Winter Wheat Production in Eastern Nebraska

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Introduction

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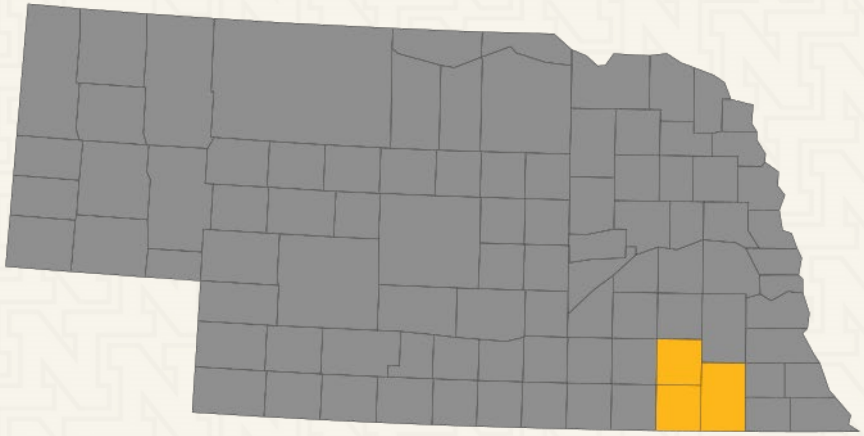
croptechcafe.org



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Overview

- Needs assessment by growers
- Wheat production in the region
- Economics and weather
- Soil health aspect
- Winter wheat management for new growers:
  - Variety Selection
  - Diseases
  - Planting dates and rates
  - Nutrients

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Online Resources

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Crop Watch

Secure https://cropwatch.unl.edu/wheat

UNIVERSITY OF NEBRASKA-LINCOLN

Login Search

Institute of Agriculture and Natural Resources
CROPWATCH

Nebraska IANR Nebraska Extension CropWatch Crops Wheat

HOME | WEATHER (GDD & ET) INFO & RESOURCES | CROPS | MANAGEMENT | RELATED TOPICS | ARCHIVES

Wheat

The latest Extension information on wheat production and management practices from the University of Nebraska-Lincoln.

Wheat Navigation

- Wheat Home
- Production
- Variety Testing
- Virtual Varieties Tour
- Soil Management
- Weed Management
- Insect Management
- Disease Management
- Irrigation/Water
- Value Added/Organic
- Marketing/Economics
- Nebraska Research

EMAIL US

Crop Growth and Development

View at cropwatch.unl.edu/wheat

Wheat Wheat Cafe

Welcome to the Winter Wheat Cafe for Eastern Nebraska

Positioning your farm to manage manure, control tough weeds, and improve soil health are just some of the advantages to growing winter wheat in Eastern Nebraska. Current livestock producers and future poultry growers will find additional value of adding winter wheat to their farming operation.

Resources found on this page:

application timing (select all that apply)?

Split application (preplant and sidedress) *(44%, 11 Votes)*

Spring liquid (UAN or liquid mixes) (24%, 6 Votes)

Split application (preplant and fertigation) (16%, 4 Votes)

Fall anhydrous ammonia (12%, 3 Votes)

Spring anhydrous ammonia (4%, 1 Votes)

Spring dry (Urea, ammonium nitrate, etc.) (0%, 0 Votes)

Total Voters: **25**

Brought to You By

Serving Northeast Nebraska

View at croptechcafe.org/winterwheat

Needs Assessment

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Needs Assessment

1. Variety trials
   1. Added location in 2017
2. Wheat in rotation research
   1. On-farm research studies through NRCS Soil Health Demonstration Farms
3. Soil fertility research and recommendations
   1. Nitrogen and sulfur fertility trials

Winter Wheat Production Needs Assessment in Eastern Nebraska

Eastern Nebraska grower (n=37) and UNL and NRCS faculty/staff in responses (n=7) conducted in 2015 and 2019.

- Continue variety trials for eastern Nebraska
  - No-till after soybeans and seed corn
- Wheat in a corn/soybean rotation research
  - Research to document the impact wheat in rotation with corn and soybeans has on reducing soil erosion
  - Research to document the economic and rotation benefits and profitability to adding wheat to the corn/soybean rotation such as those below:
    - Rainfed corn-soybean-wheat/cover crop (3 crops in 3 years)
    - Rainfed corn-soybean-wheat/forage crop (4 crops in 3 years)
    - Irrigated corn-soybean-wheat/double-crop soybean (4 crops in 3 years)
      - Has this changed with climate change/growing season length?
      - BMPs for system and modeling to assess risk of not reaching maturity
    - Irrigated seed corn or short season corn-wheat-double crop soybeans (3 crops in 2 years)
- Soil fertility research and current fertility programs
  - Evaluate the need for chloride and sulfur applications in various soils
- Row spacing and seeding rate
  - Diseases risk and yield
- Predicting lodging risk and mitigation
  - Palisade (growth regulator), variety, N rate
- Cover crops after wheat research
  - Species, mix, management, etc. to benefit the next crops and economics
- On-farm storage BMPS and marketing considerations/plans for both grain and straw
- Managing winter wheat for cover crop seed production
- Crop rotation considerations
  - Cover crop after wheat for grazing or nitrogen credit
    - Mix versus mono-legume
    - Soil type consideration for cover crop
  - Corn, soybeans or other crops following year after wheat
  - After seed corn versus after soybeans
  - Shorter season corn and soybeans, potential yield penalty
- High yield practices
  - Plant population/stand counts
- Fungicide application methods and volume

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Wheat Production in the Region

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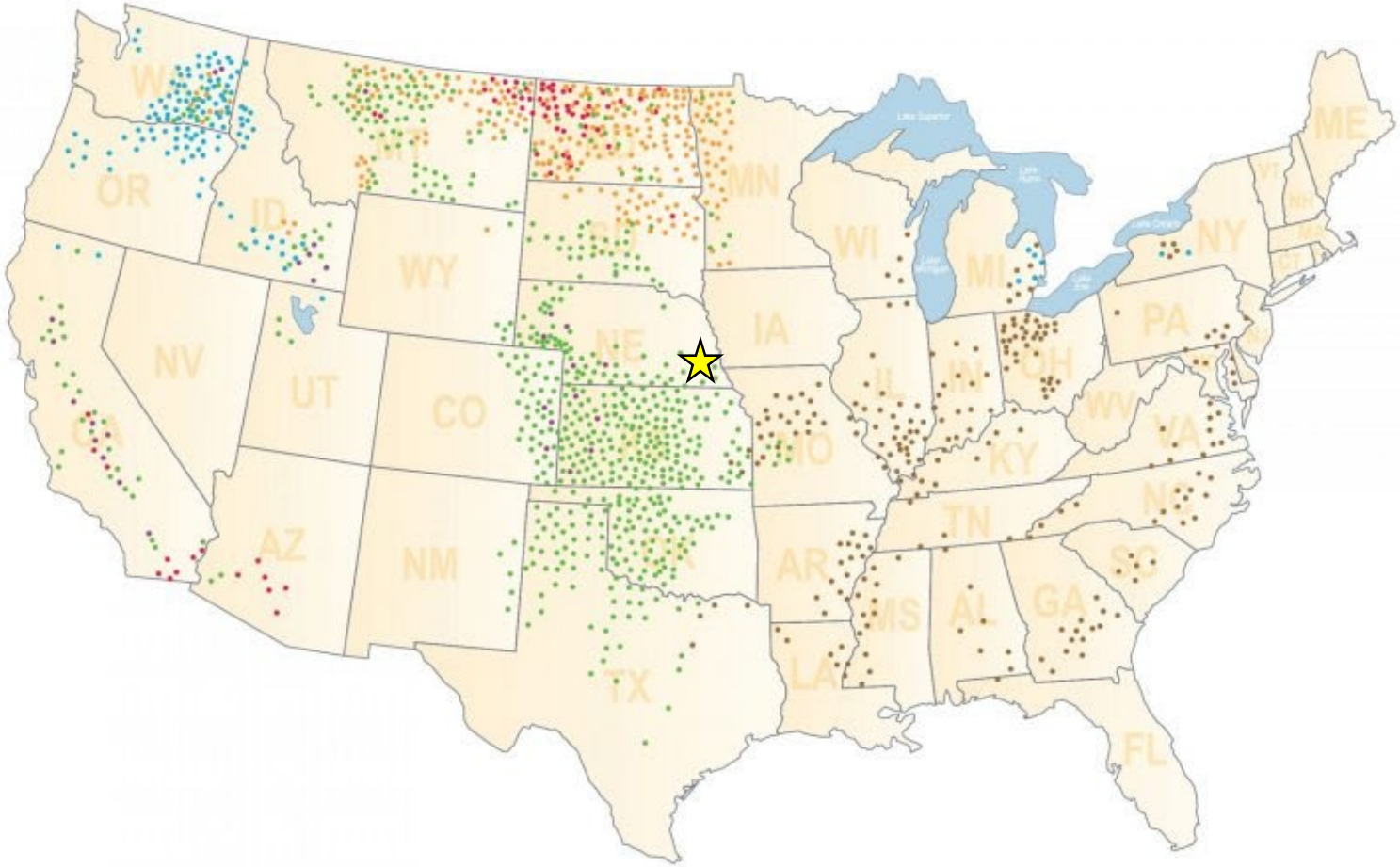
U.S. Wheat Production and Classes



HARD RED WINTER · HARD RED SPRING · SOFT RED WINTER · SOFT WHITE · HARD WHITE · DURUM

U.S. Wheat Production and Classes

- U.S. Wheat Associates
  - https://www.uswheat.org/working-with-buyers/wheat-classes/
  - 6 classes of wheat

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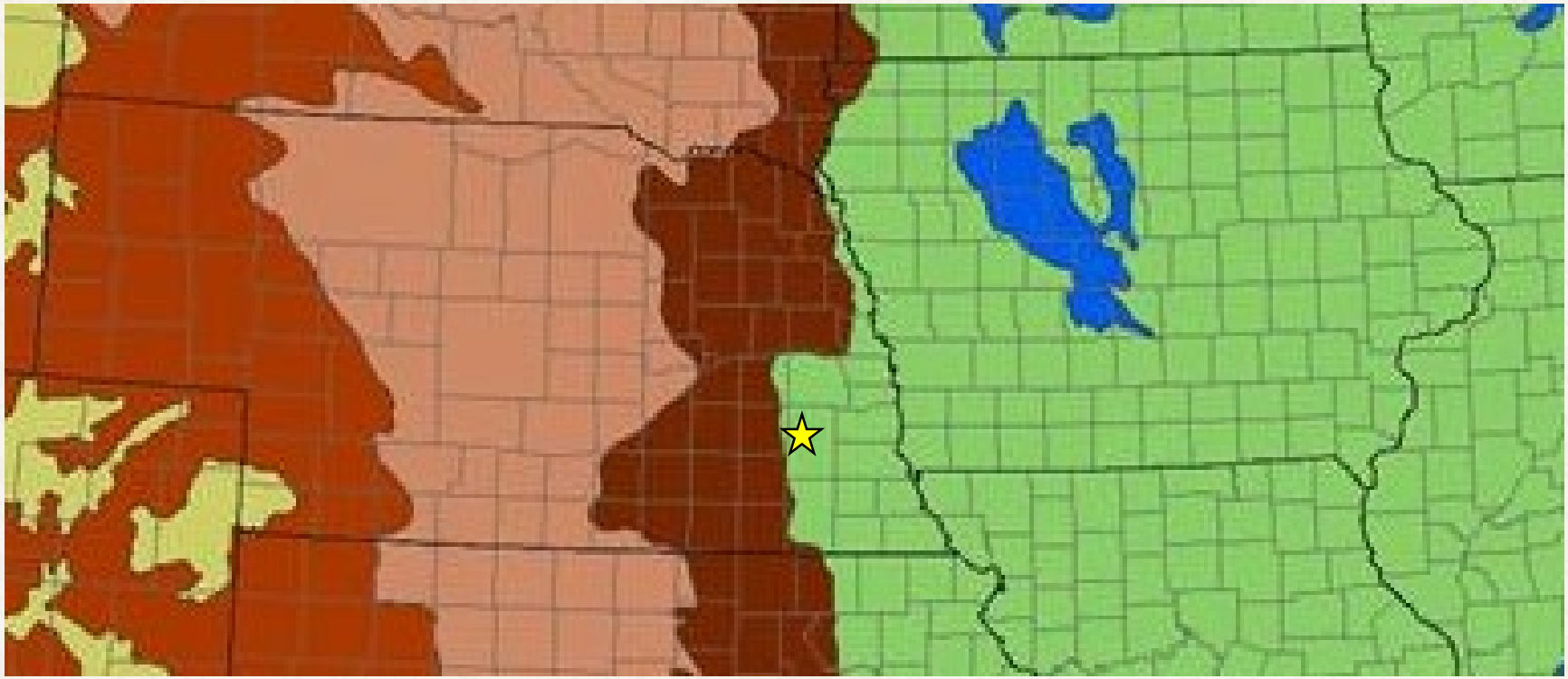
Soil Moisture Regime – USDA NRCS



