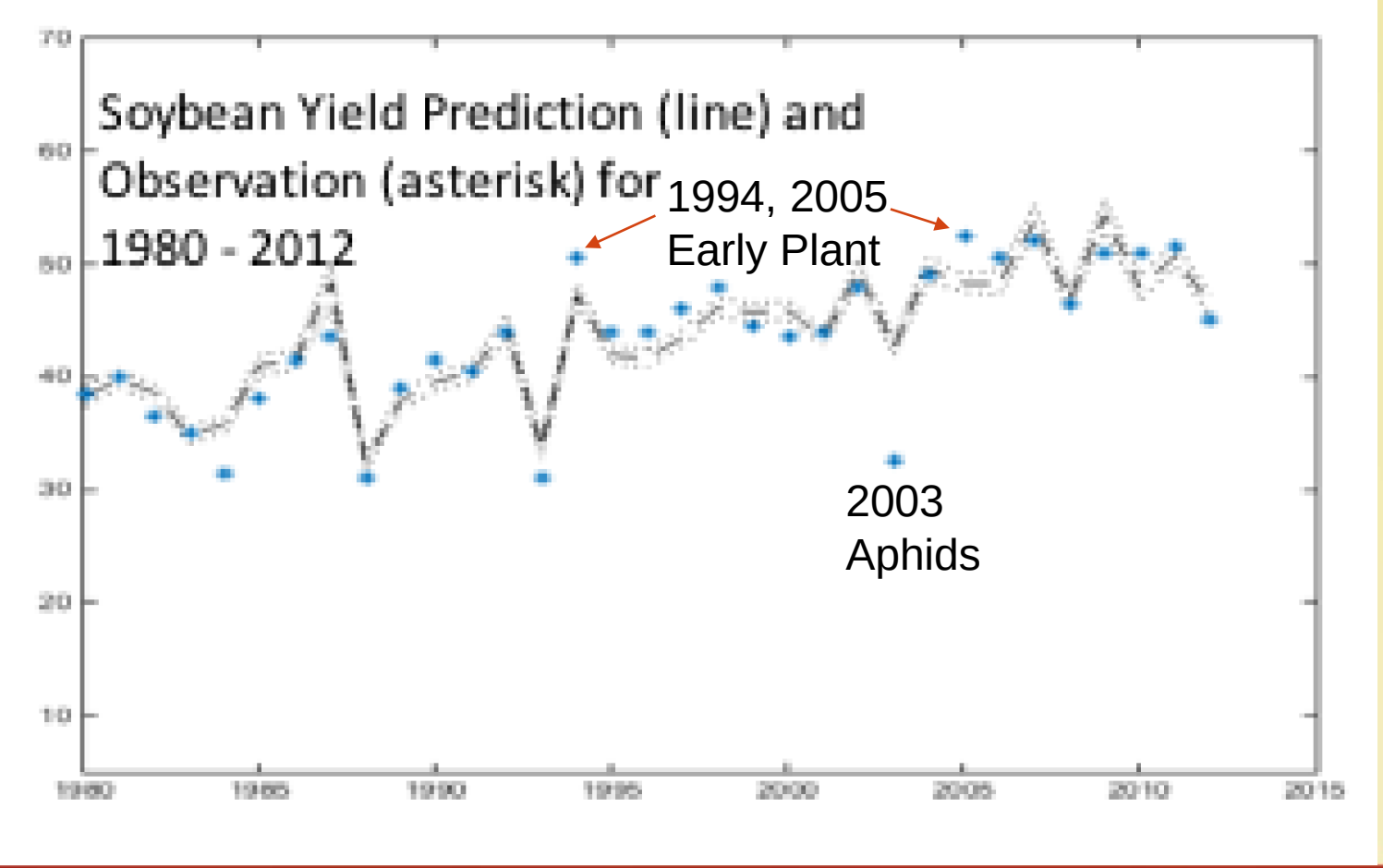
Trend Extrapolation based on Climate Indicators Rather than Calendar Date



Yield Data Model Evaluation: Corn Yield Prediction Within Training Period Shows No Bias and Small Error



Yield Data Model Evaluation: Soybean Yield Prediction Within Training Period Shows Errors from Aphids and Early Planting

