



QUALITY OF THE UNITED STATES SOYBEAN CROP: 2019

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NORTH ASIA REGIONAL



UNIVERSITY OF MINNESOTA

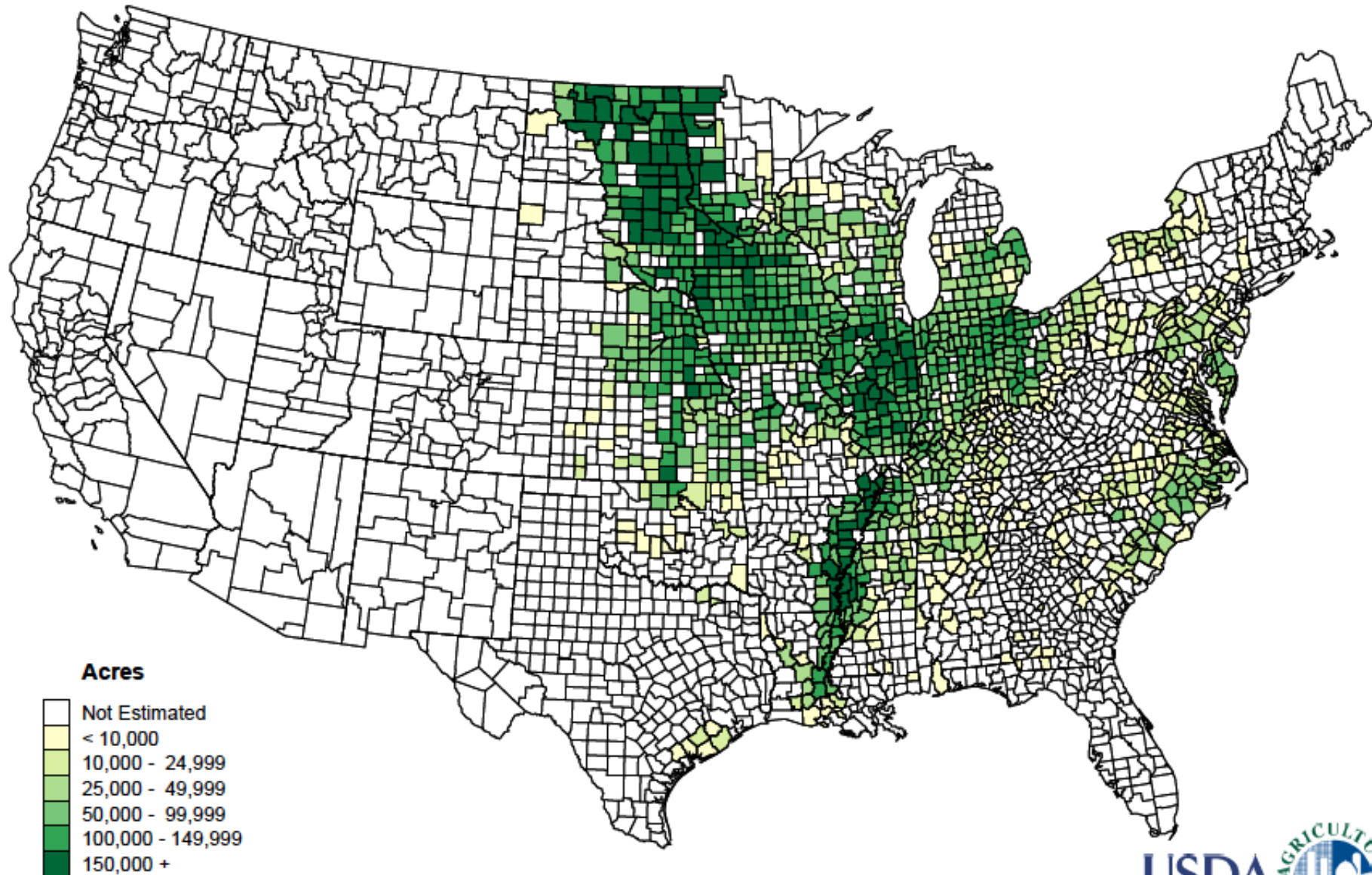


OUTLINE



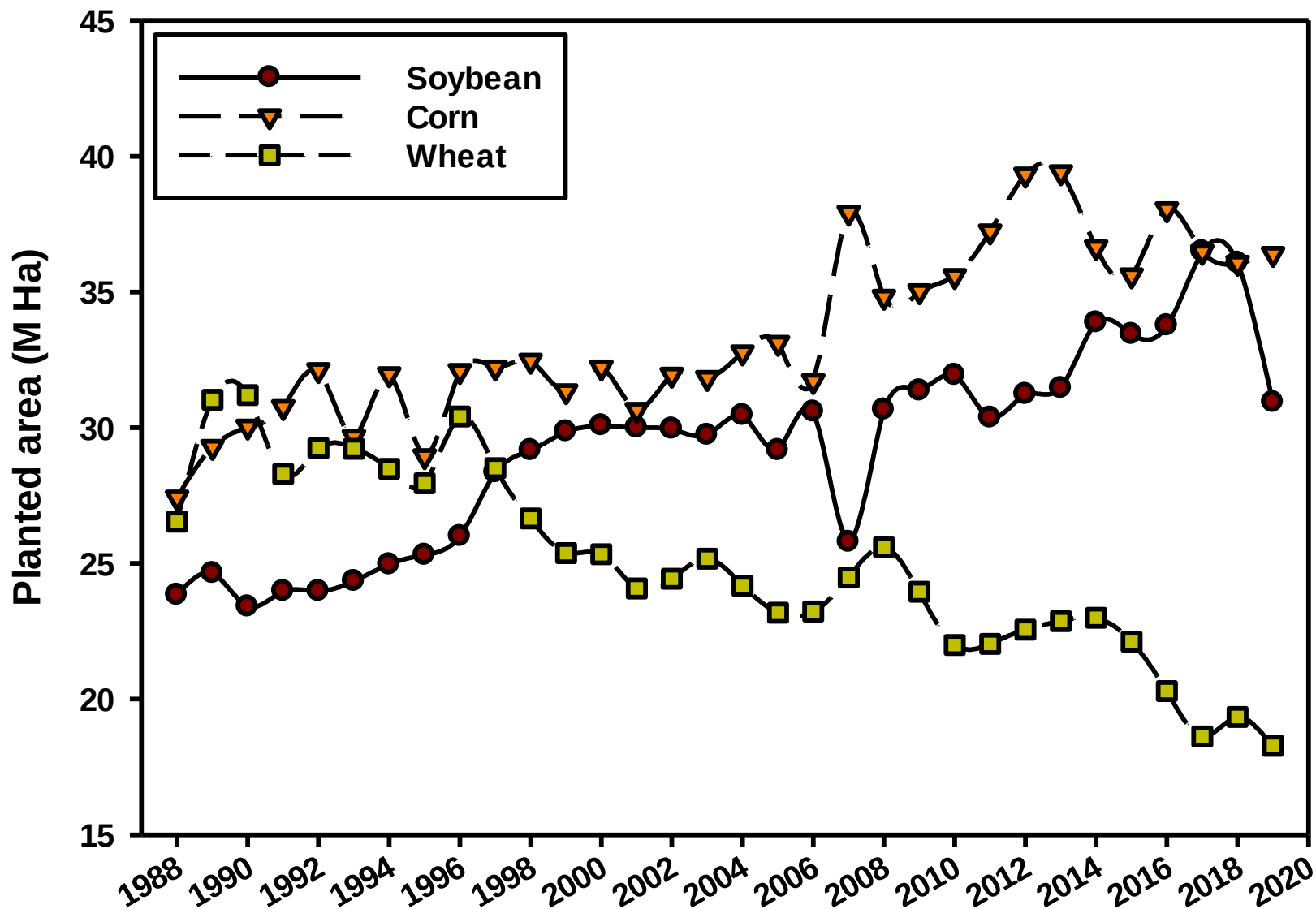
- 2019 Growing season
- Historical protein and oil variation
- 2019 survey results

U.S. SOY FOR A GROWING WORLD



U.S. Department of Agriculture, National Agricultural Statistics Service

Soybean, Corn, and Wheat in the US (planted ha)



A close-up photograph of soybean pods hanging from a stem. The pods are dark brown and covered in fine, light-colored hairs. The background is a soft, out-of-focus brown, suggesting a field of mature soybeans.

THE 2019 GROWING SEASON

2019 GROWING SEASON

- The big stories of 2019 included
 - Excess spring rains
 - Quantities of rainfall were at record or near record levels
 - Duration of this rainy period was long (4-6 weeks) and bracketed the planting period
 - Distribution of this anomaly was extremely broad
 - Mid-season drought was relatively confined
 - Excess rains returned to most of the Northern Corn Belt before and throughout harvest

2019 GROWING SEASON

- Spring conditions
 - The excess rain events in the spring delayed planting across much of the Midwest.
 - Large and broad rain events caused flooding of minor rivers affecting farms directly and impacted shipping along major waterways.

2019 GROWING SEASON

- Prevent Plant
 - Due to heavy rainfall, large numbers of acres across a very broad geography could not be planted to soybean or other crops.
 - 7.9 M Ha of US farmland was left unplanted
 - 1.8 M Ha of soybean

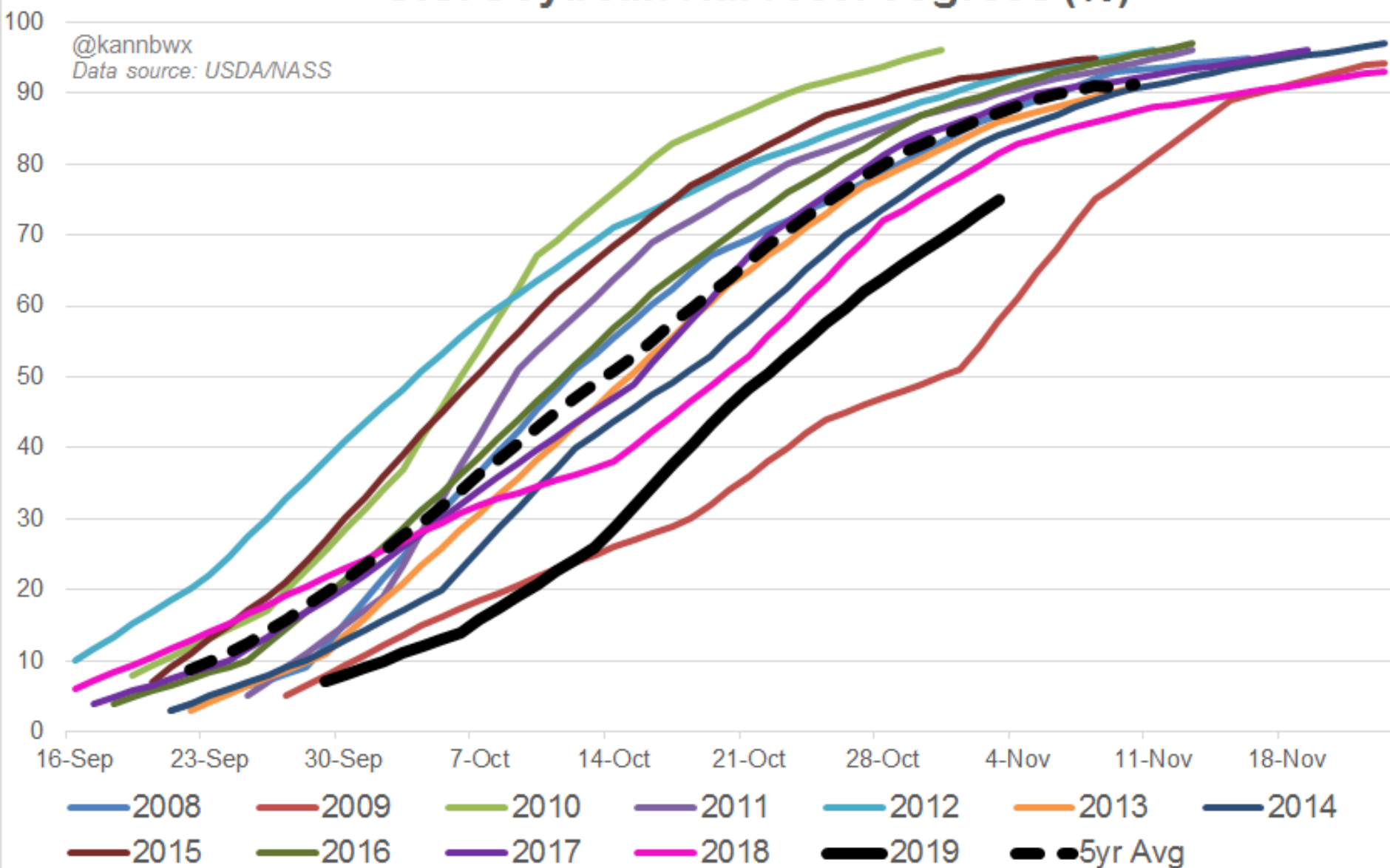
2019 GROWING SEASON

- Mid-season and fall conditions
 - Crop development was delayed throughout the summer in most states due to delayed plantings.
 - Crop development tended to 'catch up' across the "I-states" and Ohio where excess rainfall was limited and temperatures tended to be above average.
 - Crop development in the Dakotas continued to lag far behind normal due to excess rain and limited temperatures.
 - Heavy and broad rain events in the Northern states severely delayed harvest in these states.