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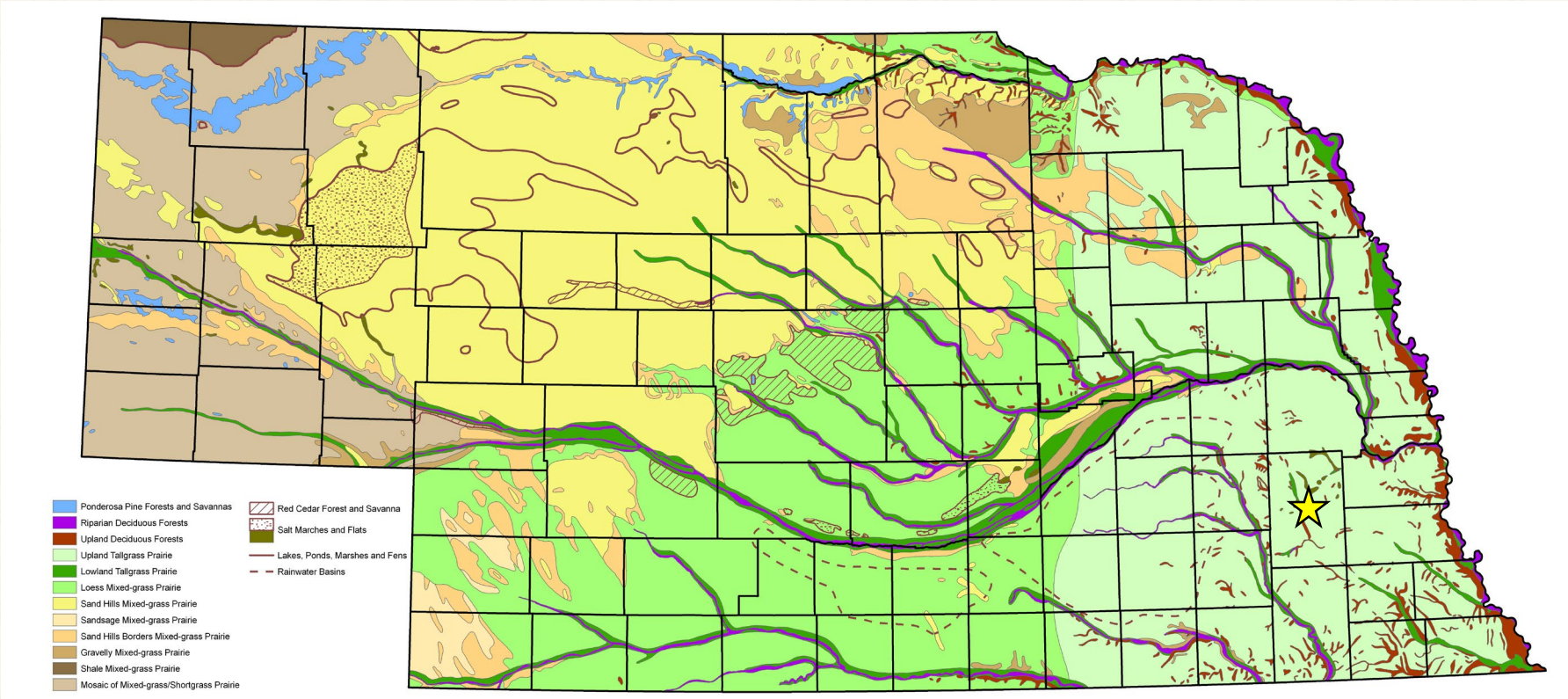
Native Vegetation



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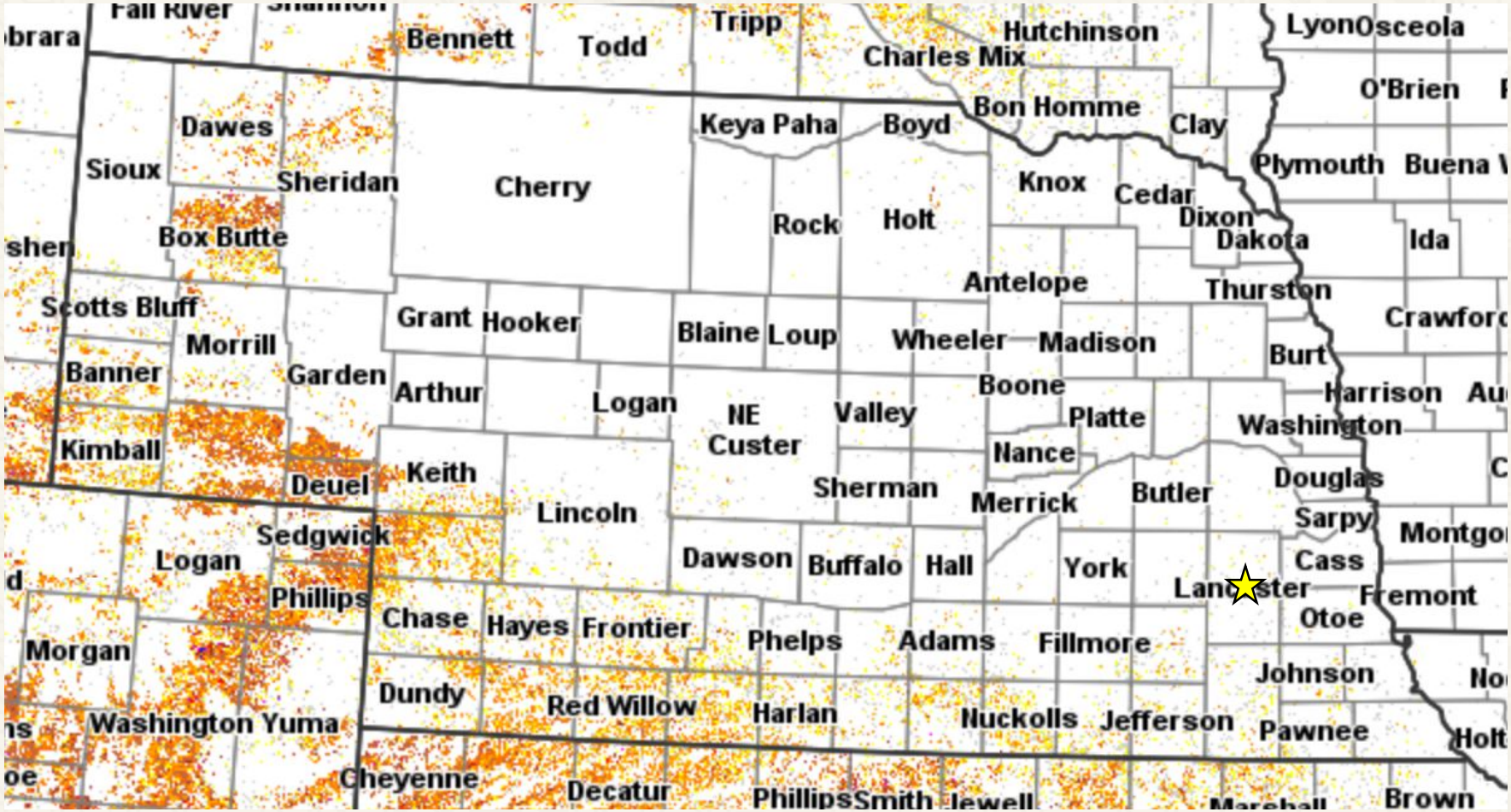
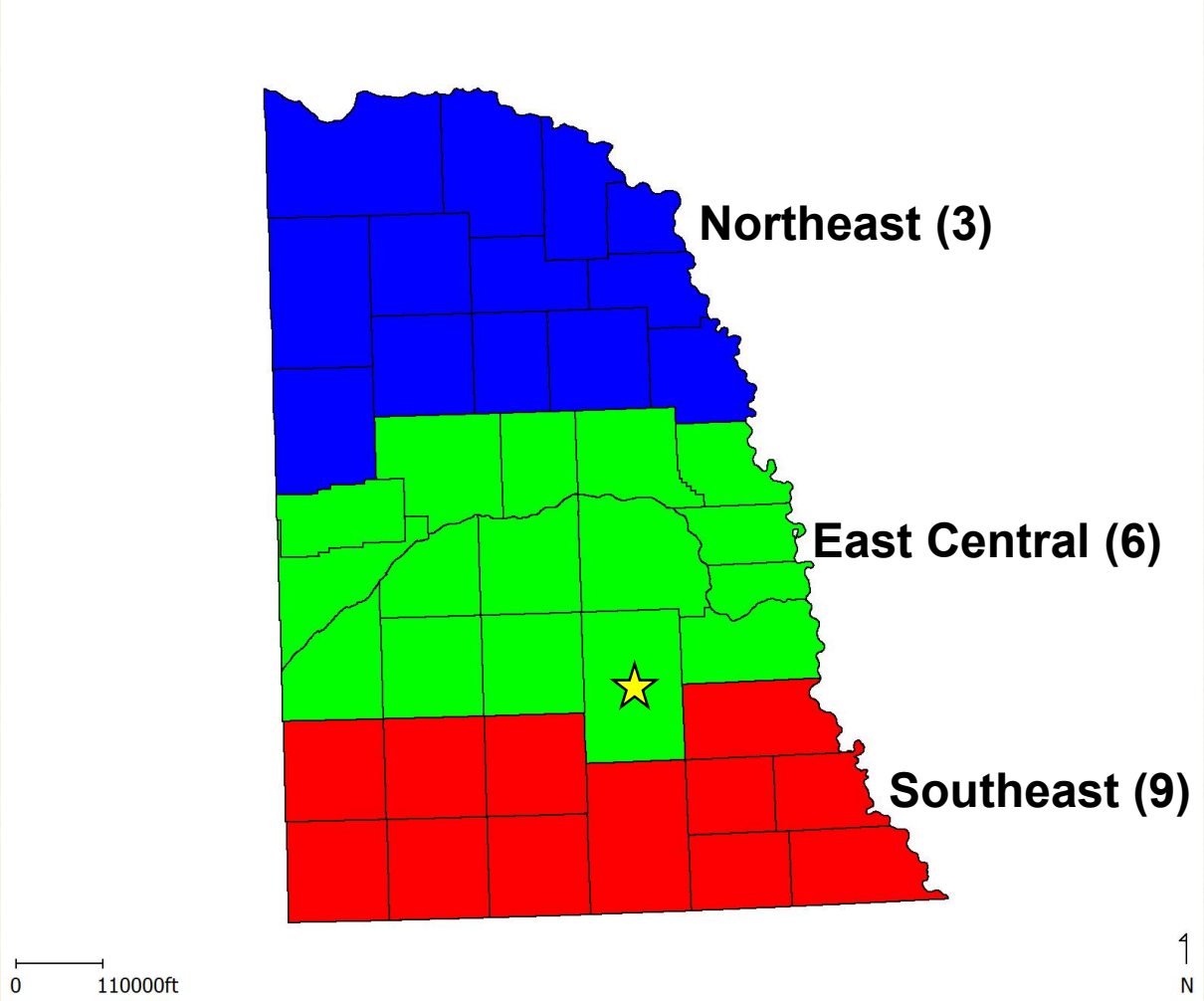
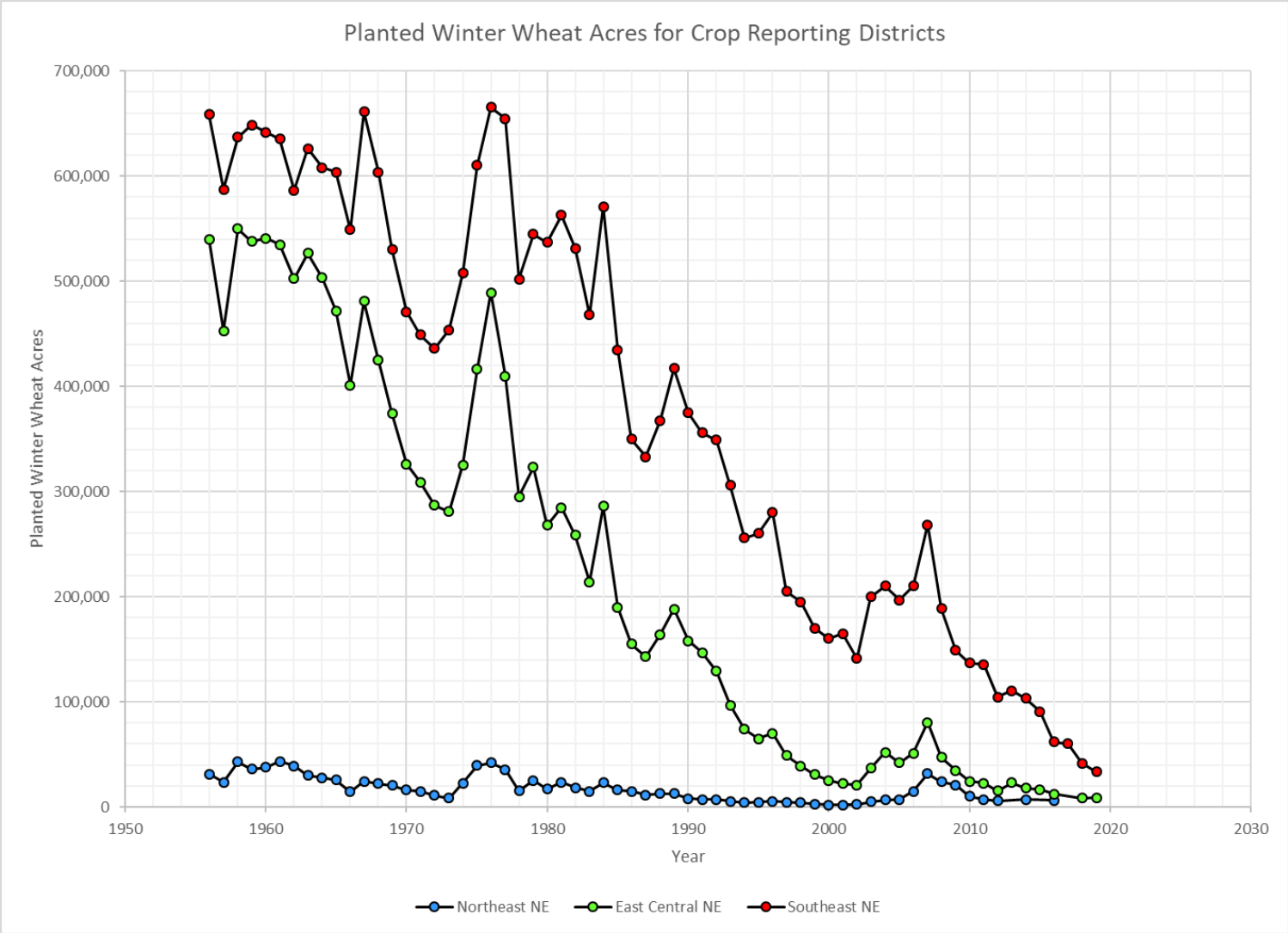
CropScape Wheat Frequency – MODIS