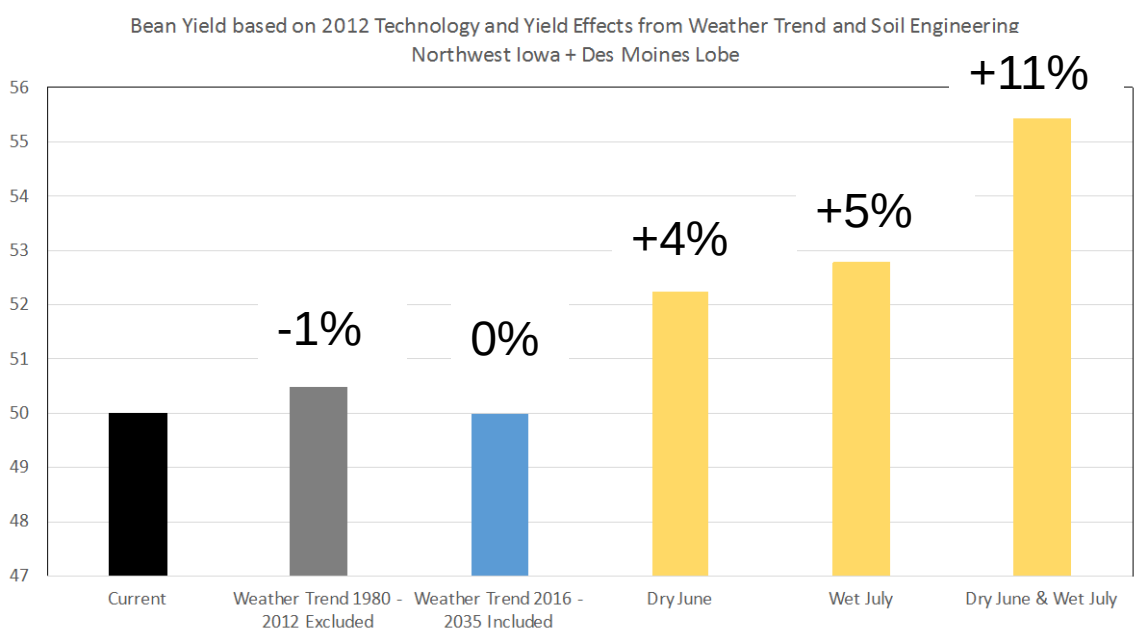


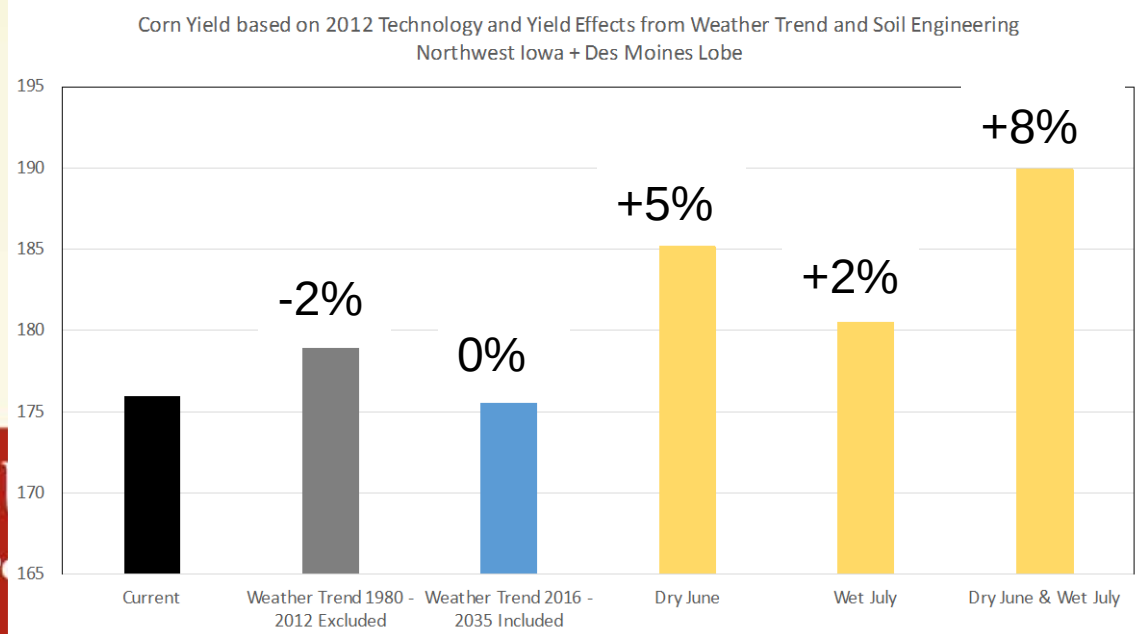
NW Iowa + DSM Lobe Yield Effects

Black minus Gray is Yield Change from May – Jun Rainfall Change

Blue minus Black is Yield Change from weather trend to 2035

Yellow minus Black is Yield Change from soil engineering



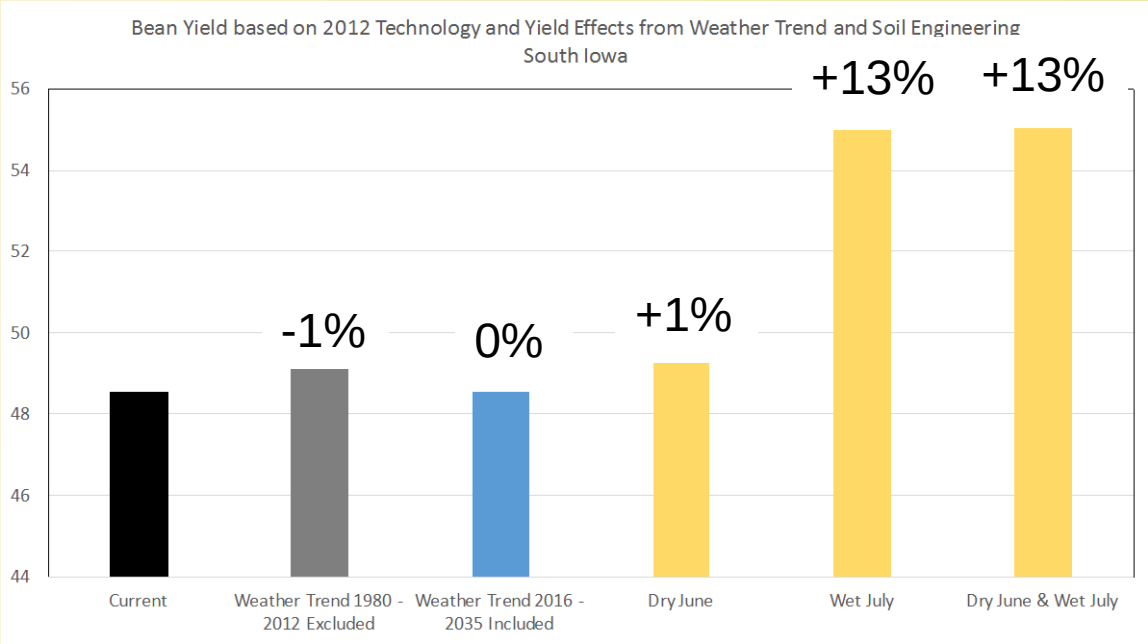


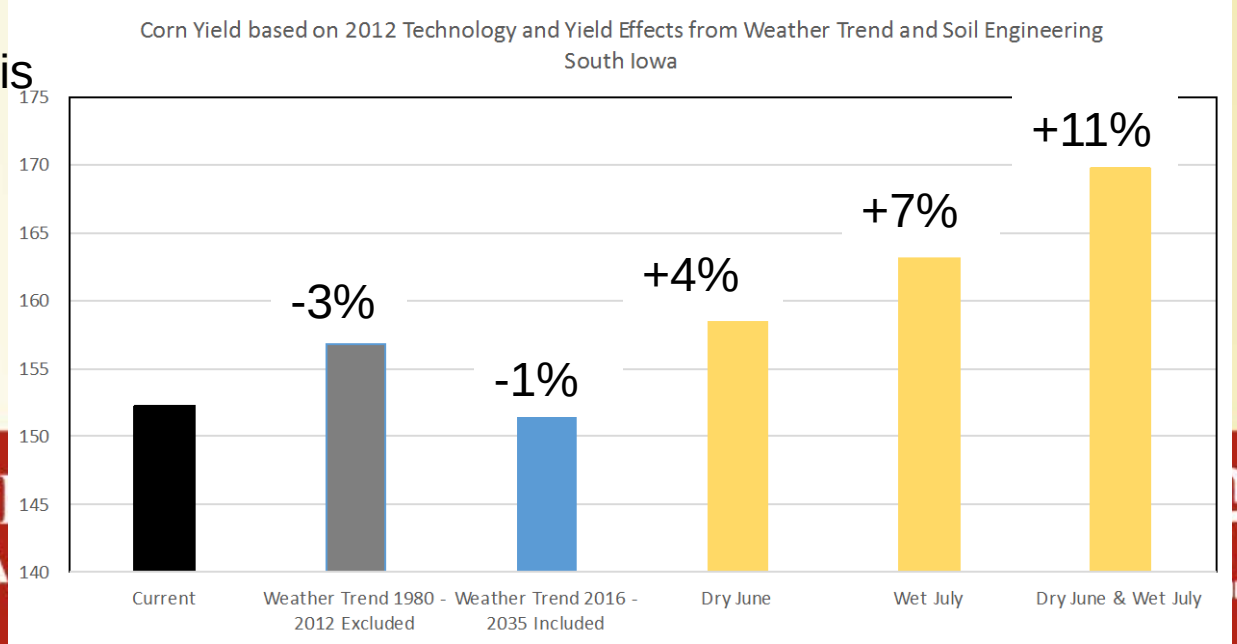
South Iowa Yield Effects

Black minus Gray is Yield Change from May – Jun Rainfall Change

Blue minus Black is Yield Change from weather trend to 2035

Yellow minus Black is Yield Change from soil engineering



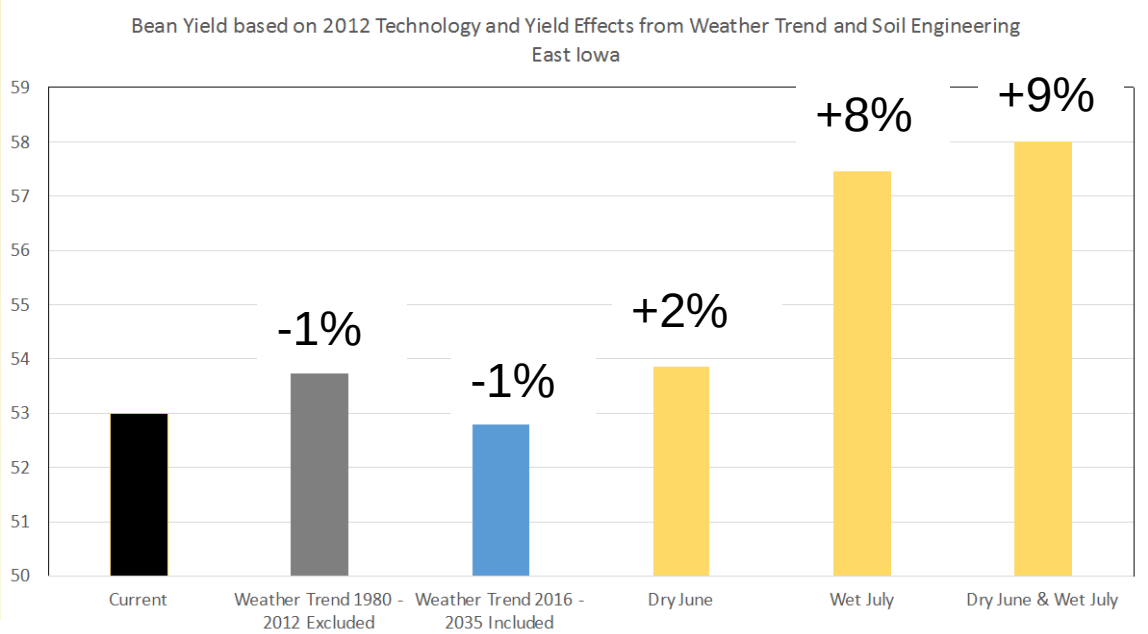


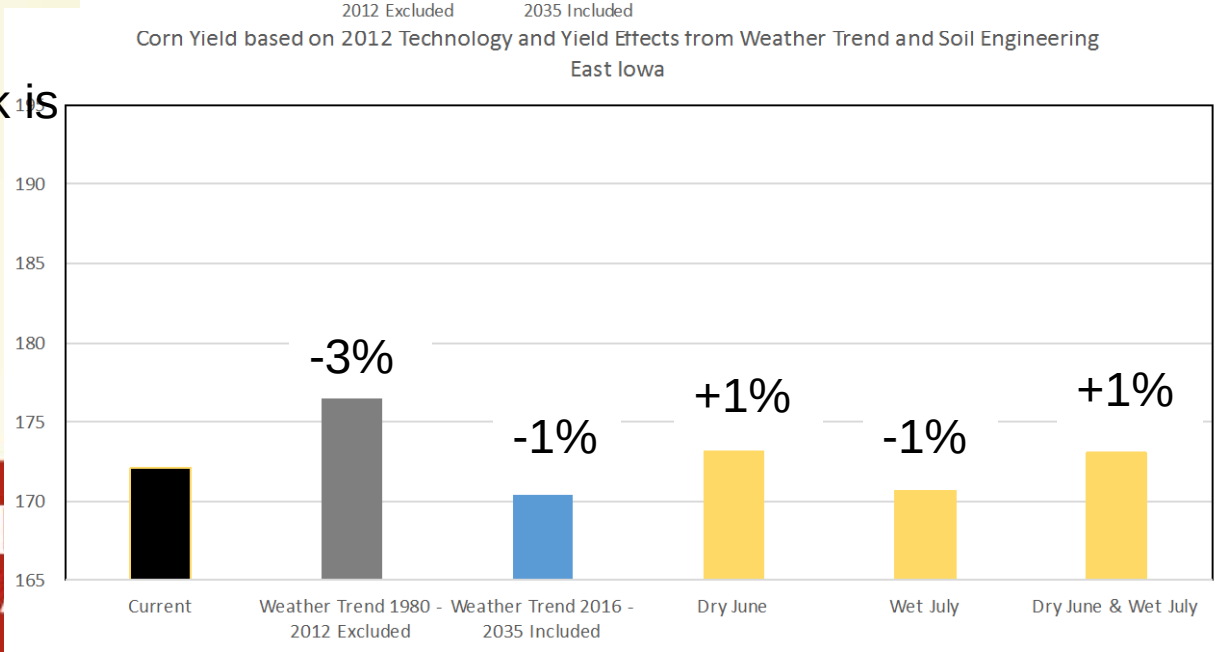
East Iowa Yield Effects