U.S. Soybean Harvest Progress (%)

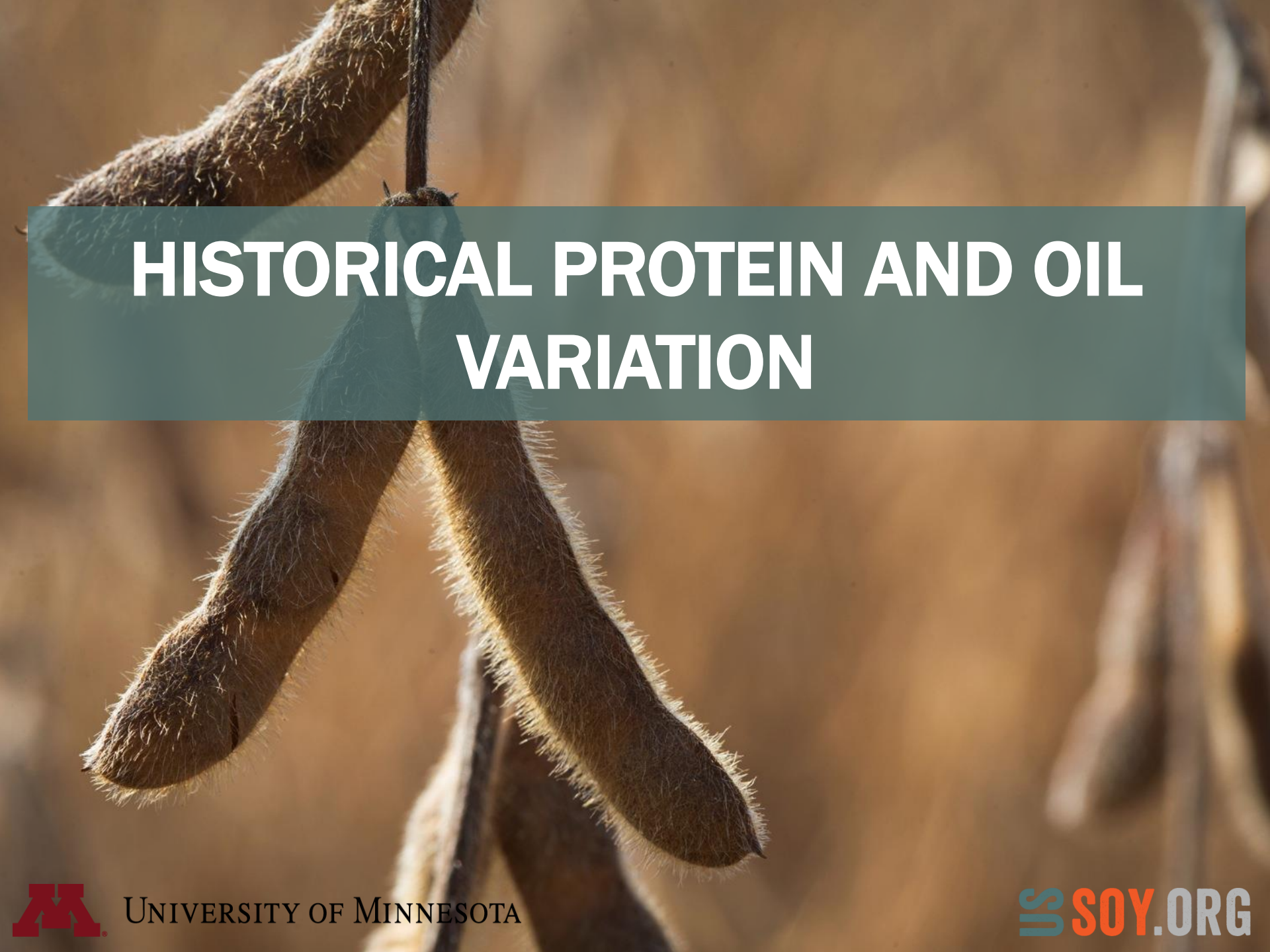
@kannbwx

Data source: USDA/NASS



SOYBEAN YIELDS OCTOBER USDA REPORT

- **Total production of 96.7 M MT**
 - Production will decrease by 20% from 2018
 - Harvested area decreased by 14%
 - to 30.6 M Ha
 - Yields decrease by 7.3% from 2018
 - to 3.5 MT/ha
 - Smallest crop since 2013

A close-up photograph of several soybean pods hanging from a stem. The pods are brown and fuzzy, with fine hairs visible. The background is a soft, out-of-focus brown. A semi-transparent teal banner is overlaid across the middle of the image, containing the title text in white.

HISTORICAL PROTEIN AND OIL VARIATION



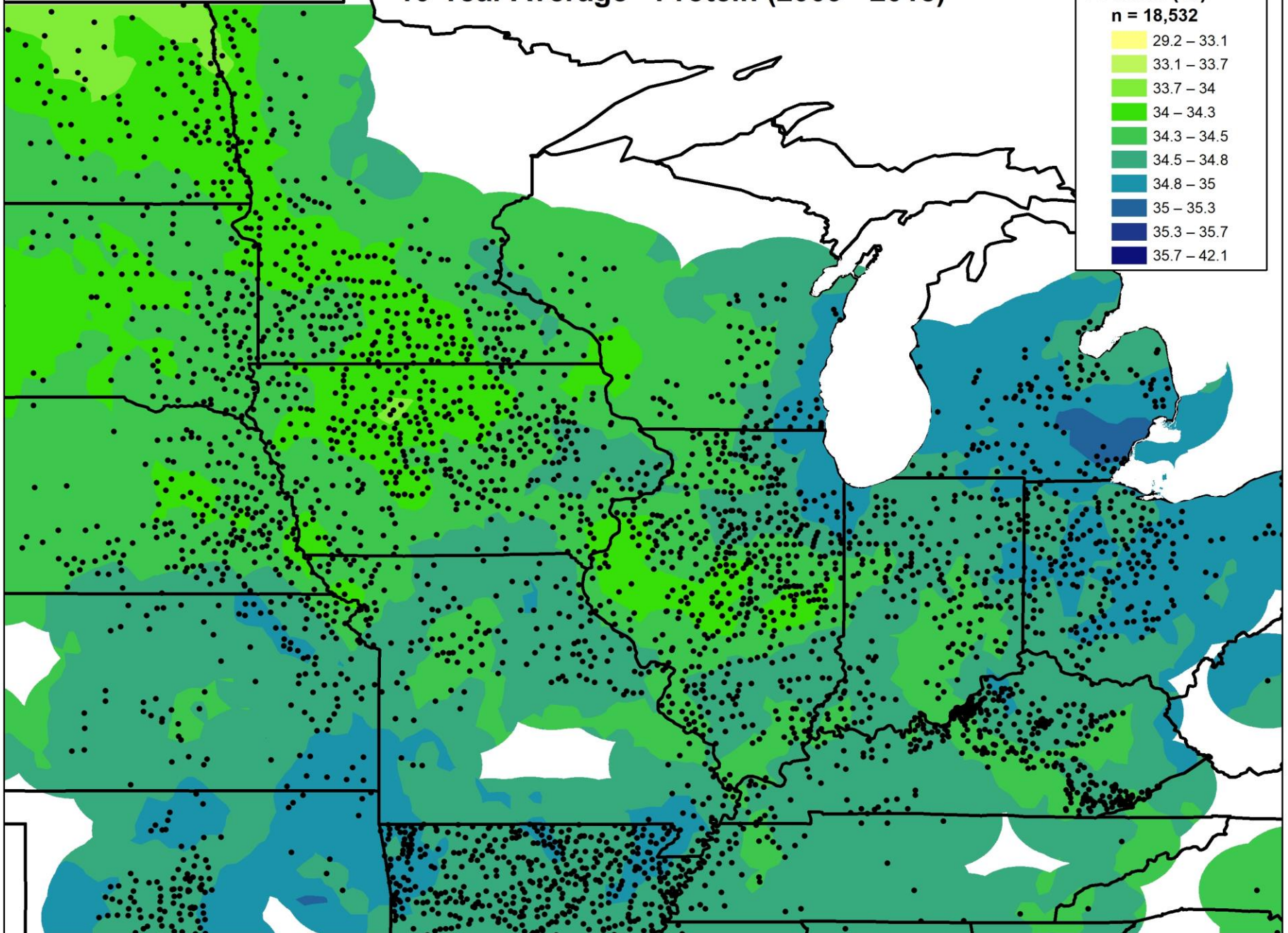
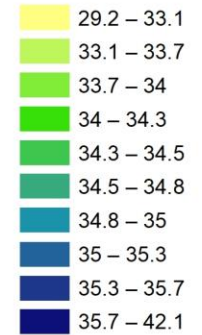
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 **SOY.ORG**

10-Year Average - Protein (2009 - 2018)

Protein (%)

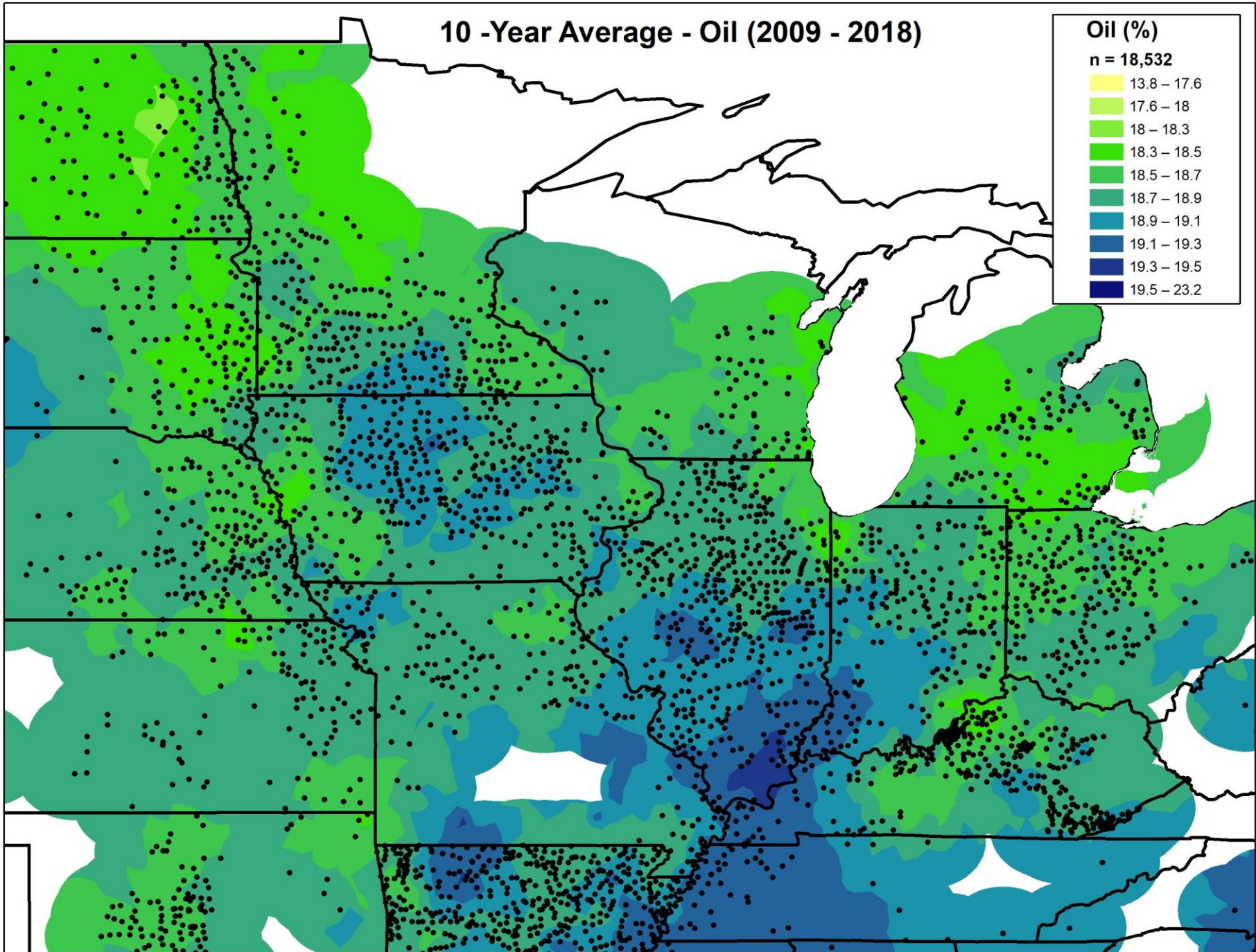
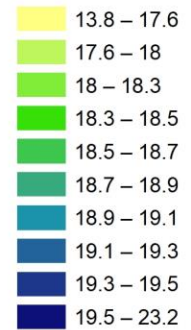
n = 18,532