Eastern Crop Reporting Districts



USDA-NASS
Planted Winter Wheat Acres



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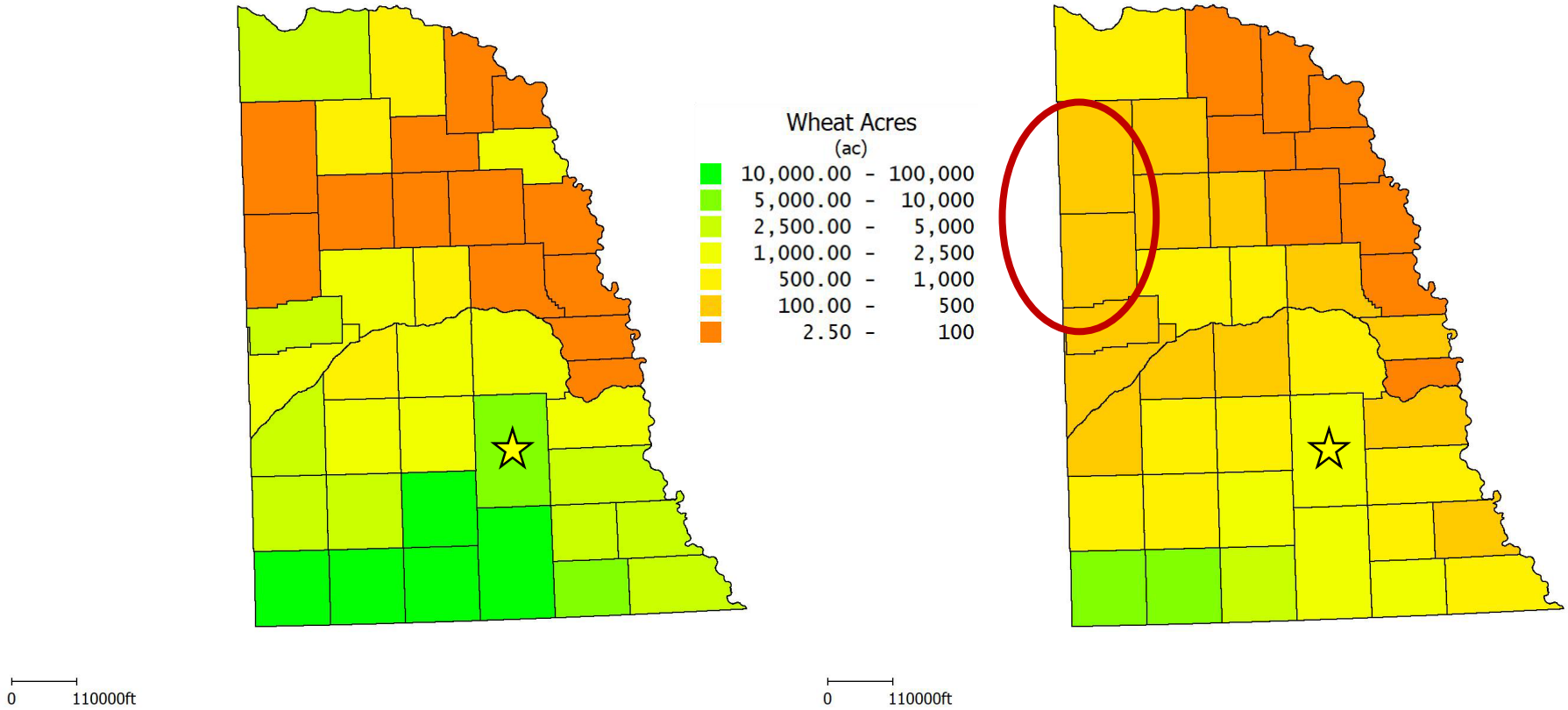
Retreat of Wheat in the East