Black minus Gray is Yield Change from May – Jun Rainfall Change

Blue minus Black is Yield Change from weather trend to 2035

Yellow minus Black is Yield Change from soil engineering

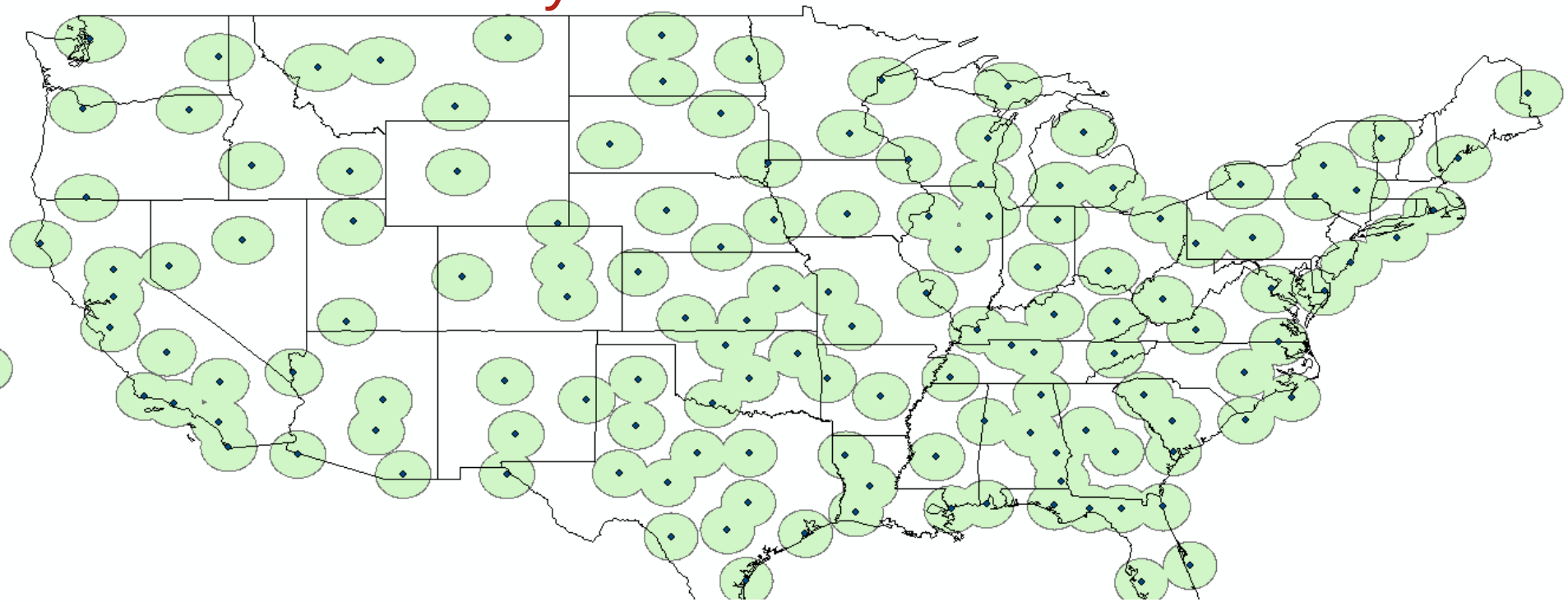




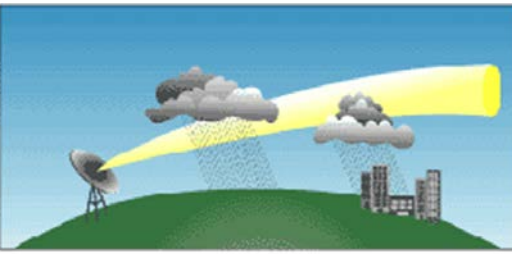
Will the rainfall be more manageable?

Farmers already have the tools they need

Distance from Radar Determines Accuracy of Rainfall Measurement



The radar beam will not sense rain far away from the radar. Instead, it will sense only the mid to upper parts of the cloud.



The effects of curvature of the earth on weather radar compounded by distance

The areas outside of the green circles are sensing clouds 3,000 ft or higher above the ground. This reduces accuracy of rainfall estimate.