10 -Year Average - Oil (2009 - 2018)

Oil (%)

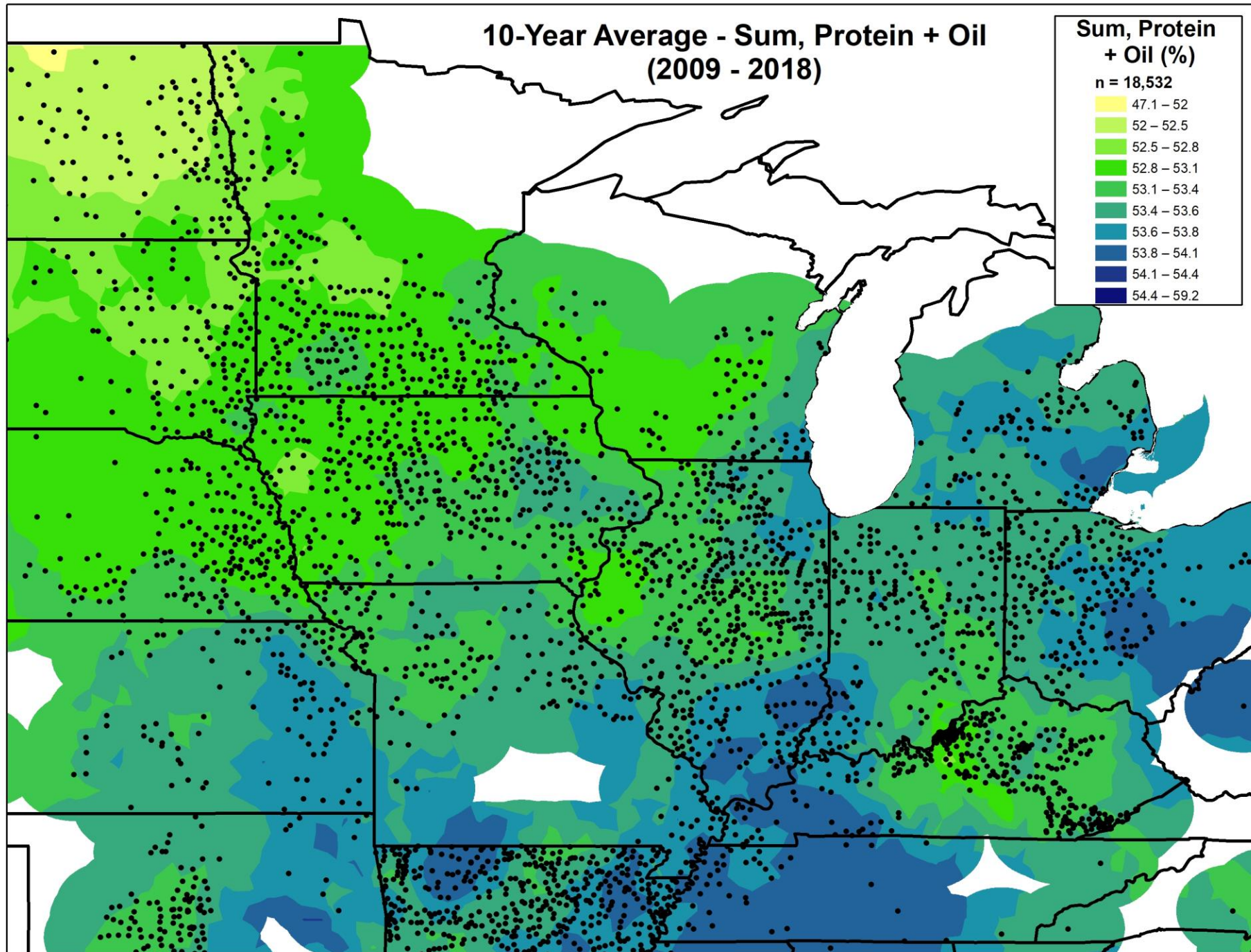
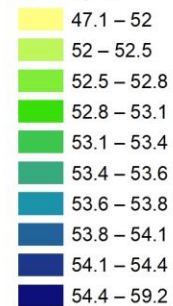
n = 18,532



10-Year Average - Sum, Protein + Oil (2009 - 2018)

Sum, Protein
+ Oil (%)

n = 18,532



ENVIRONMENTAL IMPACTS ON SOYBEAN PROTEIN AND OIL

- Location-specific environmental impacts (latitude, climate, and soil type) affect long-term quality trends
- However, annual variation in weather patterns affects year-over-year variation in soybean quality
- Rainfall patterns appear to have the greatest impact on soybean quality
 - Excessive rainfall early in the season appears to reduce protein deposition in the seed
 - Drought conditions during the seed-filling stages exacerbate this condition

A close-up photograph of soybean pods hanging from a stem. The pods are brown and fuzzy, with a dark stem running through them. The background is a soft, out-of-focus brown.

2019 SURVEY RESULTS

A close-up photograph of soybean pods on a stem, with a semi-transparent teal banner across the middle containing the text 'PROTEIN AND OIL'.

PROTEIN AND OIL

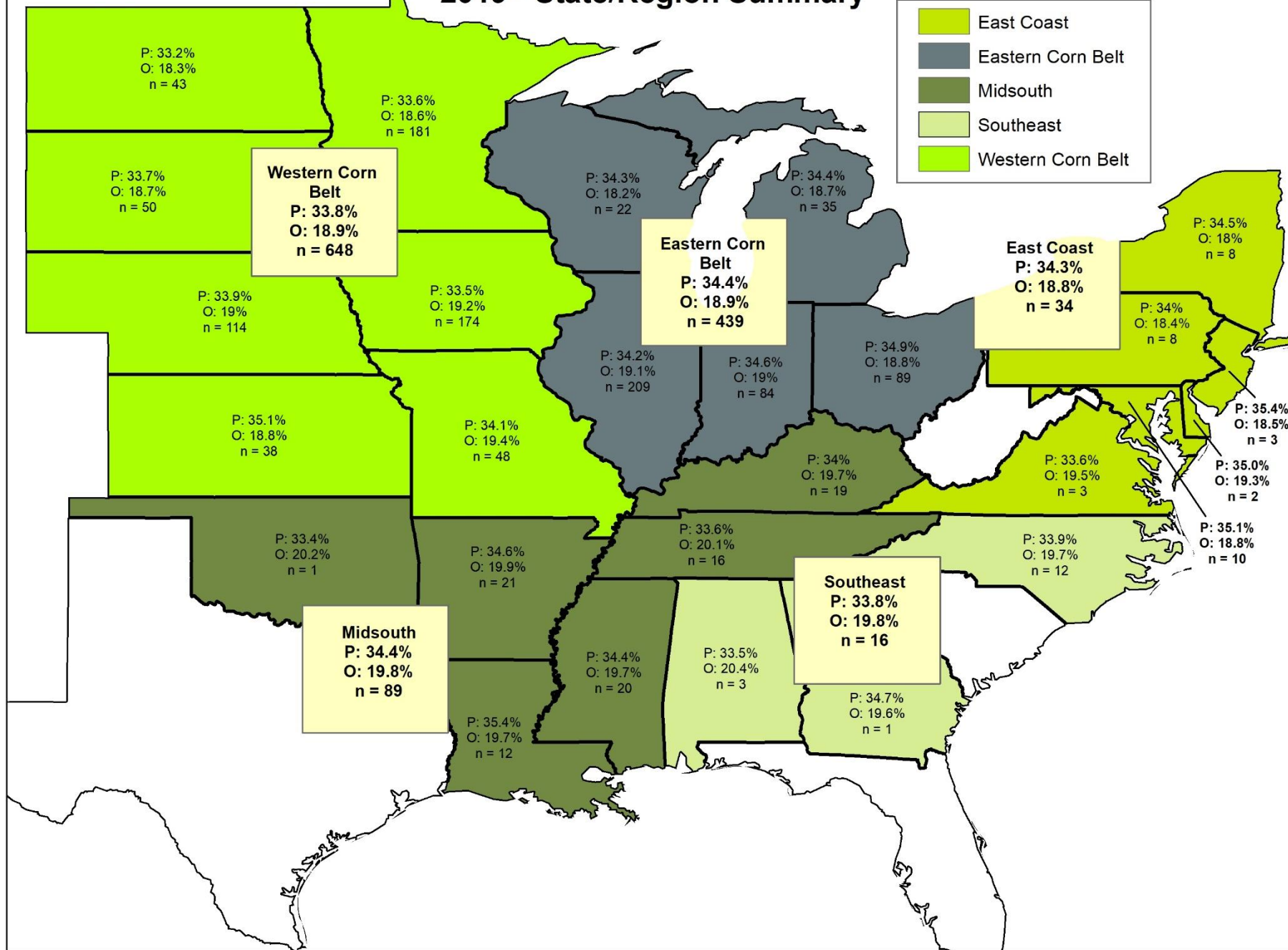
Region	Number of Samples	Protein (13%)	Change from 2018	Oil (13%)	Change from 2018	Seed Weight (g/100 seeds)
US Average	1,226	34.1		19.0		17.1
Average of 2019 Crop [†]		34.1	-0.2	19.0	+0.1	16.9
US 2009-2018 Average [†]		34.6		18.9		

[†]US average values weighted based on estimated production by state, as estimated by USDA, NASS Crop Production Report (October, 2019)

U.S. SOY FOR A GROWING WORLD						
Region [†]	Number of Samples	Protein (13%)	Change from 2018	Oil (13%)	Change from 2018	Seed Weight (g/100 seeds)
Western Corn Belt	648	33.8	-0.2	18.9	+0.2	16.9
Eastern Corn Belt	439	34.4	+0.1	18.9	-0.1	17.5
Midsouth	89	34.4	-0.5	19.8	+0.3	15.8
Southeast	16	33.8	-1.1	19.8	+0.5	14.8
East Coast	34	34.3	-0.7	18.8	-0.3	16.1

[†]Regional average values weighted based on estimated production by state, as estimates by USDA, NASS Crop Production Report (October 2019)