2000 **2019**



Economics to Consider

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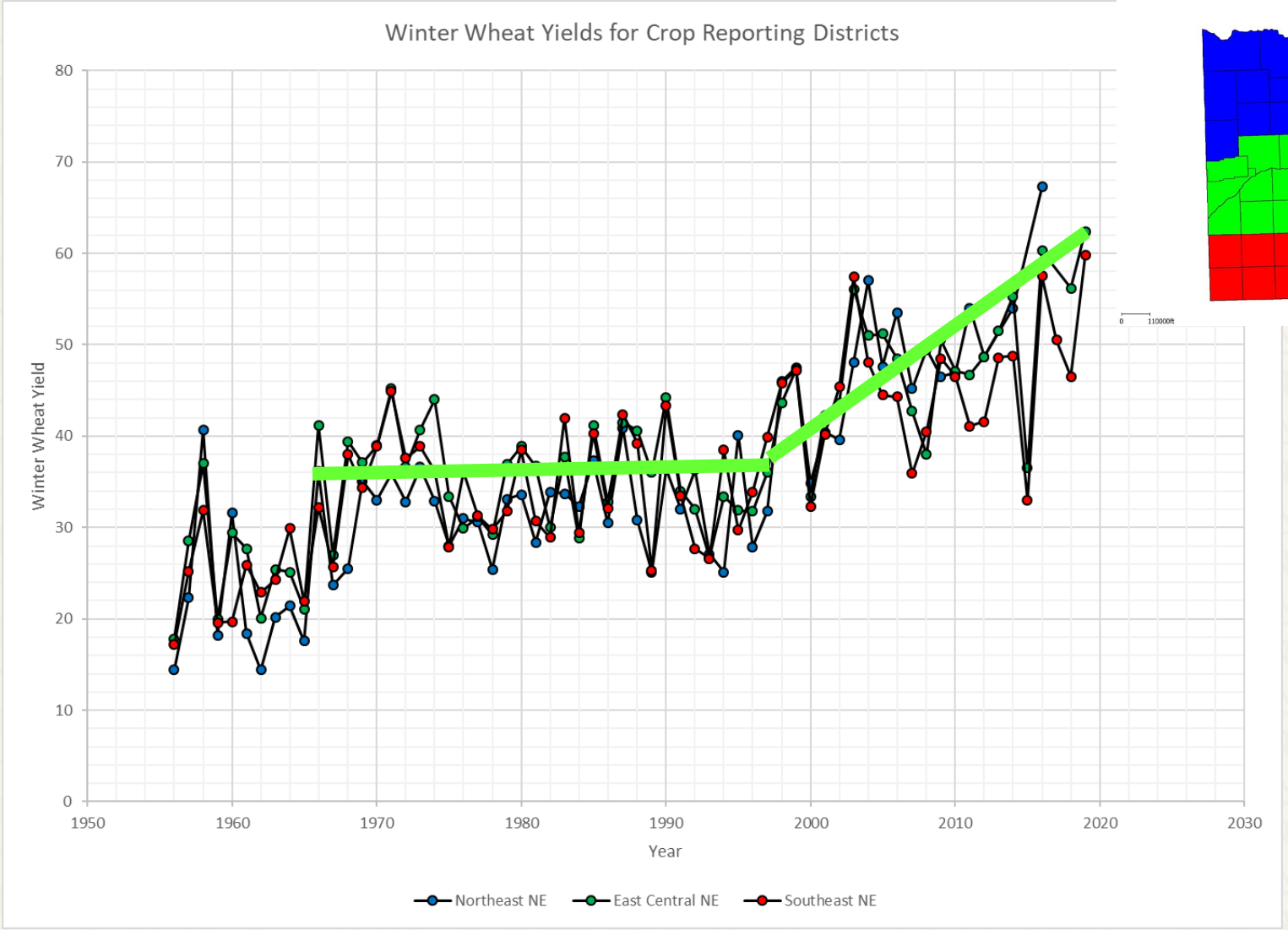
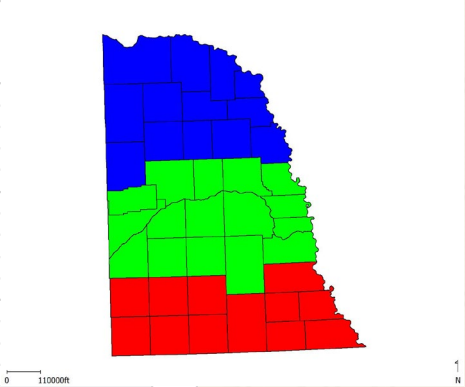
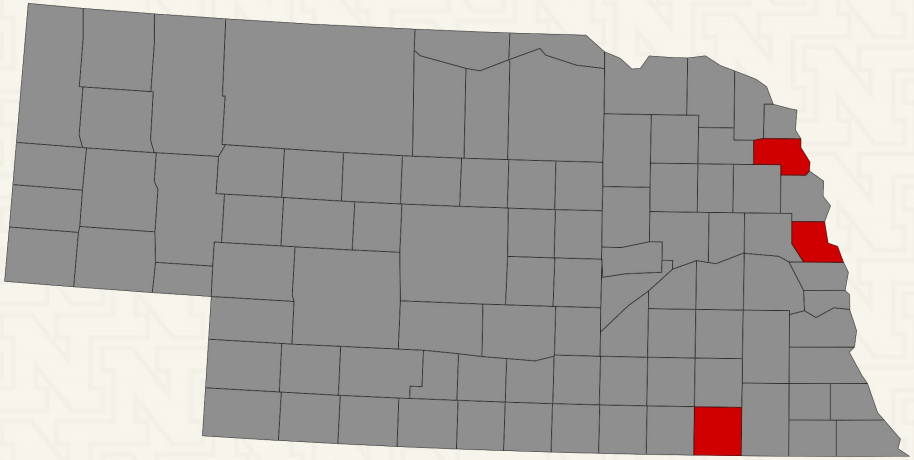
USDA-NASS
Winter Wheat Yield Trends





Local Success Stories

- Growing 100 bushel/acre wheat not uncommon
  - Thurston County
    - Winter wheat in a 5-year rotation with corn-soybeans
  - Washington County
    - 2 winter wheat fields per year
  - Jefferson County
    - National Wheat Foundation Dryland Yield Contest Finalist in 2017 – 4th place with 119 bu/ac



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Markets

- Grain - Strong Local Basis – ***2-21-2020***
  - ADM Lincoln = +0.25
- Straw – Rock Valley Hay Auction
  - Large Rounds - $70 to $135 per ton
  - Going rate in the area was $100 per ton

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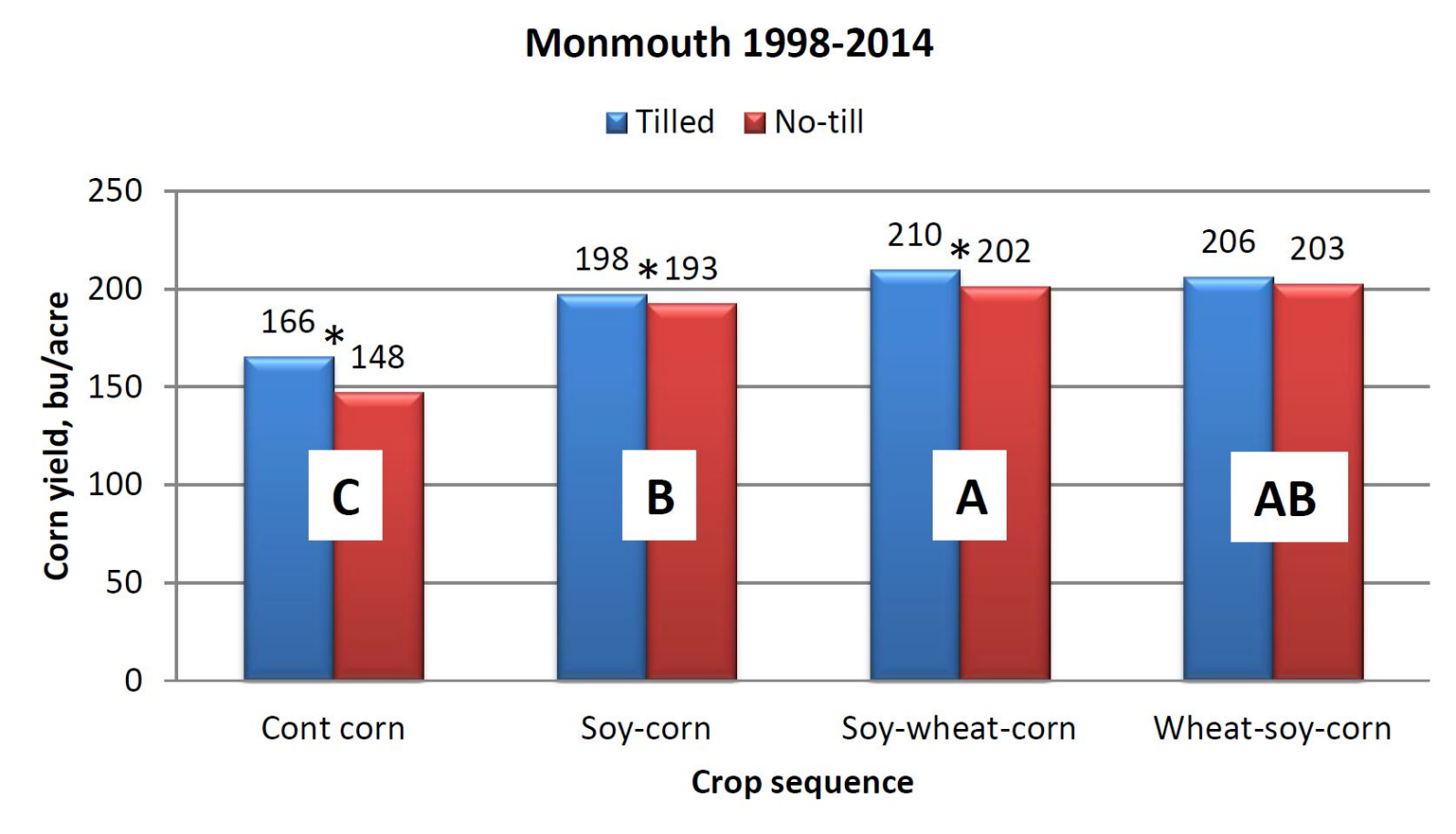
Corn Yields in w/Wheat in Rotation



http://web.extension.illinois.edu/nwiardc/downloads/58547.pdf

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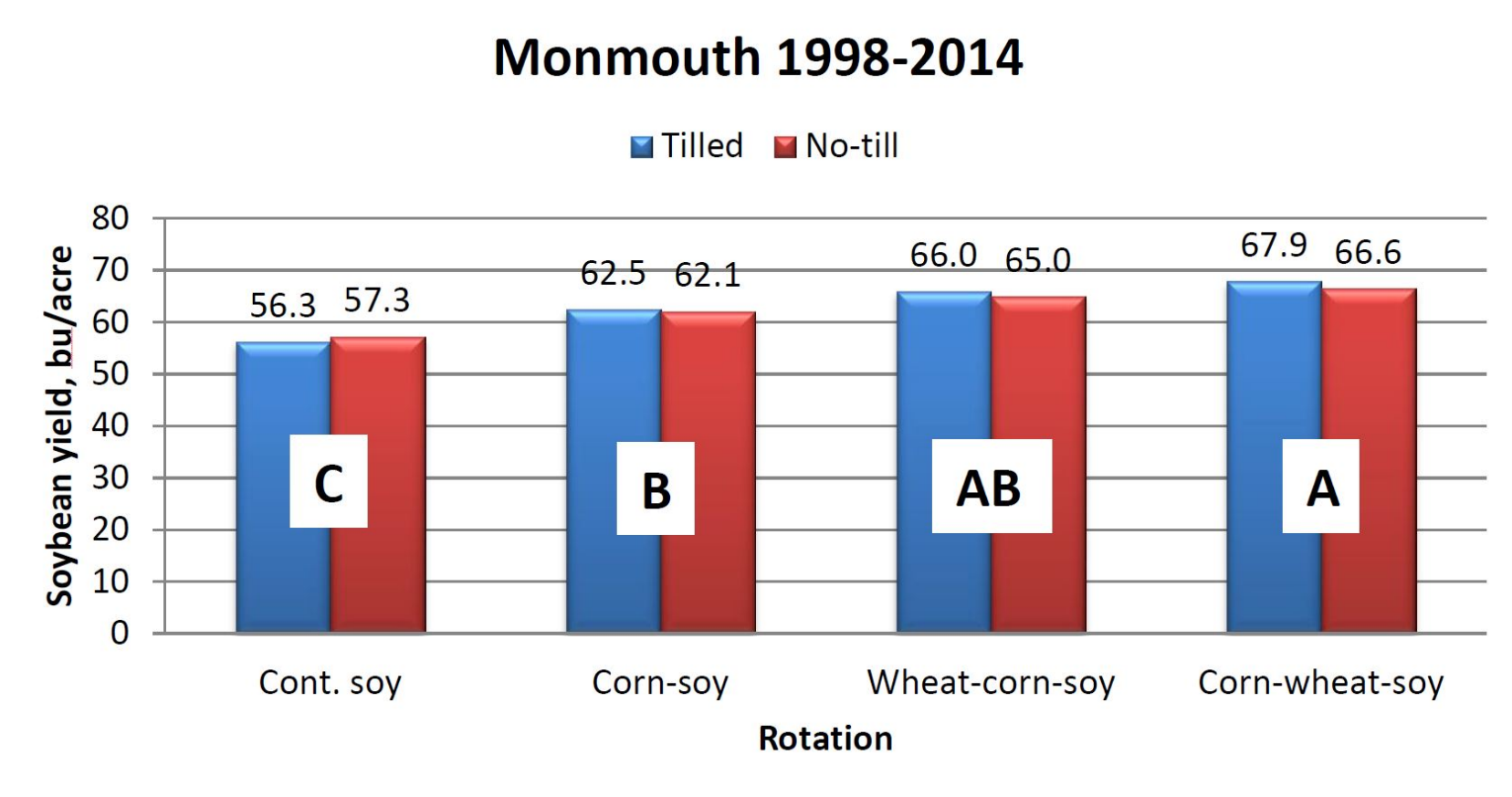
Soybean Yields w/Wheat in Rotation