Across northwest through northern Iowa, a data gap is very clear. This region could have bias in precipitation estimates. It could be confused for error from wind turbines. It isn't error from wind turbines because the radar measurement is made more than 3,000 ft above the ground.

Radar Rainfall Estimates

- Radar estimates rainfall over areas larger than your field. It will never match a rainfall gauge in your field.
  - Some services provide a rainfall variability estimate to go along with the estimate of rainfall amount.
- Hourly, real-time rainfall amount are least reliable.
  - NWS produces hourly rainfall on 1.1 mile grid for flash flooding and urban flooding, not for cumulative rainfall effects.
  - Appropriate use for ag: terrace washout, grassed waterway, creek flooding
- Daily totals are best from a multi-sensor analysis that may take a few days to complete.
  - NOAA will release a new historical analysis with 10-minute, 0.6 mile data for 1998 – 2012.

Overviews of Radar Meteorology:
https://www.wunderground.com/radar/help.asp?MR=1
http://weather.cod.edu/sirvatka/radar.html
https://en.wiki2.org/wiki/Weather_radar

Nitrogen Return on Investment

What you should pay for these services depends on what profit you can make by using them. Consider a nitrogen advisor example and adapt it to scope the potential benefit for your operations.

- 180 -> 150 lbs/acre nitrogen