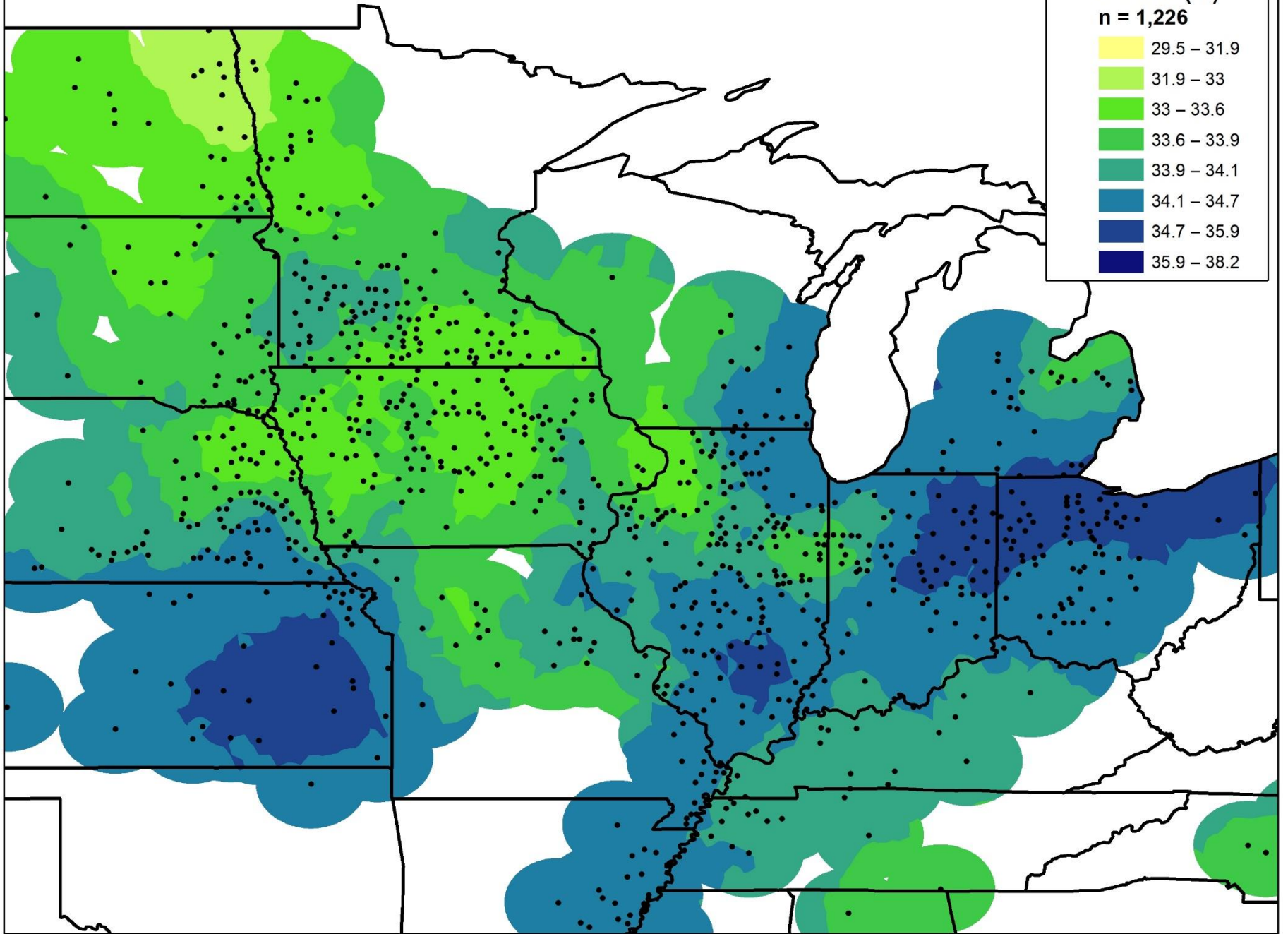
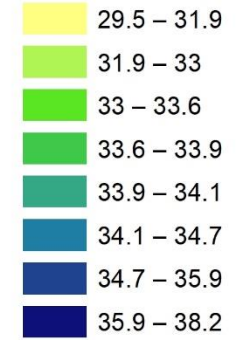
2019 - State/Region Summary



2019 - Protein

Protein (%)

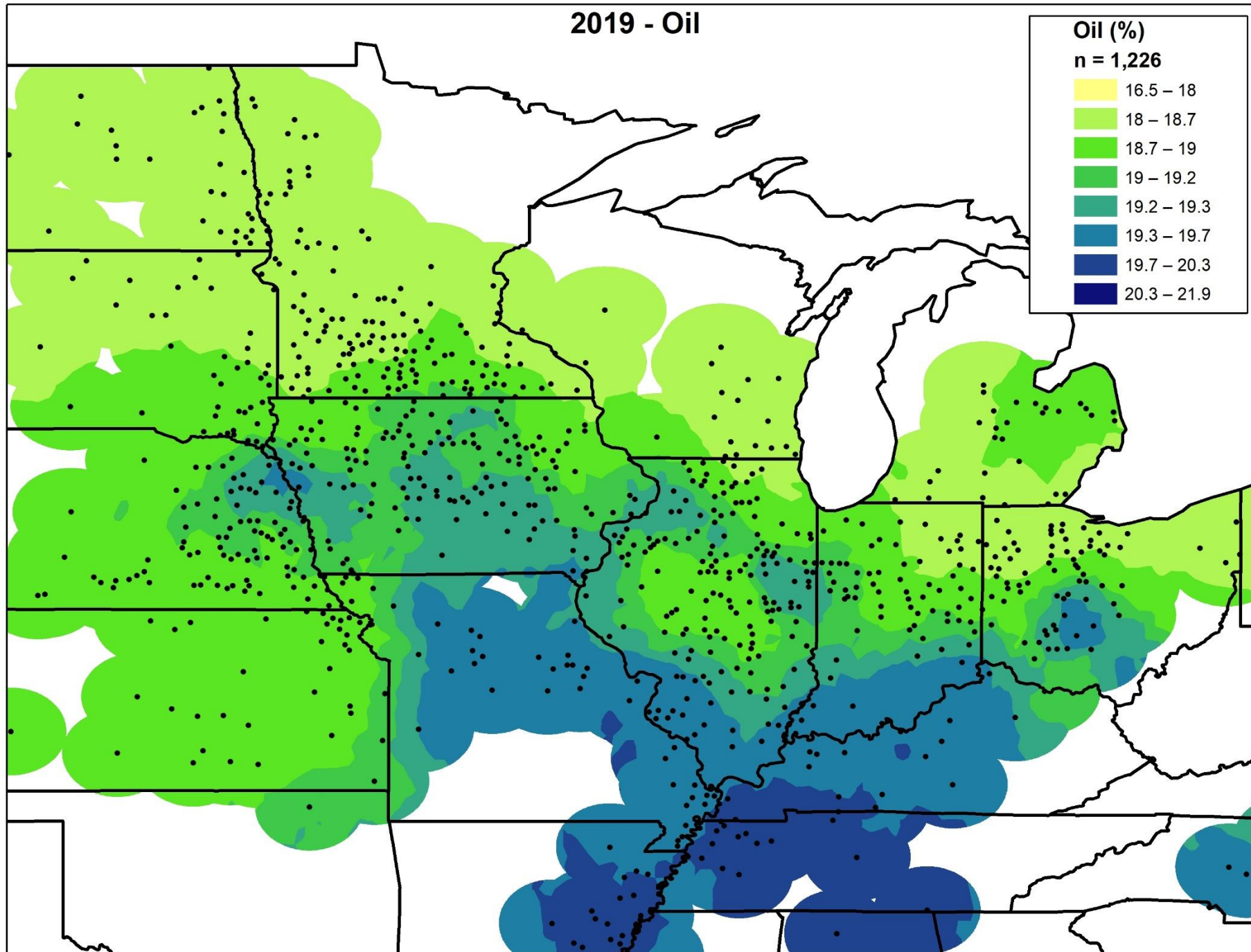
n = 1,226



2019 - Oil

Oil (%)

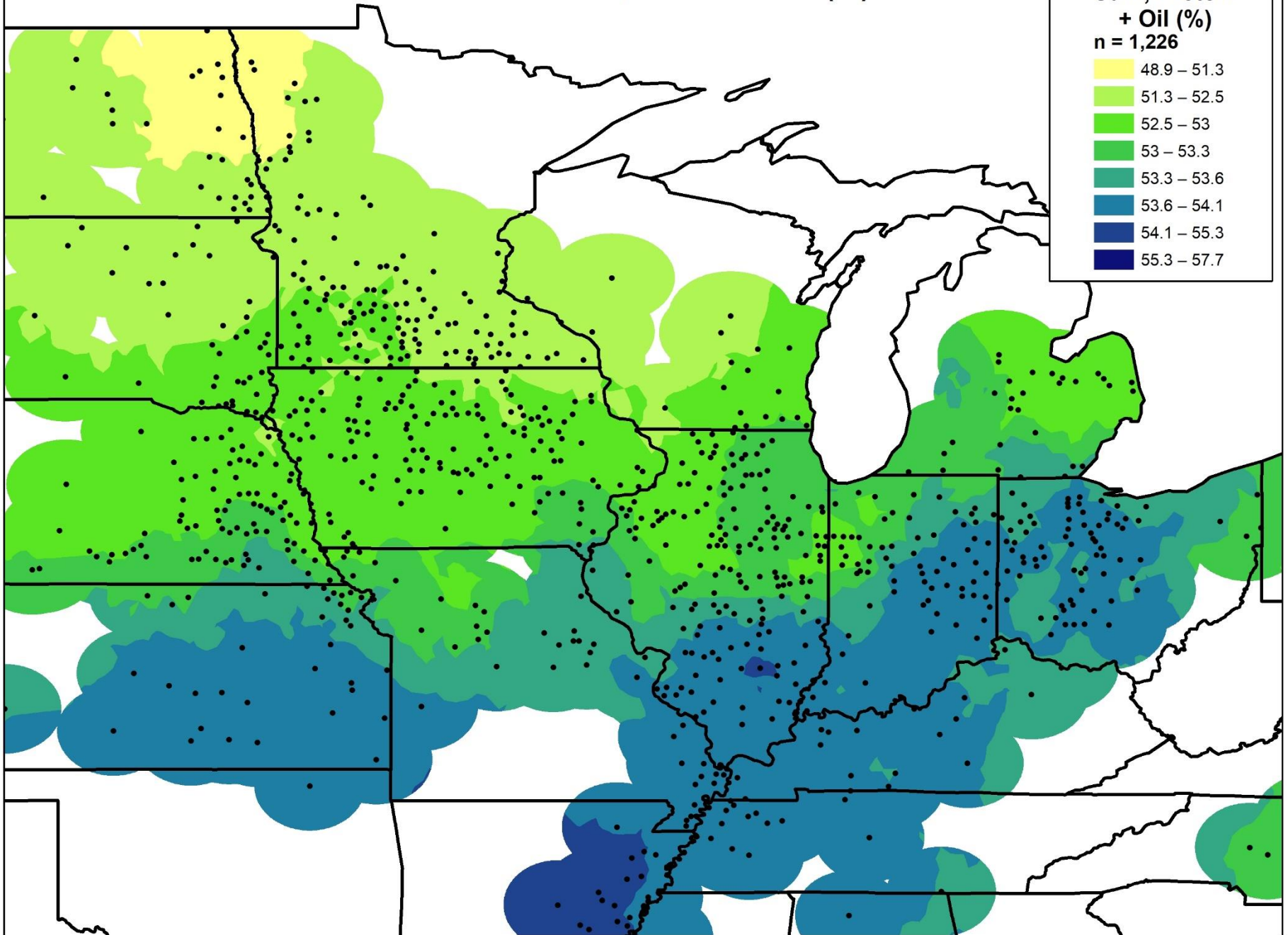
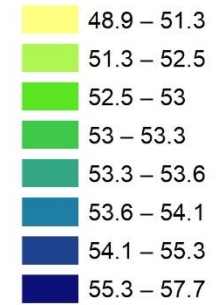
n = 1,226