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The Weather Niche for Winter Wheat

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Winter Wheat Can Help

- Manure management flexibility
- Consider all potential profits streams
  - Value of straw
  - Double crop and forages crop options
  - Potential nitrogen credit for legume cover crop
  - Corn and soybean yield improvement in 3-yr rotation
  - EQIP and CSP opportunities
- Weed control & herbicide cost
  - Marestail, Palmer Amaranth, & Waterhemp
- Soil health and conservation
  - Soil structure, erosion control, cost-share and priority
- Workload management
- Manage weather risks

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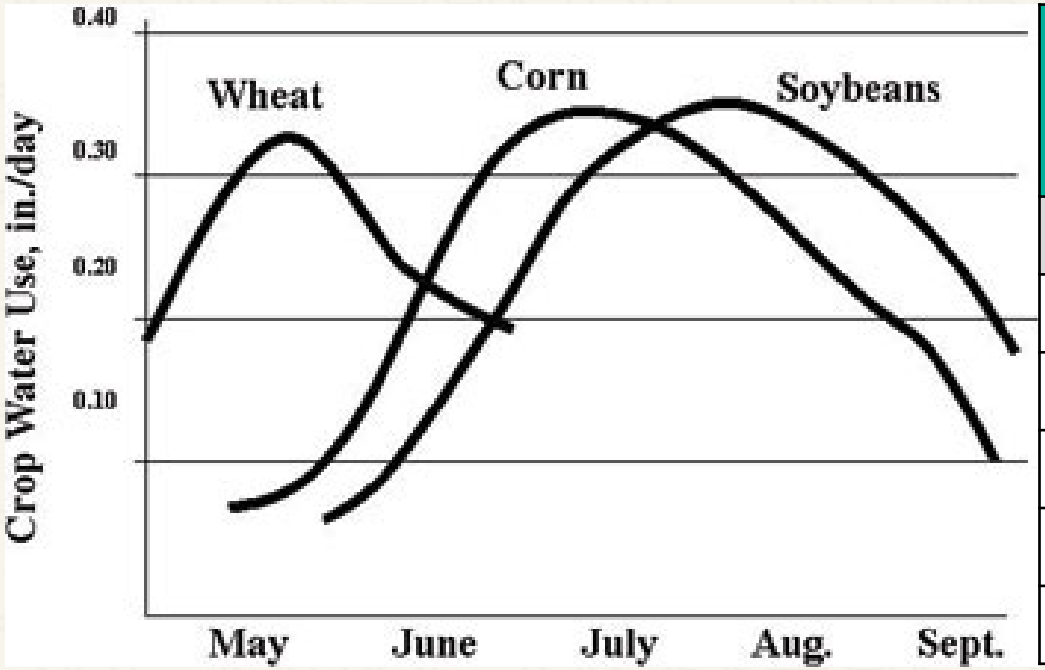
Managing Risks from Extreme Weather



Seasonal crop water use (ET) in Eastern Nebraska when water is not limiting.	
Crop	Inches/year
Corn	21-24
Soybean	20-22
Winter Wheat	16-18
Alfalfa	31-35
Source: water.unl.edu	

Source: Crop Water Use Curves from Colorado State University http://extension.colostate.edu/topic-areas/agriculture/limited-irrigation-managementprinciples-and-practices-4-720/

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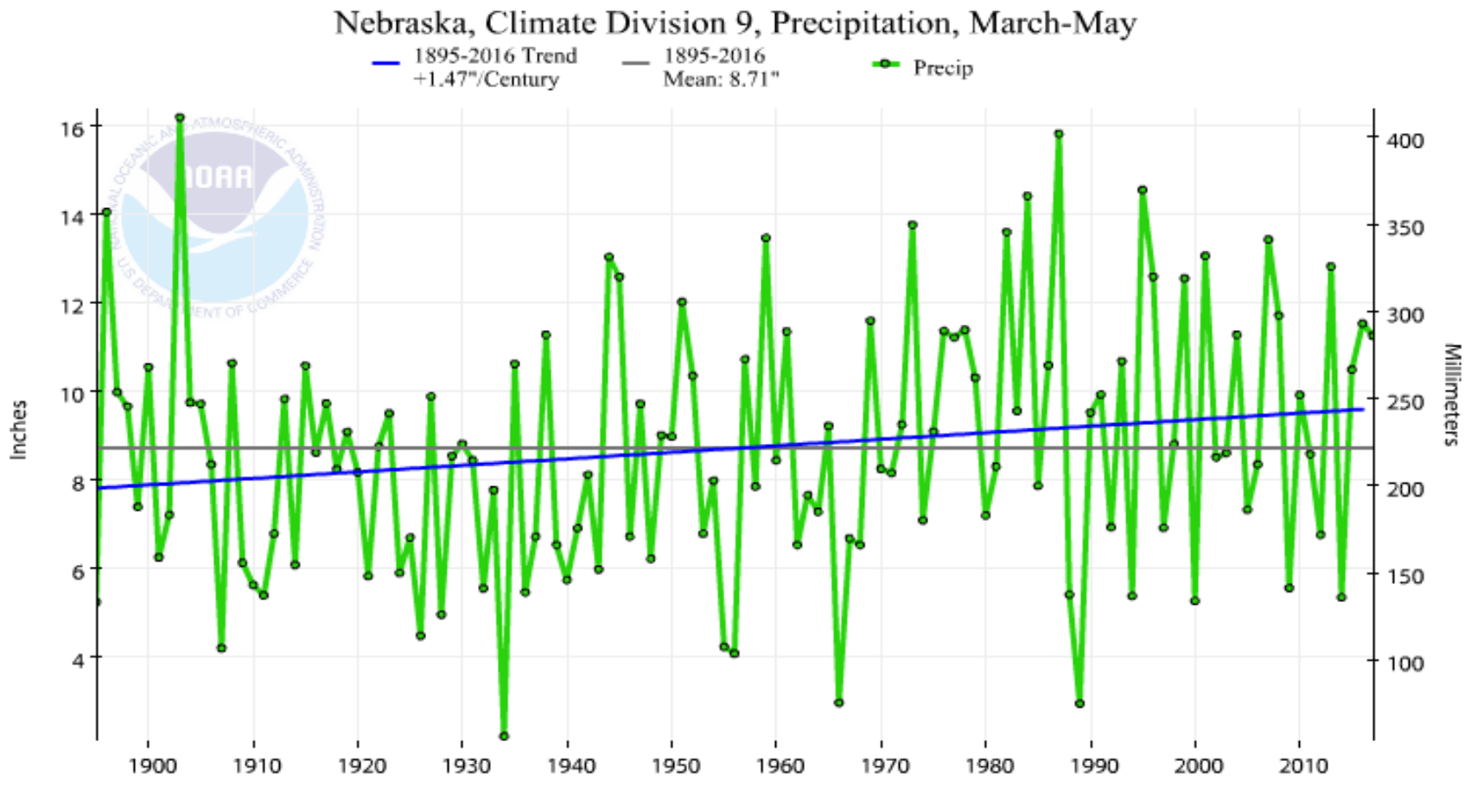
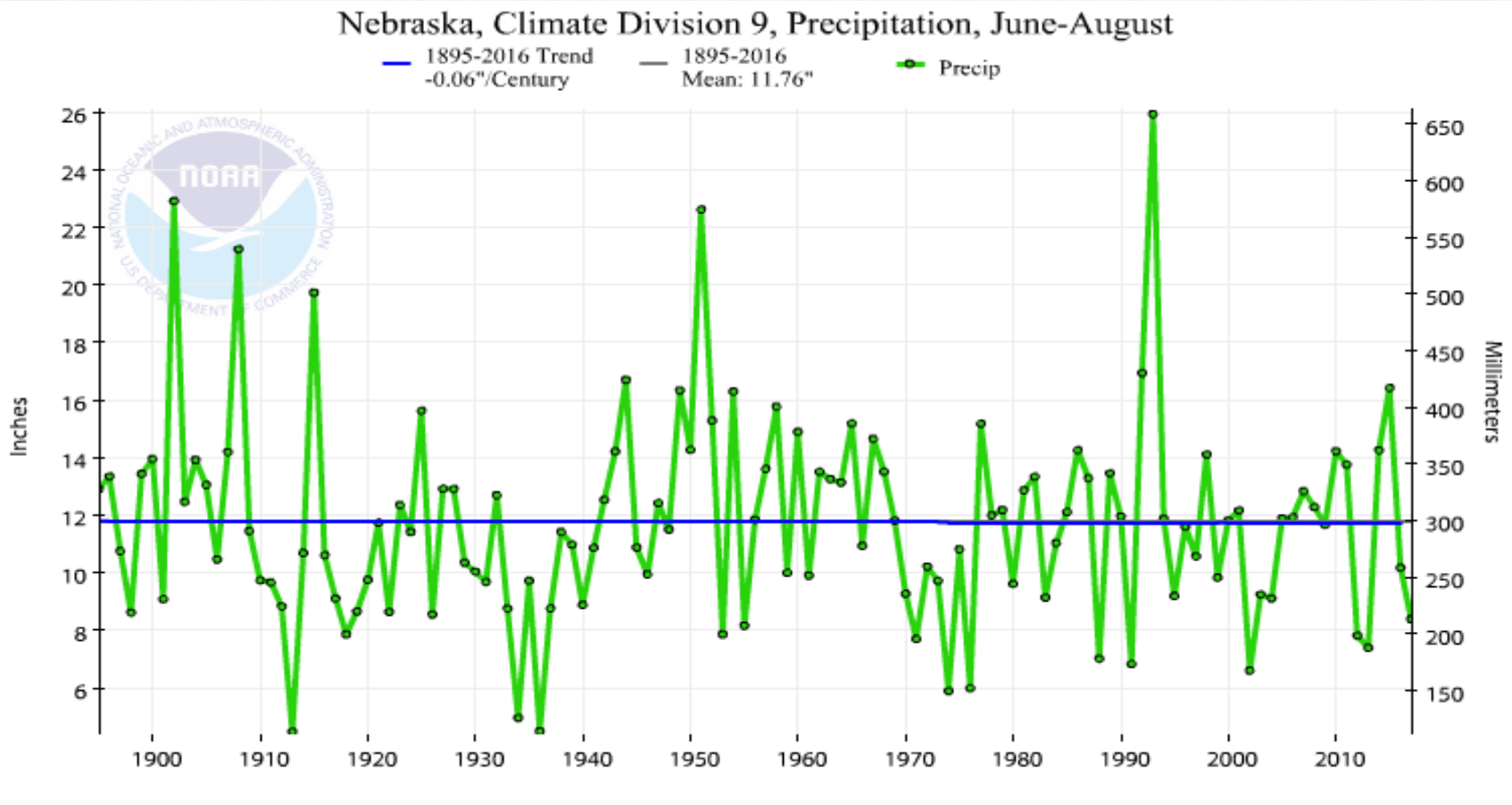
Precipitation Trends: Southeast NE