- 30 lbs/acre * 0.60 = $18/acre

- If Nitrogen Advisor could guarantee $18/acre savings without yield loss, I would not pay more than $3-5/acre for this advice. The ROI would be approximately 2 – 3.

Field Trafficability ROI

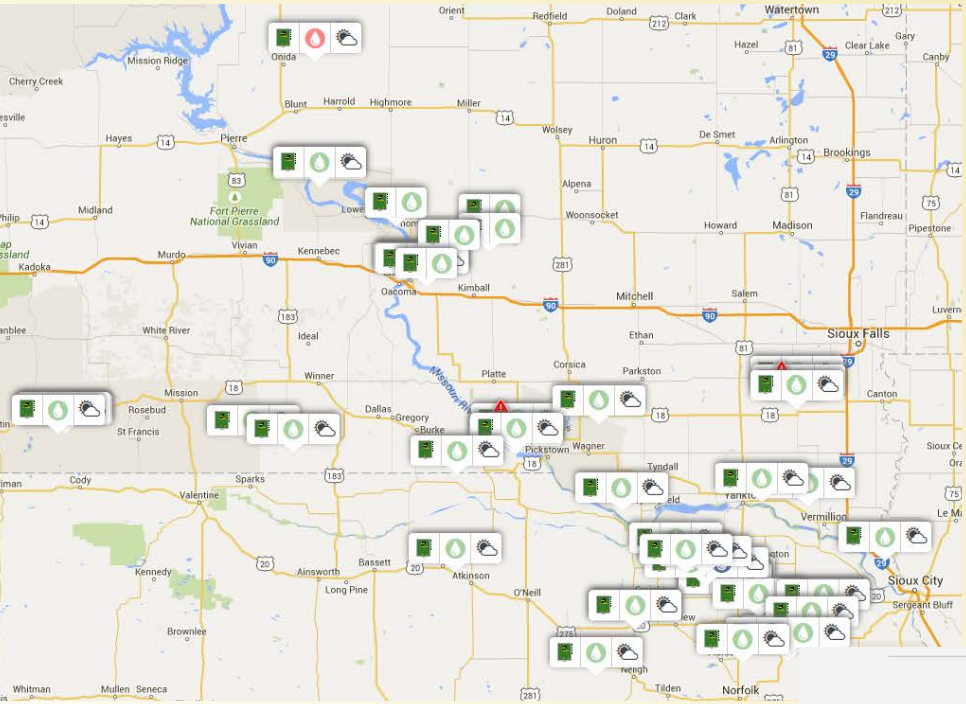
- Consider a field that is 35 miles away, which means a 70 mile round trip to scout for excessive wetness, pests, etc.
- 70 miles @ 15 mpg * $2.00 per gallon is $10.66.
- If Field Trafficability Advisor could guarantee $10.66 savings per 100 acre field, then you would need to avoid 10 trips per year to make your money back at $1/acre. I would not pay more than $1/acre for this advice. For prices below $1/acre, the ROI would be approximately 2 – 3.