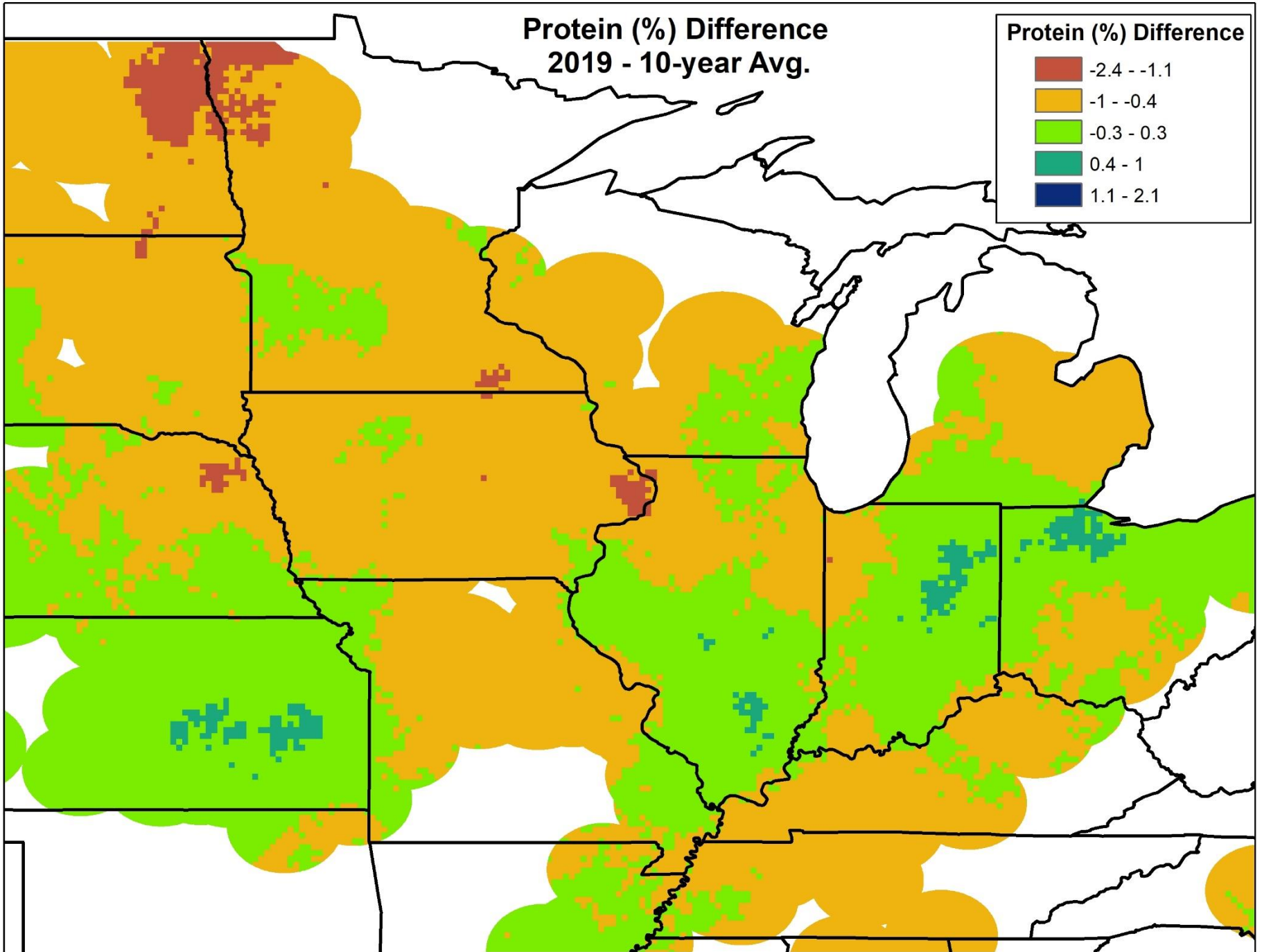
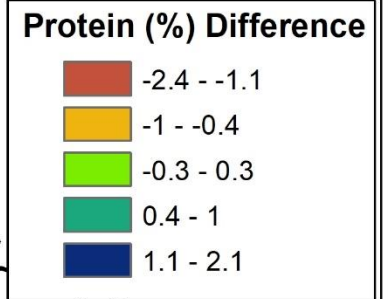
2019 - Sum, Protein + Oil (%)

Sum, Protein
+ Oil (%)

n = 1,226

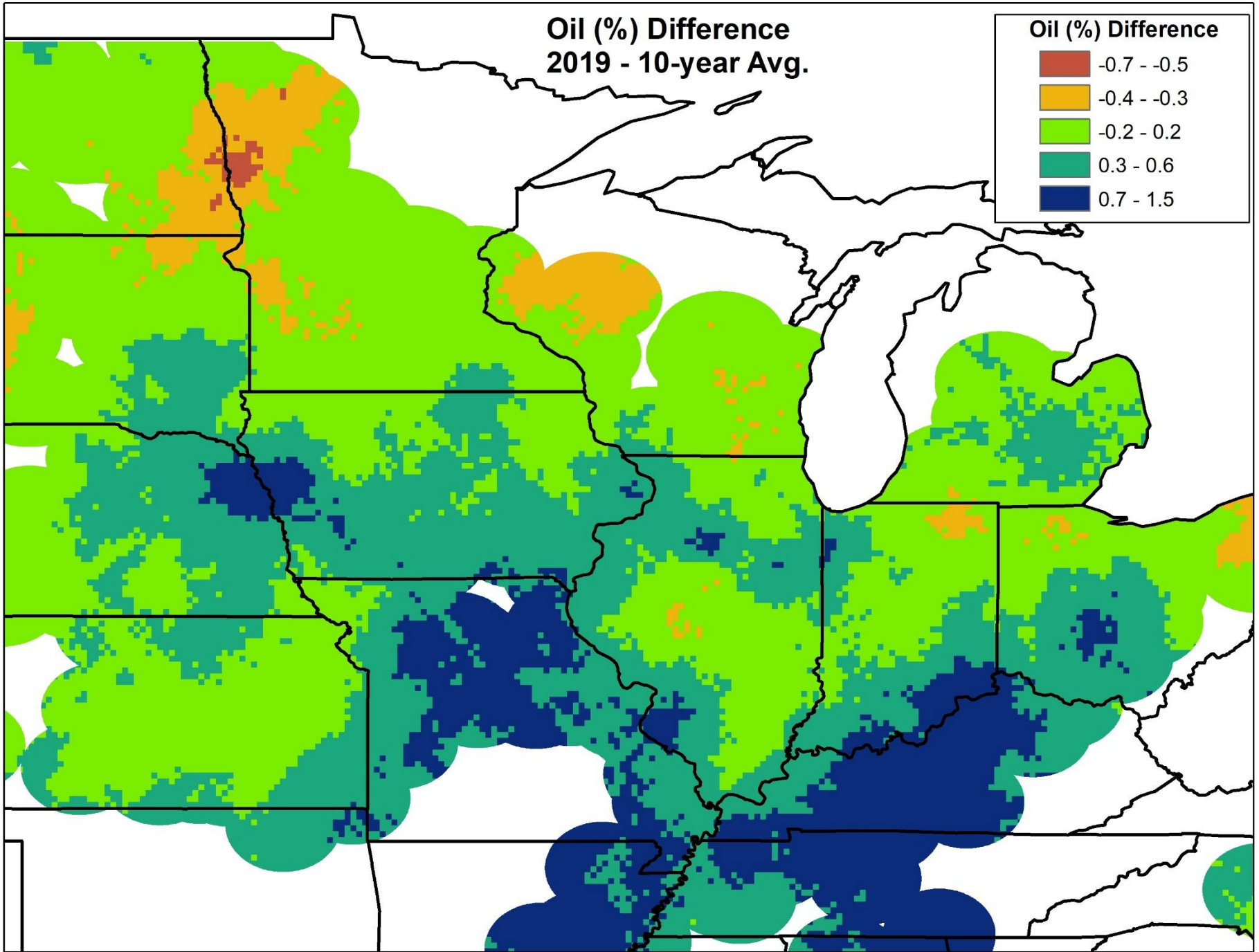
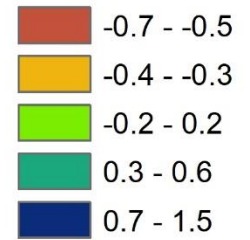


**Protein (%) Difference
2019 - 10-year Avg.**



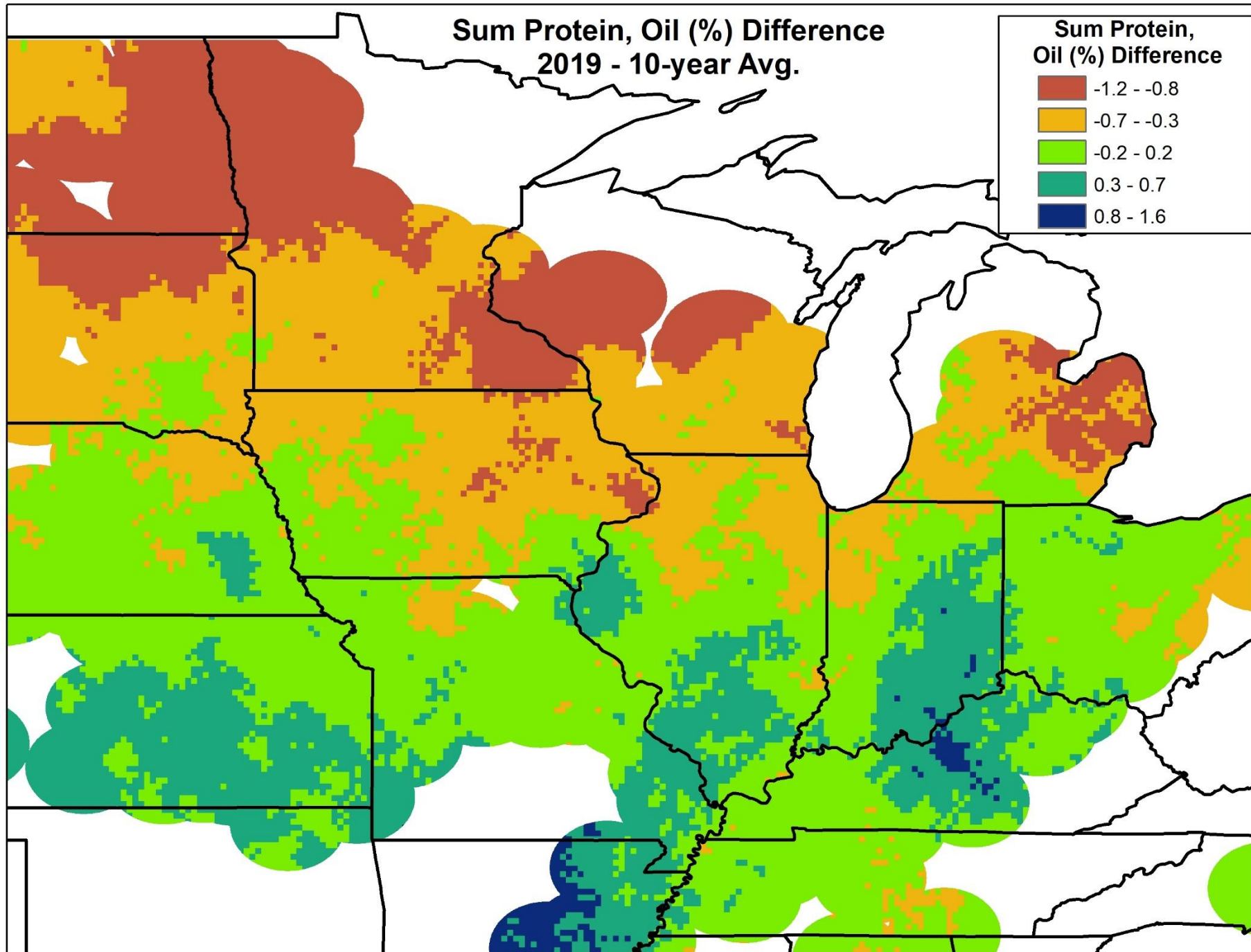
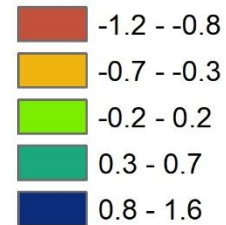
**Oil (%) Difference
2019 - 10-year Avg.**