Precipitation Trends: Southeast NE



Wheat, Your Underground Partner

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Soil Physical Health Indicators

- What is an aggregate and define stability
  - Aggregates – group of soil particles that bind to each other
  - The ability of soil aggregates to resist falling apart or disintegrating
- Aggregate stability
  - Water stable aggregates - most sensitive and best single indicator
  - Also a biological indicator
- How can I measure this on my farm?
  - Water aggregate stability highly correlated with slake test

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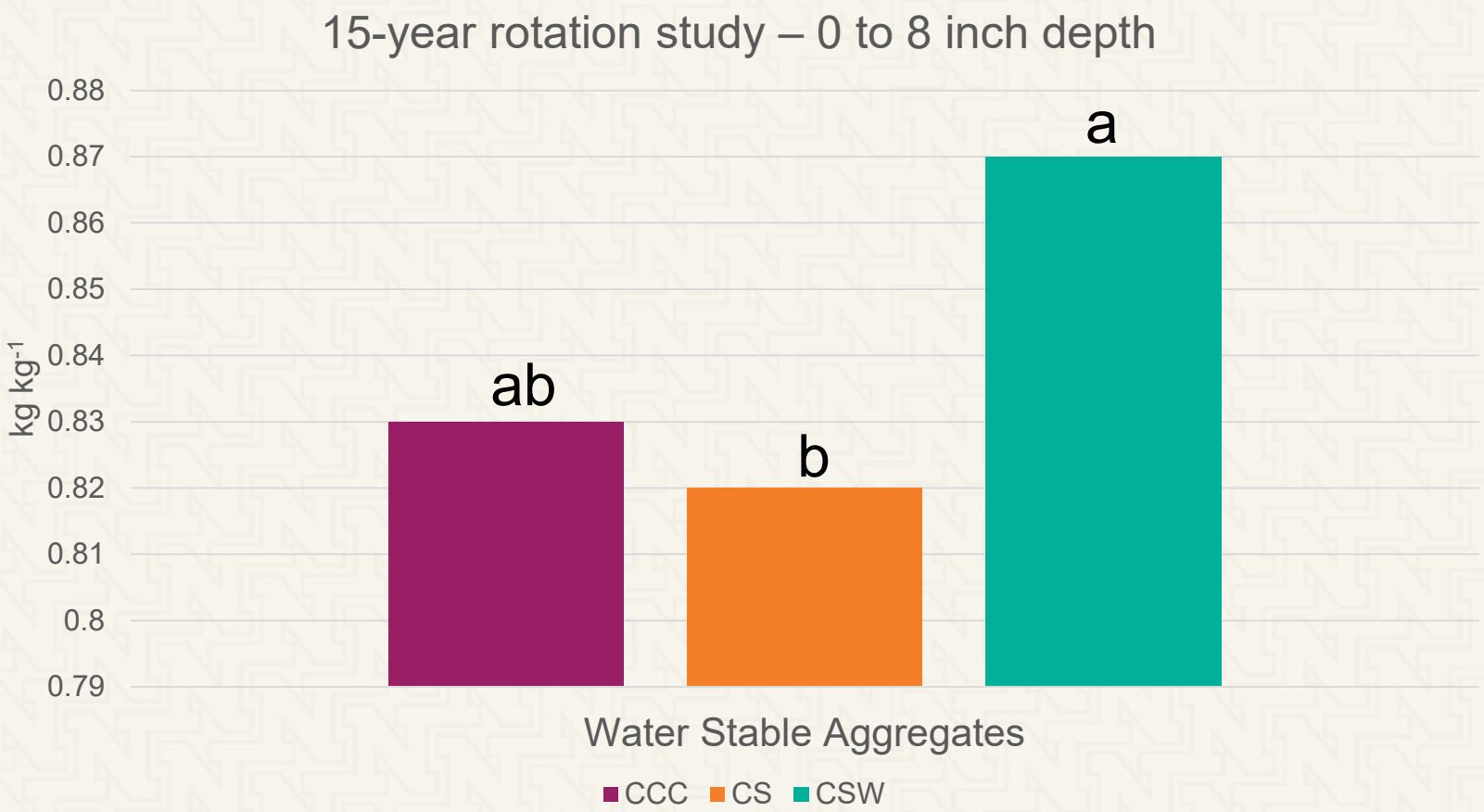
Water Stable Aggregates



Agronomy Journal 107:971-978 (2015) – Monmouth and Perry, IL

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Crop rotation and tillage matter

Improving Soil Health with Winter Wheat

- Aspects of soil health
  - Physical
  - Biological
  - Chemical

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Eastern NE Cropping Systems

Improving Soil Health with Winter Wheat

Current issue

Soil health (biological, physical, and chemical) has been a popular focus over the past decade with emphasis on utilizing no-till and cover crops in eastern Nebraska. However, **a more diverse crop rotation is often left out of the discussion as a way to improve soil health**. The corn-soybean rotation is the most widely utilized cropping systems in eastern Nebraska. Despite the potential benefits adding a third or fourth crop to this rotation to improve soil health, few farmers in eastern Nebraska have because of various adoption barriers.

Crop rotation research

Two long-term (14 & 15 years) crop rotation studies in the Midwest have shown that **including winter wheat into the corn-soybean rotation** results in the following **improvement in soil health**:

1. **Increase in water stable aggregates** (most sensitive and best single indicator of soil physical health)
2. **Higher total nitrogen**
3. **Higher potentially mineralizable nitrogen**

These aspects of soil health were increased by adding wheat into the rotation regardless of the tillage system, conventional and no-till. The dense fibrous root system of wheat and nitrogen derived from wheat root deposits is likely the cause of these measurable differences. These long-term crop rotations studies did not include cover crops.

Overcome barriers to adding wheat

Barriers producers share

- Economics of wheat grain yield only/input cost compared to corn and soybean production
- Logistics of planting and harvesting only 1 or 2 fields
- Concerns about the learning curve of growing a new crop

Overcoming these barriers

- **Improve economics by** capturing good basis in Fremont, selling straw, growing forage crop after wheat, higher soybean yield in rotation, and USDA programs
- **Improve logistics with** custom drilling and harvesting and business opportunity
- **Reduce learning curve through** new website, grower group email list, and future peer-learning group, and work with cropping systems extension educators

Local Grower quotes

"It (wheat) breaks up our corn-bean rotation and it creates more organic matter, because of the root mass." Local Farmer – Fremont Tribune

"Winter wheat gives you an additional 45 to 60 days for the cover crop to grow, which results in more material to graze if you choose to, and more root mass to help build organic matter in the soil." Local Farmer - Nebraska Farmer Magazine

"I'm hoping the wheat residue will double as a mat for the soil and a cover crop to help suppress weeds as well. It might decrease some chemical costs." Local Farmer - Nebraska Farmer Magazine

For more information

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Wheat resources for eastern Nebraska at croptechcafe.org/winterwheat

Winter Wheat Development and Growth

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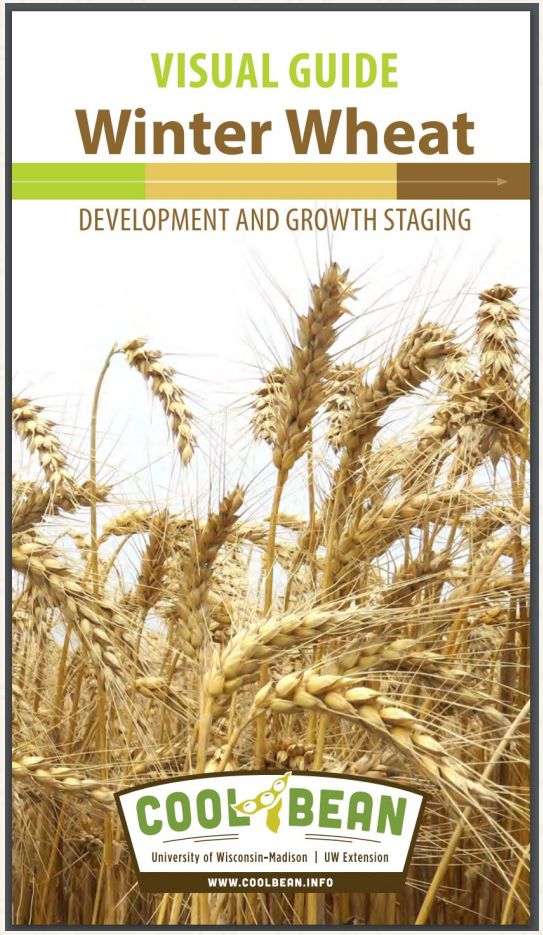
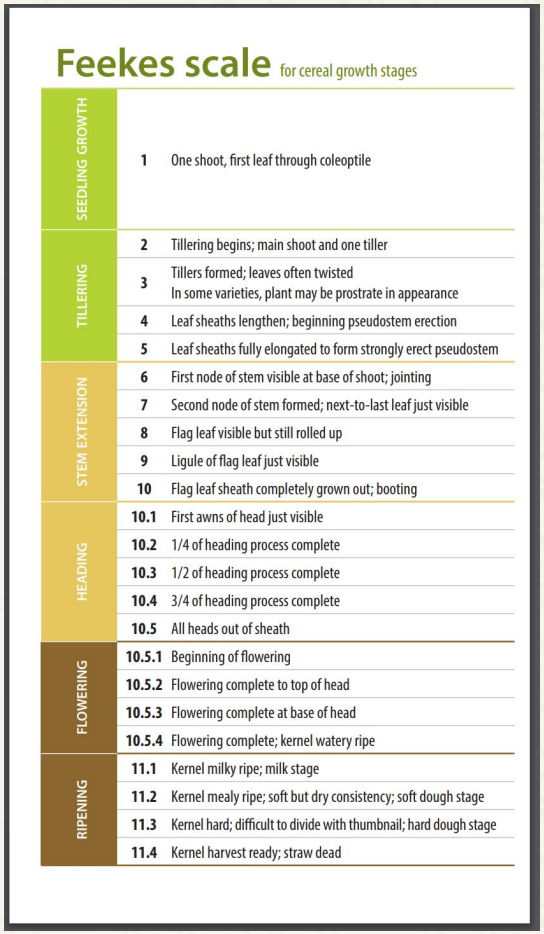
Wheat Development and Growth





Feekes scale for cereal growth stages

SEEDLING GROWTH	1	One shoot, first leaf through coleoptile
TILLERING	2	Tillering begins; main shoot and one tiller
	3	Tillers formed; leaves often twisted In some varieties, plant may be prostrate in appearance
	4	Leaf sheaths lengthen; beginning pseudostem erection
	5	Leaf sheaths fully elongated to form strongly erect pseudostem
STEM EXTENSION	6	First node of stem visible at base of shoot; jointing
	7	Second node of stem formed; next-to-last leaf just visible
	8	Flag leaf visible but still rolled up
	9	Ligule of flag leaf just visible
	10	Flag leaf sheath completely grown out; booting
HEADING	10.1	First awns of head just visible
	10.2	1/4 of heading process complete
	10.3	1/2 of heading process complete
	10.4	3/4 of heading process complete
	10.5	All heads out of sheath
FLOWERING	10.5.1	Beginning of flowering
	10.5.2	Flowering complete to top of head
	10.5.3	Flowering complete at base of head
	10.5.4	Flowering complete; kernel watery ripe
RIPENING	11.1	Kernel milky ripe; milk stage
	11.2	Kernel mealy ripe; soft but dry consistency; soft dough stage
	11.3	Kernel hard; difficult to divide with thumbnail; hard dough stage
	11.4	Kernel harvest ready; straw dead

http://coolbean.info/wp-content/uploads/sites/3/2018/04/2018_WheatGrowthStages_FINAL.pdf