Before Considering These Services

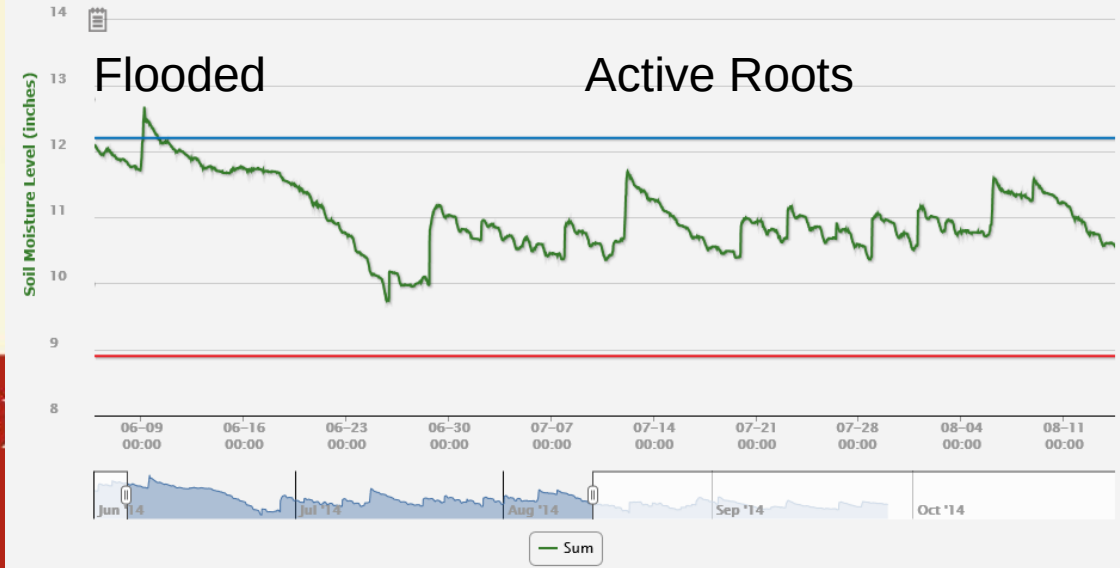
- Go through the decisions/actions that could use weather and agronomic advisors.

- Determine potential savings/benefits for each decision/action and get a rough ROI for different levels of cost per acre for the advisor services.