Oil (%) Difference



**Sum Protein, Oil (%) Difference
2019 - 10-year Avg.**

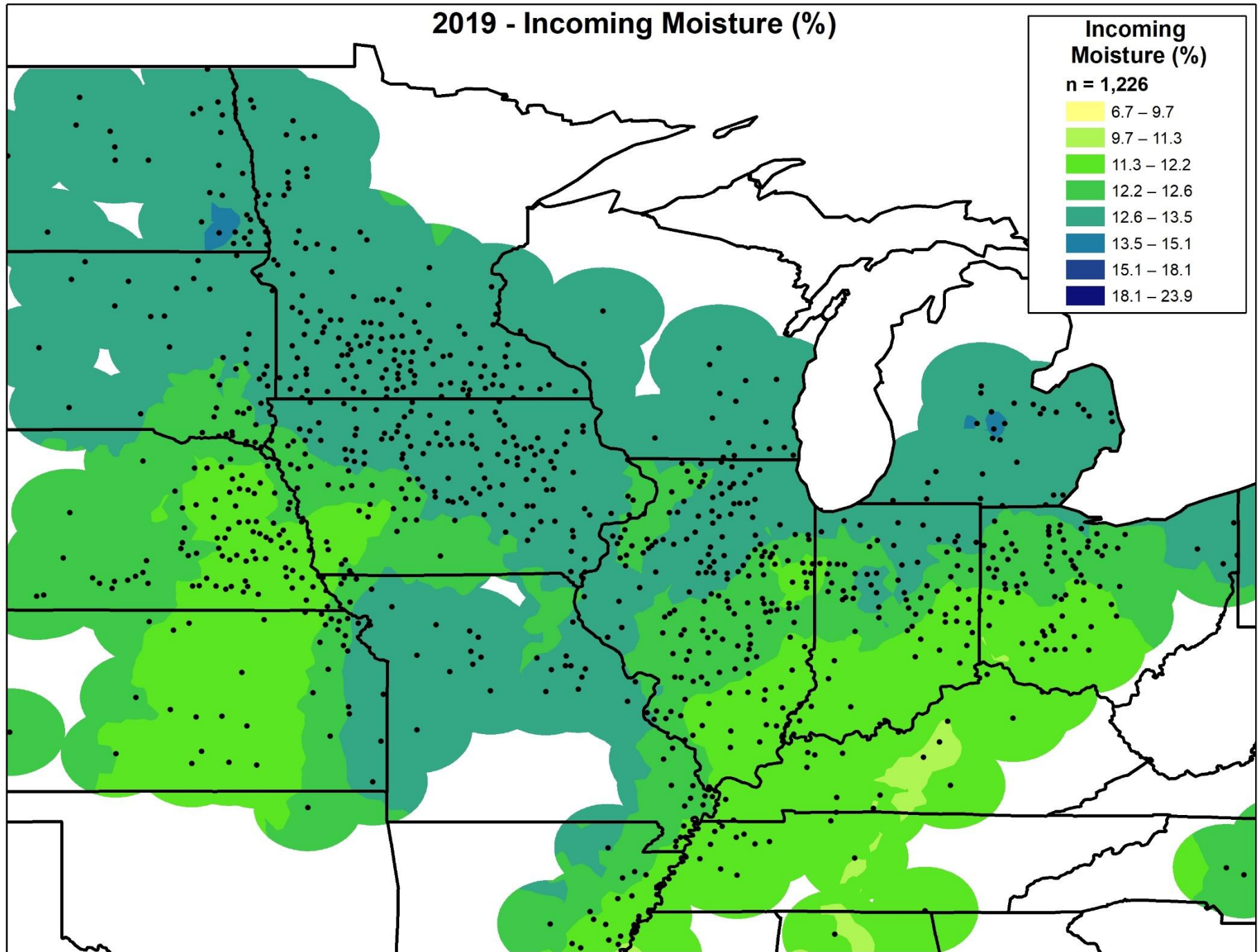
**Sum Protein,
Oil (%) Difference**



A close-up photograph of two soybean pods hanging from a stem. The pods are dark brown and covered in fine, light-colored hairs. The background is a soft, out-of-focus brown, suggesting a natural field setting. A semi-transparent dark teal banner is overlaid across the middle of the image, containing the title text.

PHYSICAL CHARACTERISTICS

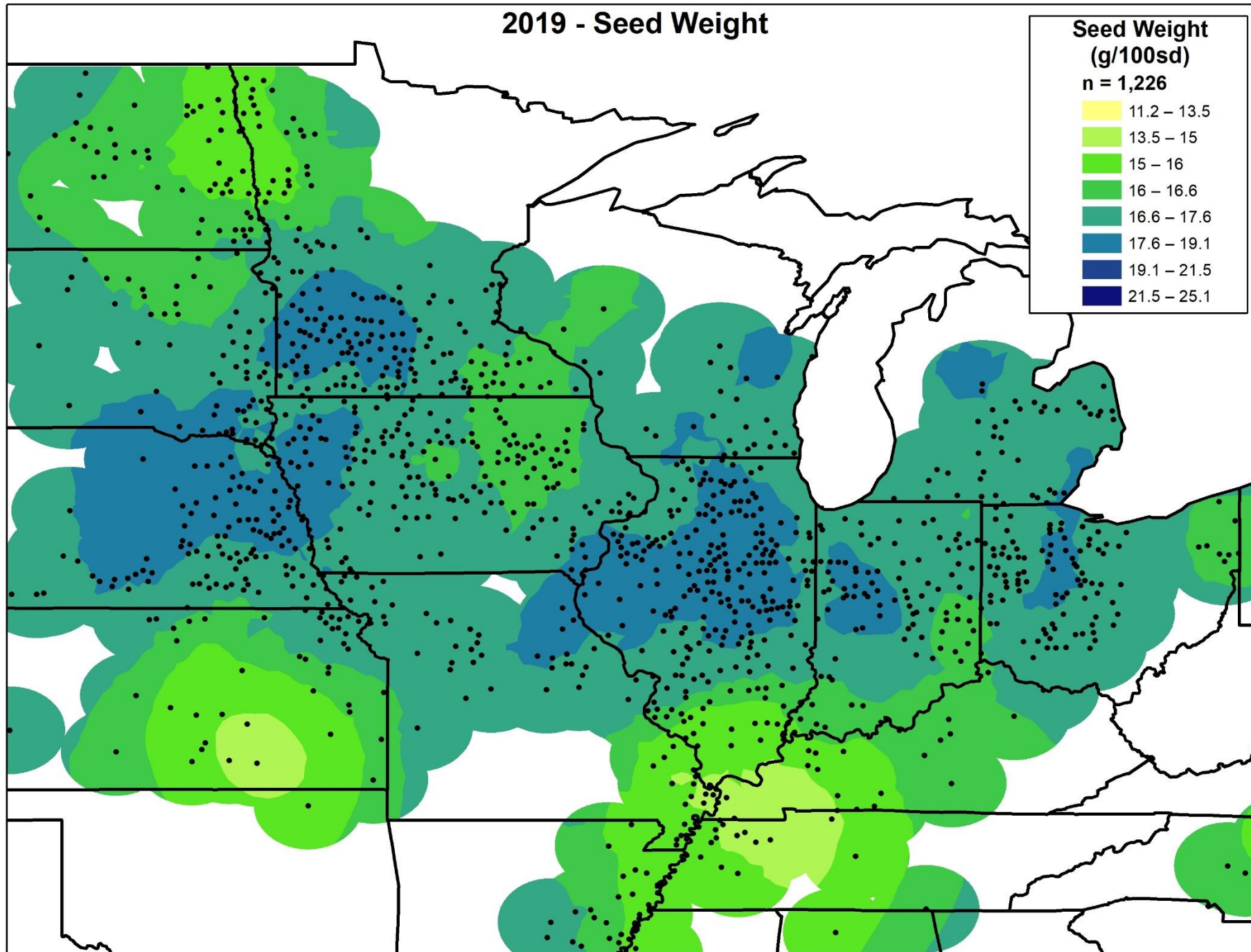
2019 - Incoming Moisture (%)



2019 - Seed Weight

Seed Weight
(g/100sd)

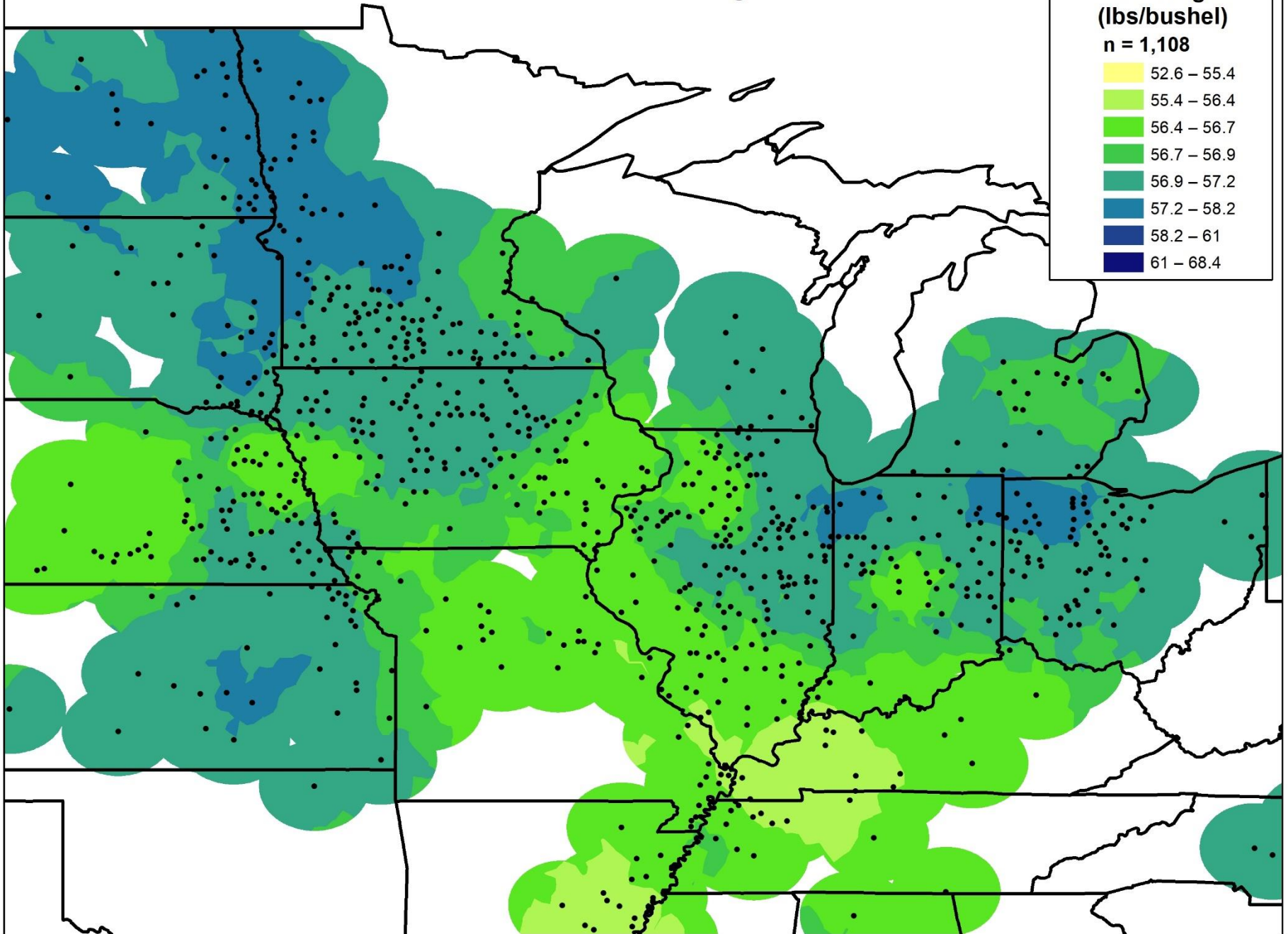
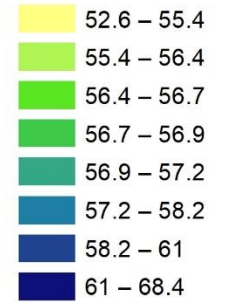
n = 1,226



2019 - Test Weight

Test Weight
(lbs/bushel)

n = 1,108



BETTER MEASURES OF THE VALUE OF SOYBEANS

- Soybeans & soybean meal have been valued primarily on an indirect measure of protein – ‘crude protein’
- Crude protein is probably not the best measure of a soybean (or a soybean meal’s) value
 - Overestimates total amino acids (true protein) at higher protein levels
 - No information on protein QUALITY (relative balance of amino acids)
- Both formal and informal feeding trials in destination countries have repeatedly shown that meal from US soybeans performs better than expected based on protein levels

Ravindran et al. (2014)

- *“OVERALL, SOYBEAN MEAL ORIGINATING FROM THE U.S. HAD BETTER NUTRITIVE VALUE COMPARED WITH THOSE FROM ARGENTINA AND INDIA, ON THE BASIS OF APPARENT METABOLIZABLE ENERGY [HIGHER SUCROSE IN U.S. SBM] AND CONTENTS OF DIGESTIBLE CRUDE PROTEIN AND DIGESTIBLE AMINO ACIDS.”*
- *“PERHAPS THE INTERESTING FINDING OF THE CURRENT WORK IS THE LACK OF CORRELATION BETWEEN CP CONTENT AND NUTRITIVE QUALITY OF SOYBEAN MEAL.”*

Region [†]	#	Protein (13%)	Lysine (% 18 AAs)	Change from 2018	5 EAAs [‡] (% 18 AAs)	Change from 2018
Western Corn Belt	648	33.8	7.1	+0.2	15.5	0
Eastern Corn Belt	439	34.4	7.1	+0.3	15.4	+0.1
Midsouth	89	34.4	7.0	+0.2	15.4	+0.1
Southeast	16	33.8	7.1	+0.3	15.5	+0.2
East Coast	34	34.3	7.1	+0.3	15.4	+0.1