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Winter Wheat Management in Eastern Nebraska

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Management Factors of Winter Wheat in Eastern Nebraska

Rank	Management Factor	Yield Difference (bu/ac)
1	Variety Selection	21
2	Foliar Fungicide	16
3	Row Spacing, 15 vs 7.5”	16
4	Planting Date (2 wks)	10
5	Nutrient Mgnt (30 lbs N)	7
6	Seeding Rate	5

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Variety Selection

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Variety Selection is Critical

Variety	3-year yield average (bu/ac)
WB4303	99
AM Eastwood	78

UNL Variety Trial Test Results
http://cropwatch.unl.edu/winter-wheat-variety-test-results

Colorado Wheat Variety Database
http://ramwheatdb.com/database.php

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Variety Testing Locations – Eastern Nebraska

- Soils and practices
  - Washington
    - Moody/Marshall series
    - No-till after soybeans
  - Saunders
    - Filbert - very deep, somewhat poorly drained, very slowly permeable soils formed in loess
    - Tilled after oats
  - Lancaster
    - Crete - very deep, moderately well drained soils formed in loess
    - Tilled after oats
  - Jefferson
    - Crete silt loam
    - No-till after soybeans

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Wheat Seed Brands in Eastern Nebraska

- Husker Genetics (UNL)
- NuPride (UNL)
- Kansas Wheat Alliance (KSU)
- WestBred (Bayer)
- Limagrain Cereal Seeds
- AgriMaxx
- AgriPro (Syngenta)
- Dyna-Gro

Digital Variety Tour - http://croptechcafe.org/winterwheat/

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Example: Zenda – Kansas Wheat Alliance Released 2016

Placement

- All counties

Highlights

- Great yield performance record in UNL 3-yr trials
- Moderate resistance to Fusarium Head Blight
- Excellent test weight

Management Suggestions

- Replacement for Everest
- Average drought tolerance

View at croptechcafe.org/winterwheat

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Disease Management

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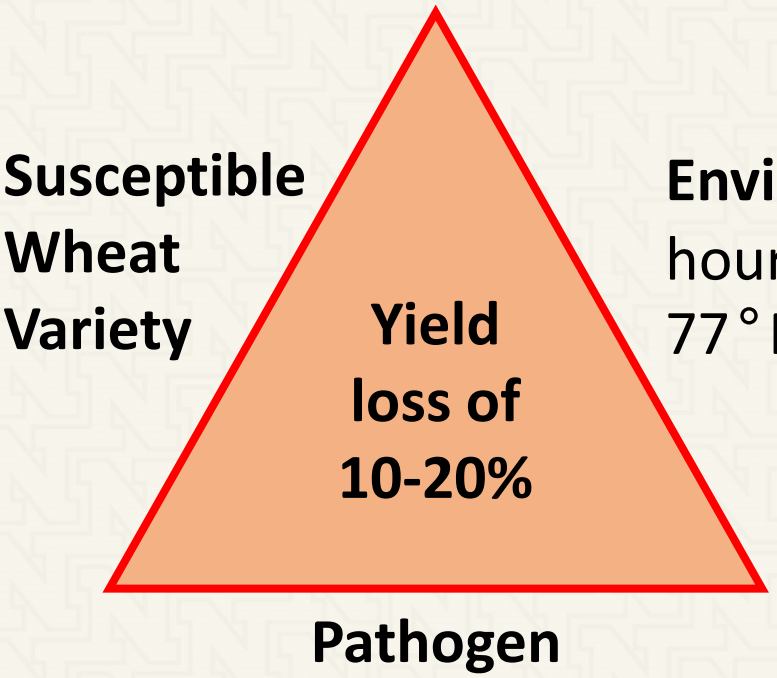
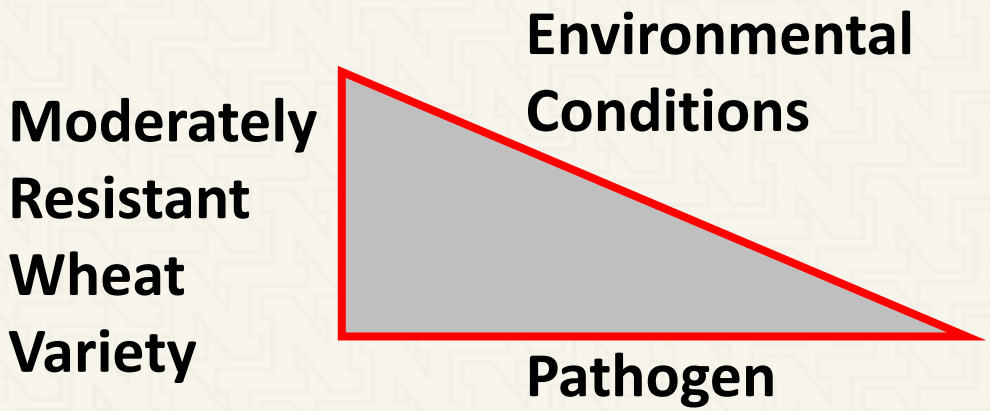
Disease Triangle – Leaf Rust
(*Puccinia triticina*)



Environmental Conditions (59-68°F plus 6 hours of leaf wetness for infection & 68-77°F plus wet weather)



Timing of environmental conditions

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Leaf Rust

- Disease
  - Caused by fungus *Puccinia triticina*
  - Does not overwinter
  - Central and eastern Nebraska
  - Yield losses up to 14% typical
- Management
  - Variety selection for resistance
  - Scouting
  - Foliar fungicide

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Stripe Rust

- Disease
  - Caused by fungus *Puccinia striiformis* f. sp. *Tritica*
  - Does not overwinter
  - Has become a significant disease since 2010 in Nebraska
  - Yield loss up to 40%
- Management
  - Variety selection for resistance
  - Scouting
  - Foliar fungicide

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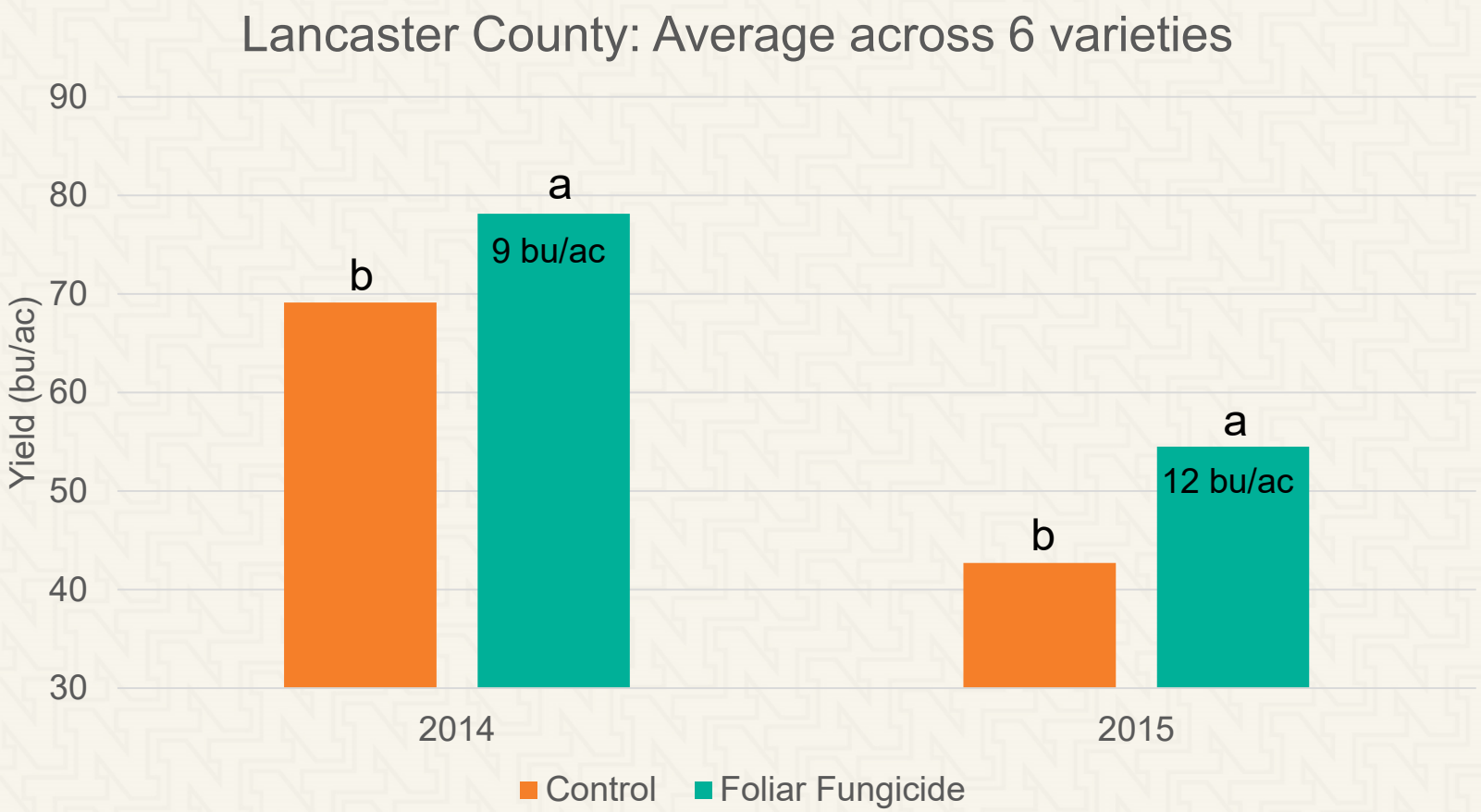
Foliar Fungicide at Flag Leaf



Bhatta, M. 2015. Effect of genotype, environment, and production packages on yield, agronomic characteristics, and end-use quality of winter wheat. Master's thesis, Univ. of Nebraska, Lincoln, NE. http://digitalcommons.unl.edu/agronhortdiss/98.