Soil Moisture Sensor Networks



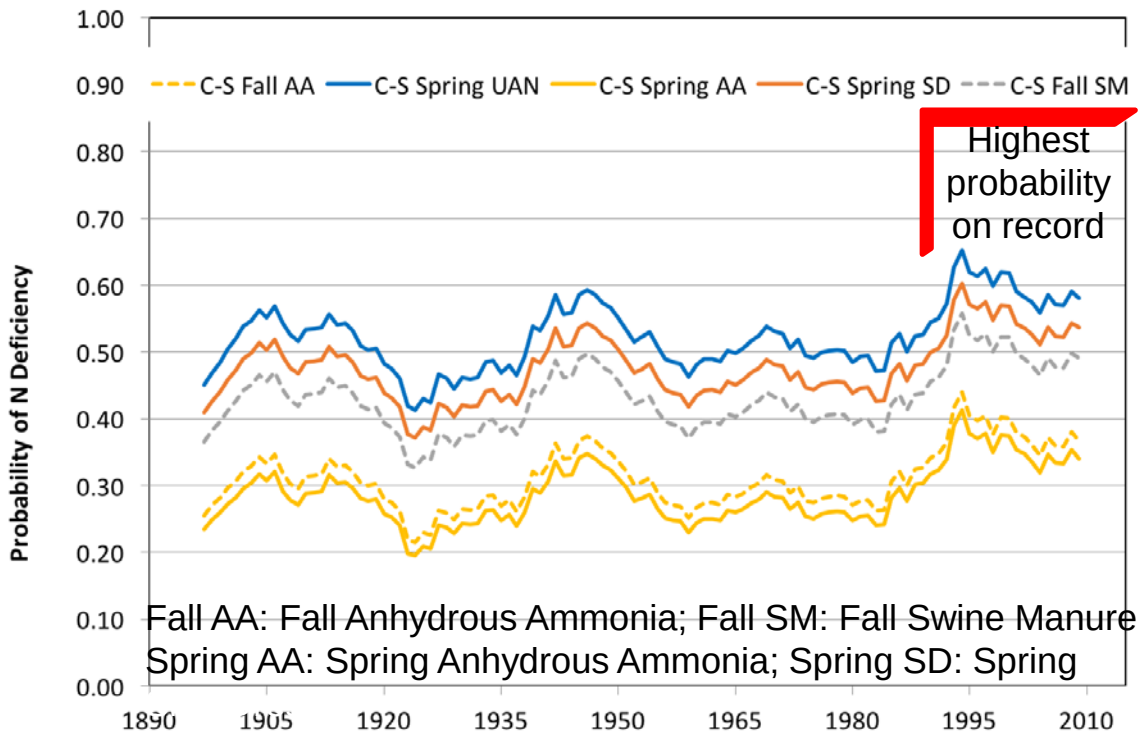
- Soil Moisture Sensors translate the rainfall data into agronomically interpretable data.
- The plot below shows a flooded field (nutrient loss?) and, later, roots that are actively taking up nutrients.



IOWA STATE UNIVERSI
Department of Agronomy

Who do you ask for guidance when no one has experienced this level of risk?

Webster City Illustration of Nitrogen Risk Deficiency Probability
Current probability of nitrogen deficiency is highest on record dating to 1893.



Fall AA: Fall Anhydrous Ammonia; Fall SM: Fall Swine Manure
Spring AA: Spring Anhydrous Ammonia; Spring SD: Spring

- Iowa Soybean On-Farm Network® nitrogen strip trial data (2006 – 2014) used to develop probability model for corn stalk nitrogen deficiency test given May – June rainfall. Higher probability means higher likelihood of test results being classified as deficient nitrogen status.
- Probability model used to simulate historical years 1893 – 2005, using weather data from Webster City.
- 10-yr moving average for 5 nutrient practices for Corn following Soybean (C-S) at median application rate from survey of growers participating in strip trials.

http://www.isafarmnet.com
Select “Nitrogen Deficiency Tool’

Adaptation Intentions in Response to Increased Extremes

Practices	% Decrease	% Don't Know	% Stay the Same	% Increase
No-till	1.6	12.7	48.0	24.4
Diversifed Rotations	1.5	22.0	50.9	12.6*
Canopy Sensors	1.3	42.5	24.6	14.2*
Edge-of-field conservation	1.8	18.7	52.1	14.5*
Control structures for drainage	1.0	29.5	38.3	17.1*
Reduced Tillage	2.2	13.9	49.6	19.8*
Cover Crops	0.9	25.3	38.0	21.7*
In-field structural conservation	0.3	8.1	53.6	26.3*
Nutrient Management	0.4	4.3	53.6	30.1*
IPM	0.3	5.6	50.8	30.8*
Subsurface tile or other drainage	1.0	11.4	31.5	43.2*
Irrigation	3.0	33.4	37.5	7.1*
Irrigation BMPs	2.1	37.4	32.5	8.6*

A way to take control

New farm pond recycles drainage water

Iowa farmer builds profitable pond to capture excess water that feeds five center pivots. Nov 19, 2015 Jim Ruen | Corn+Soybean Digest

The sun sets on Eastern Iowa farmer Jim Sladek's new 18-acre pond he built to capture and recycle drain tile water through his pivot irrigation rigs. Photo: JCS Family Farms
http://cornandsoybeandigest.com/conservation/new-farm-pond-recycles-drainage-water

Rainfall will continue to increase in Spring. Will it be manageable?

- Climate trend through 2045 means odds favor increase in humidity and spring rainfall resulting in
  - 10-15% reduction in suitable field work days
  - 4-5% corn yield reduction and 1-2% soybean yield reduction since mid 1990s
- Additional spring rainfall would be supportive of higher corn plant density.
- Additional protection of the soil and soil surface is needed today.
- Intensive water management could produce yield increase larger than climate trend yield decrease