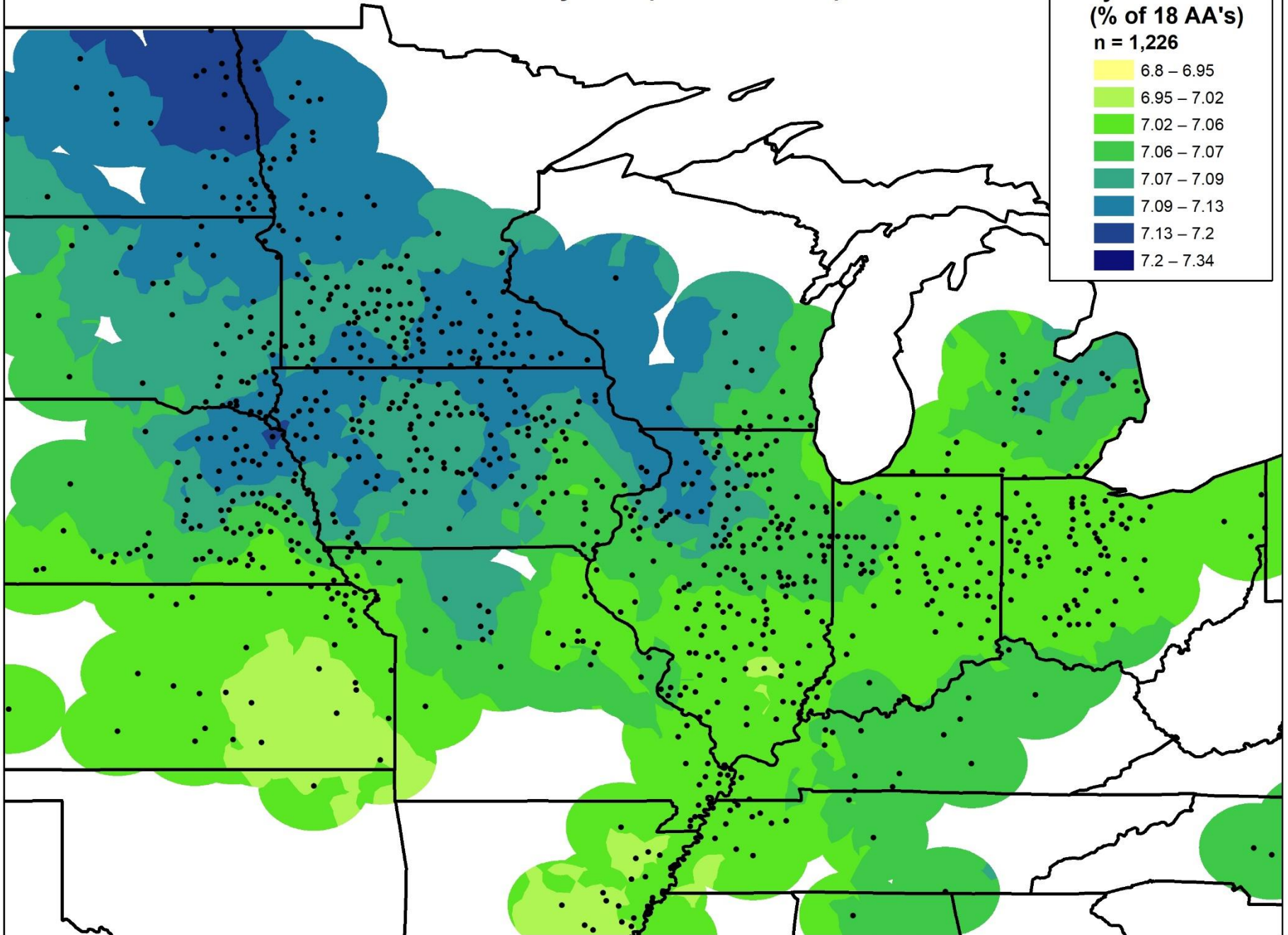
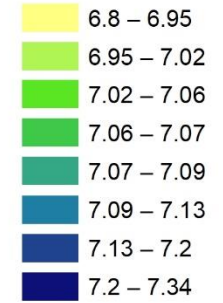
[†]Regional average values weighted based on estimated production by state, as estimates by USDA, NASS Crop Production Report (October 2019)

[‡]Five essential amino acids: cysteine, lysine, methionine, threonine, tryptophan

2019 - Lysine (% of 18 AA's)

Lysine
(% of 18 AA's)

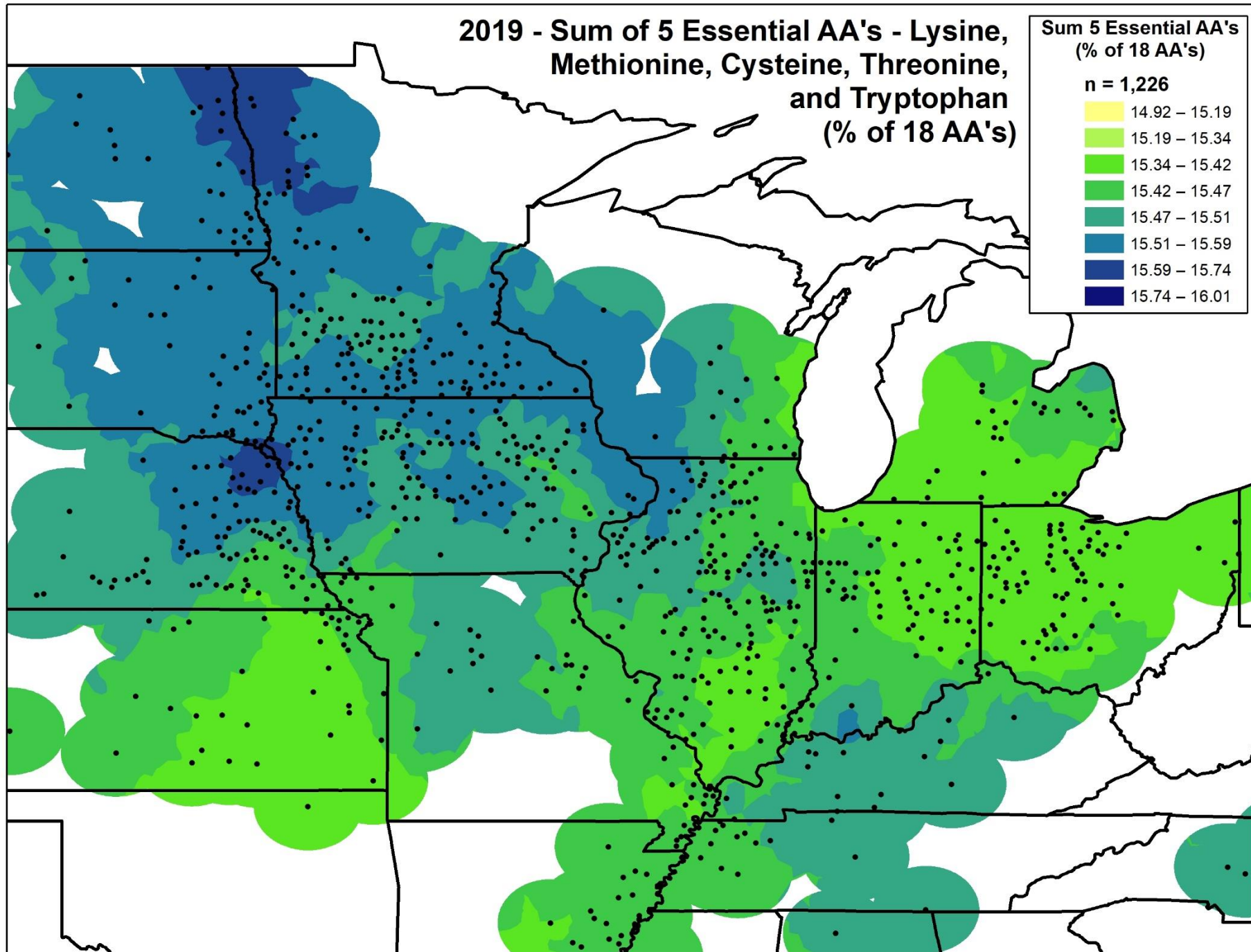
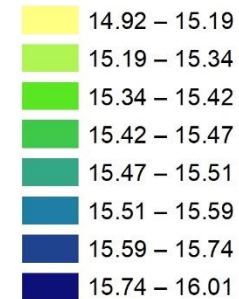
n = 1,226



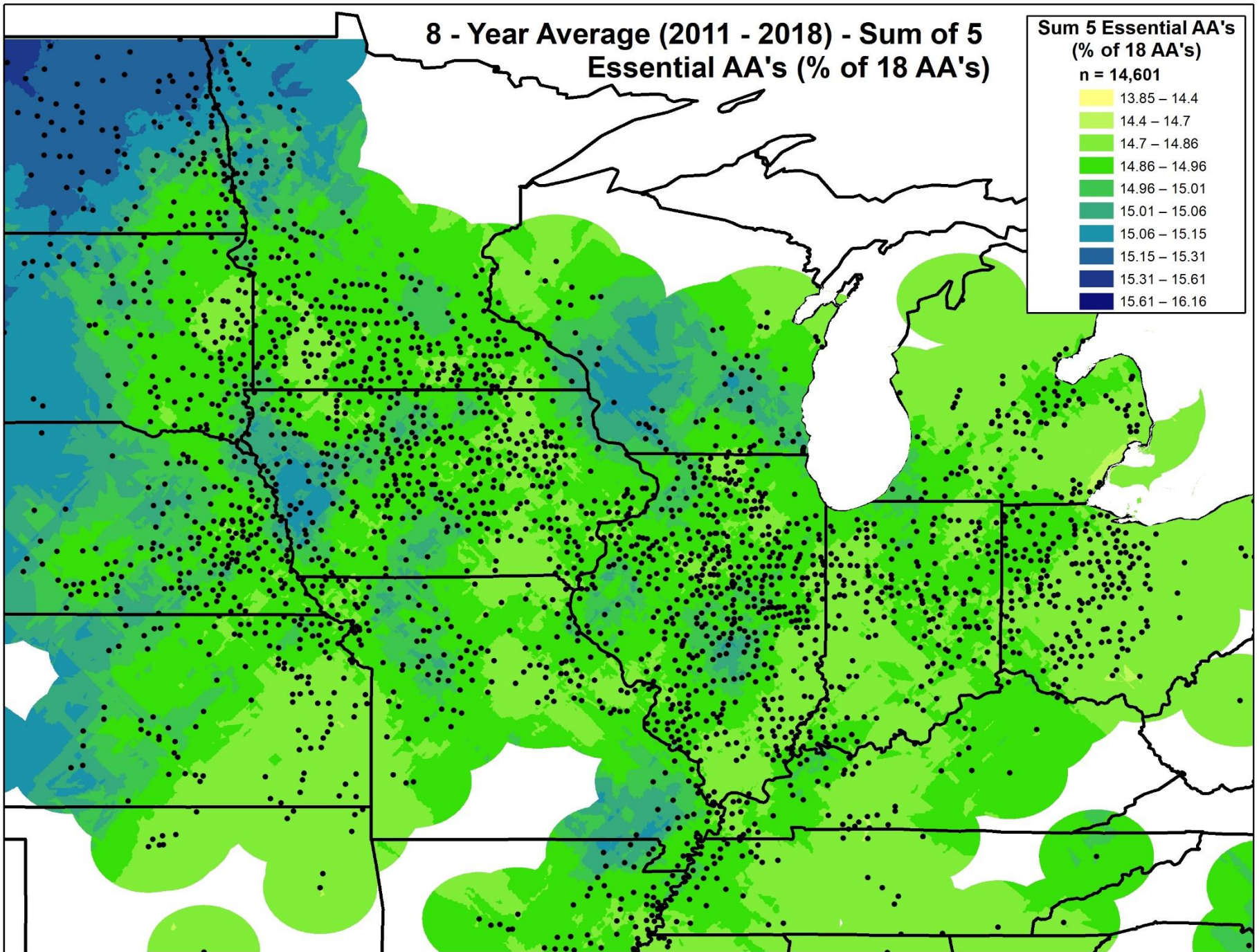
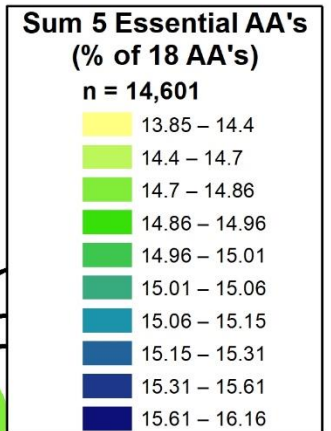
**2019 - Sum of 5 Essential AA's - Lysine,
Methionine, Cysteine, Threonine,
and Tryptophan
(% of 18 AA's)**

**Sum 5 Essential AA's
(% of 18 AA's)**

n = 1,226

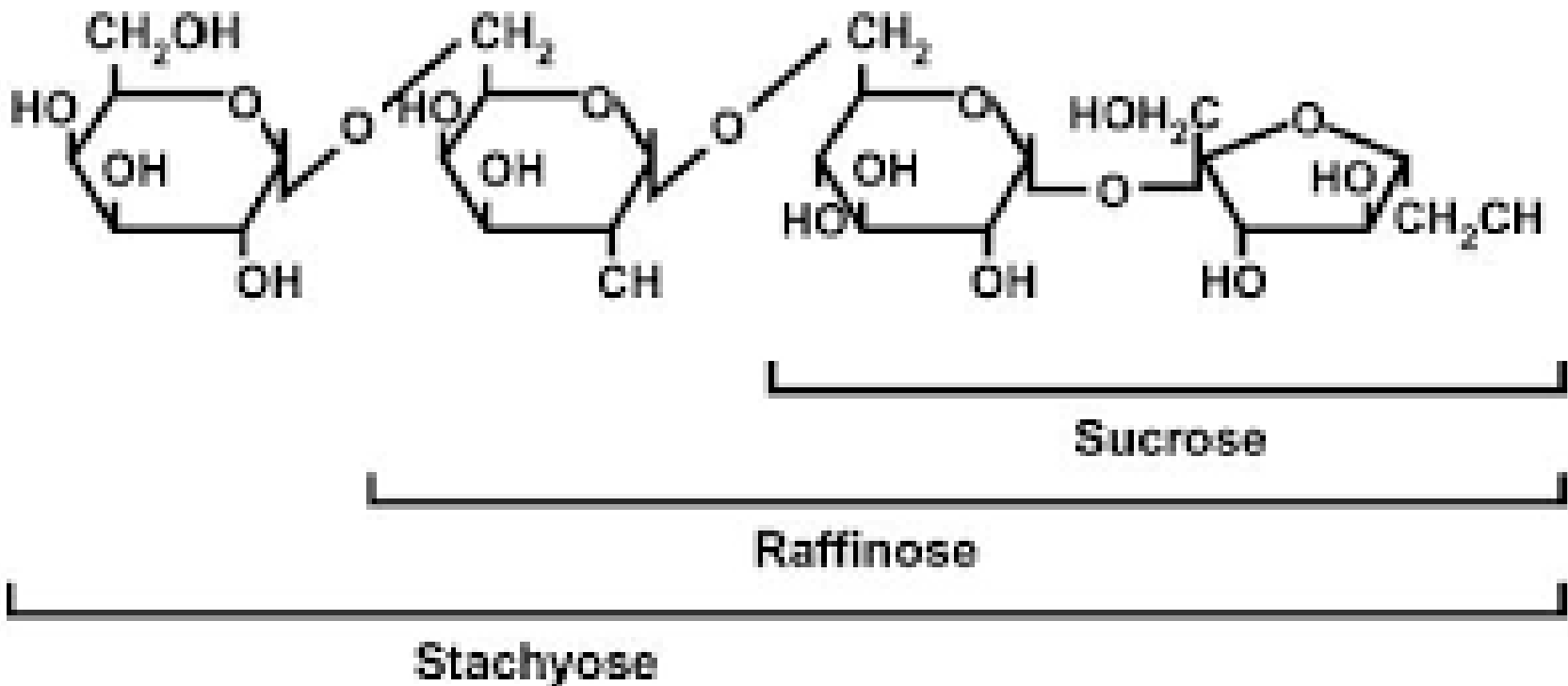


8 - Year Average (2011 - 2018) - Sum of 5 Essential AA's (% of 18 AA's)



BETTER MEASURES OF QUALITY:

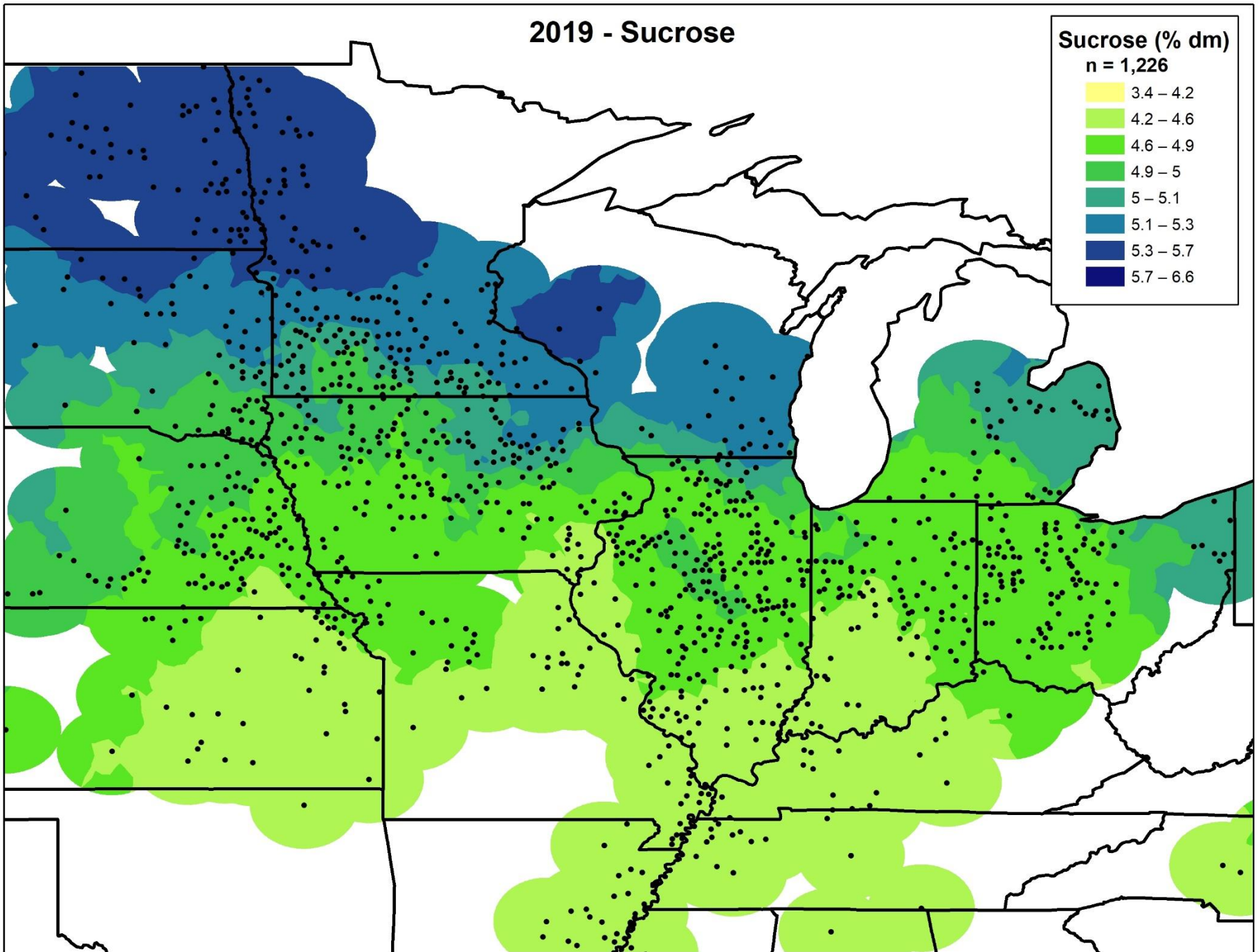
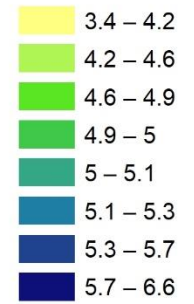
B) SOLUBLE SUGARS



2019 - Sucrose

Sucrose (% dm)

n = 1,226



8 - Year Average (2011 - 2018) - Sucrose

Sucrose (% DM)

n = 14,607

0 - 4.4

4.4 - 4.8

4.8 - 5.1

5.1 - 5.3

5.3 - 5.5

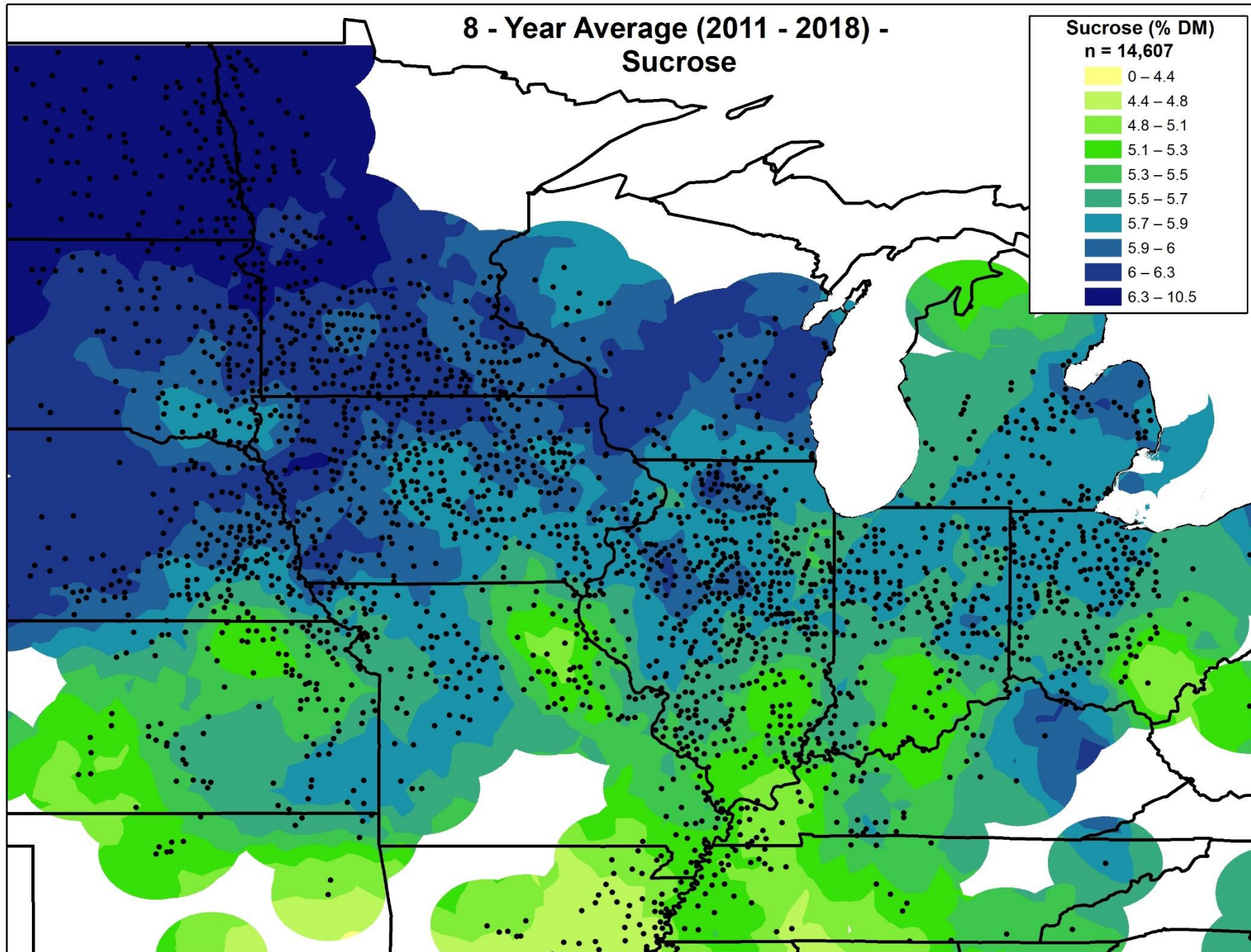
5.5 - 5.7

5.7 - 5.9

5.9 - 6

6 - 6.3

6.3 - 10.5



2019 SUMMARY

- 2019 was one of the most trying production years for most US farmers in recent memory
 - Every year, some farmers face very difficult environmental and business challenges. This year, these affected the majority of US farmers.
- Despite the severity and breadth of the challenges, US farmers will still produce
 - Nearly 100 MMT of -
 - High quality, low FM soybeans, capable of producing quality soybean meal with exceptional amino acid composition and high in energy.