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Bacterial Leaf Streak/Black Chaff

- Disease
  - Caused by bacteria *Xanthomonas translucens* pv. *undulosa*
  - Overwinters in residue/soil
- Management
  - Pathogen free seed
  - Variety selection that are less susceptible (i.e. SY Wolf, Overland)

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Fusarium Head Blight (Scab)

- Disease
  - Caused by fungus *Fusarium graminearum & boothii*
  - Reported in NE since 1898
  - Survives on residue, in soil
  - Rainfall/humidity during flowering
  - Vomitoxin (DON)
- Management
  - After corn is the highest risk
  - Variety selection for resistance
  - Disease risk mapping (http://www.wheatscab.psu.edu/)
  - Scouting
  - Foliar fungicide at early flowering

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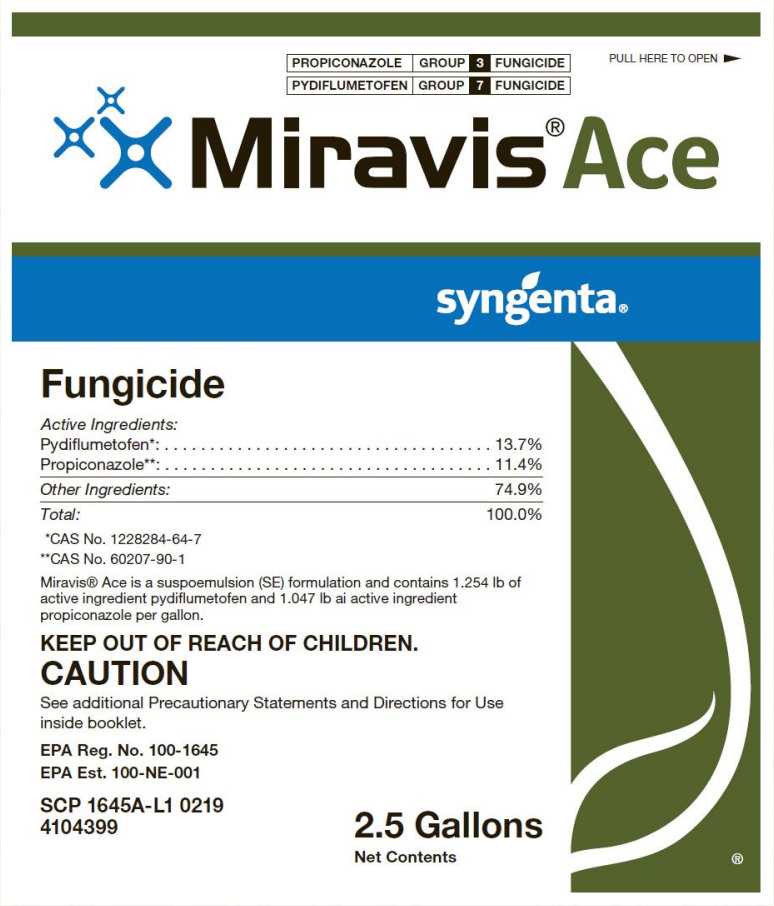
Fungicides for FHB

- Prosaro 421 SC (Bayer)
  - Prothioconazole (3, Triazole)
  - Tebuconazole (3)
- Caramba (BASF)
  - Metconazole (3)
- Miravis Ace (Syngenta)
  - Two modes of action
    - Propiconazole (3)
    - Pydiflumetofen (7, SDHI)



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Varieties with Moderate Resistance for FHB

- Varieties in the Trials
  - WB4699 (3)
  - Overland (3)
  - SY Benefit (4)
  - Zenda (5)
  - WB4269 (5)
  - LCS Valiant (6)

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Farmer Question: Variety

- "I was wondering if you could give me a little insight on what would be a good yielding wheat variety that you could no-till into cornstalks after harvest. I am trying to enroll into the CSP program and wheat is very important in their ranking process. The wheat variety would have to be suited for dryland and heavy clay soils in southwest Lancaster County." *Email on 2-21-2020*

  You need to give them a recommendation and explain why

  Resources you have to help answer their question:

  - Nebraska Certified Seed Book - http://www.necrop.org/SEED%20BOOKS/2019Small.pdf
  - Winter Wheat Variety Trial Results - https://cropwatch.unl.edu/winter-wheat-variety-test-results
  - CSU Wheat Variety Database Tools - http://ramwheatdb.com/database.php
  - Winter Wheat Cafe Variety Tour and Selection Table - http://croptechcafe.org/winterwheat/

- I will act as the grower, if you have questions, raise your hand and I will stop at your table.

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Planting Date and Seeding Rate

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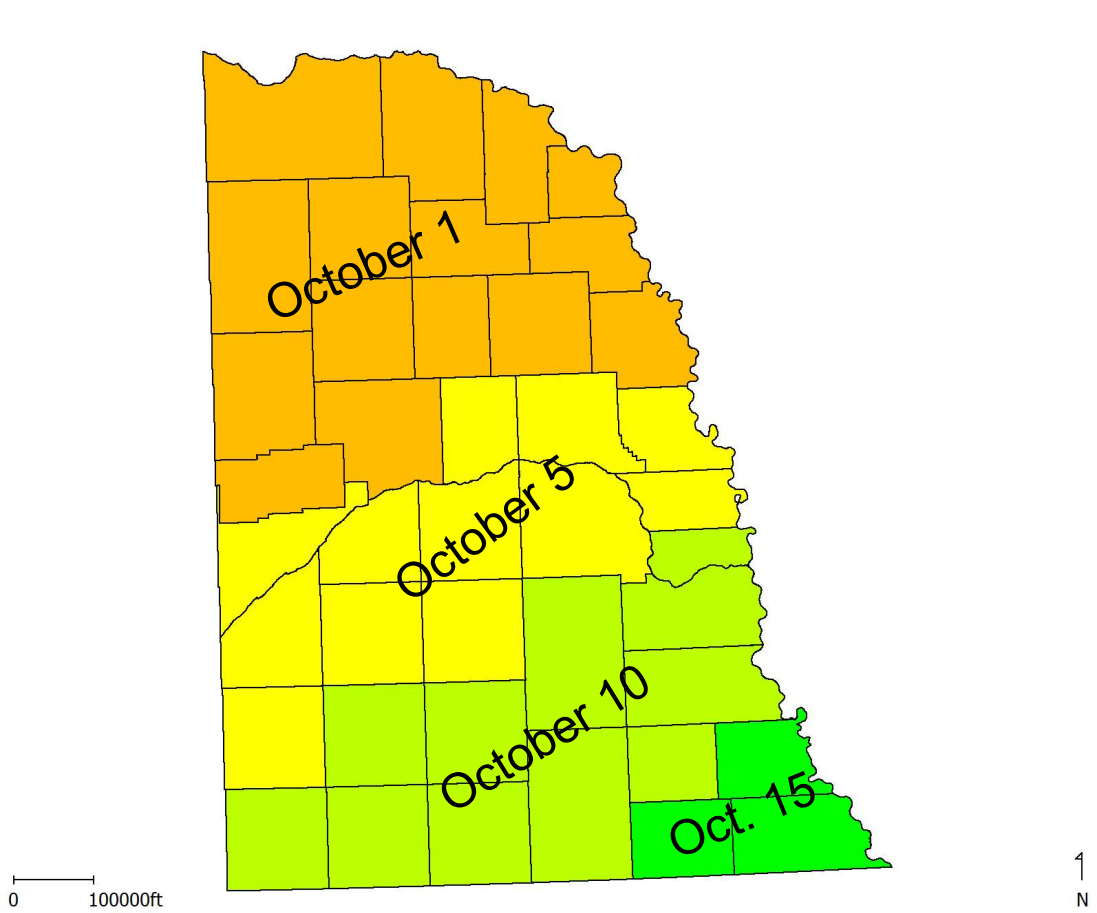
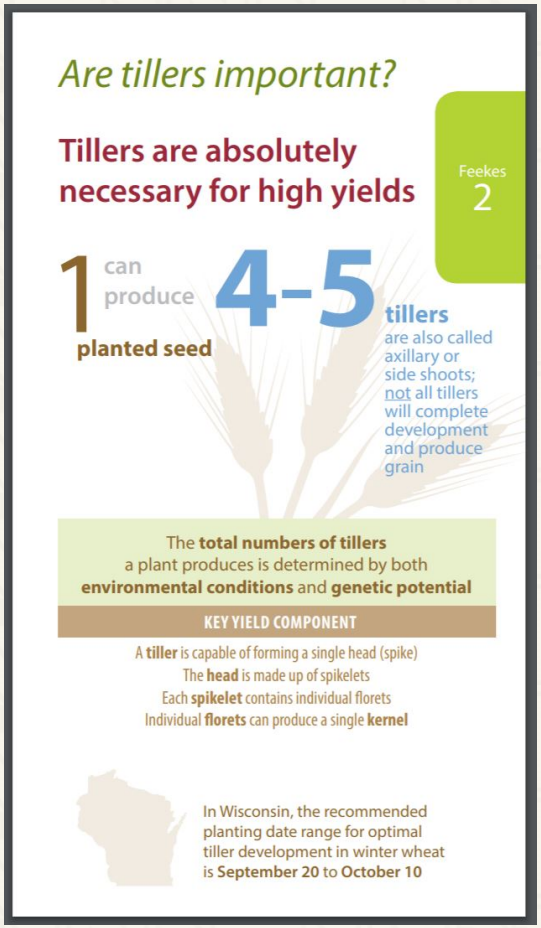
Target Planting Date Map



Target planting dates

- Planting date allows for 400 GDU (Base 40) accumulation between planting and December 31
- 1980s work in southeast NE
- Temperature norms – 1981-2010 used

Wheat Development and Growth



http://coolbean.info/wp-content/uploads/sites/3/2018/04/2018_WheatGrowthStages_FINAL.pdf

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Planting Date by Seeding Rate

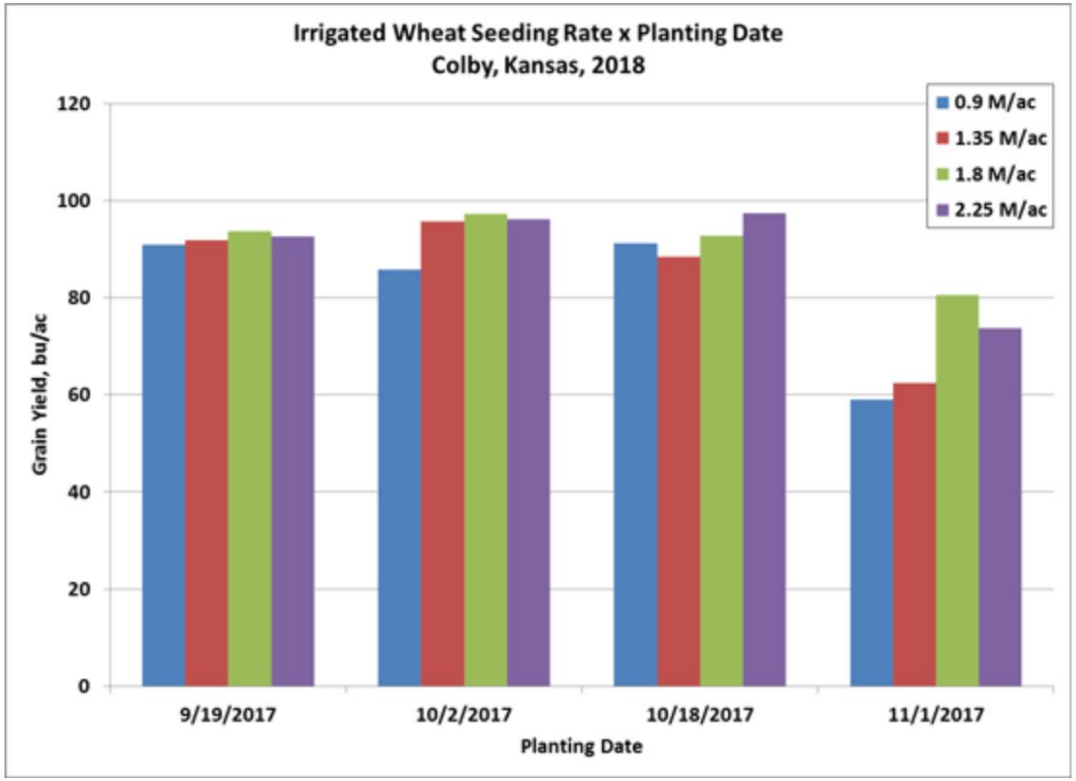

Figure 2. Irrigated wheat yields from 2017 for a study conducted in northwest Kansas evaluating planting dates and seeding rates.

Source: https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=2004

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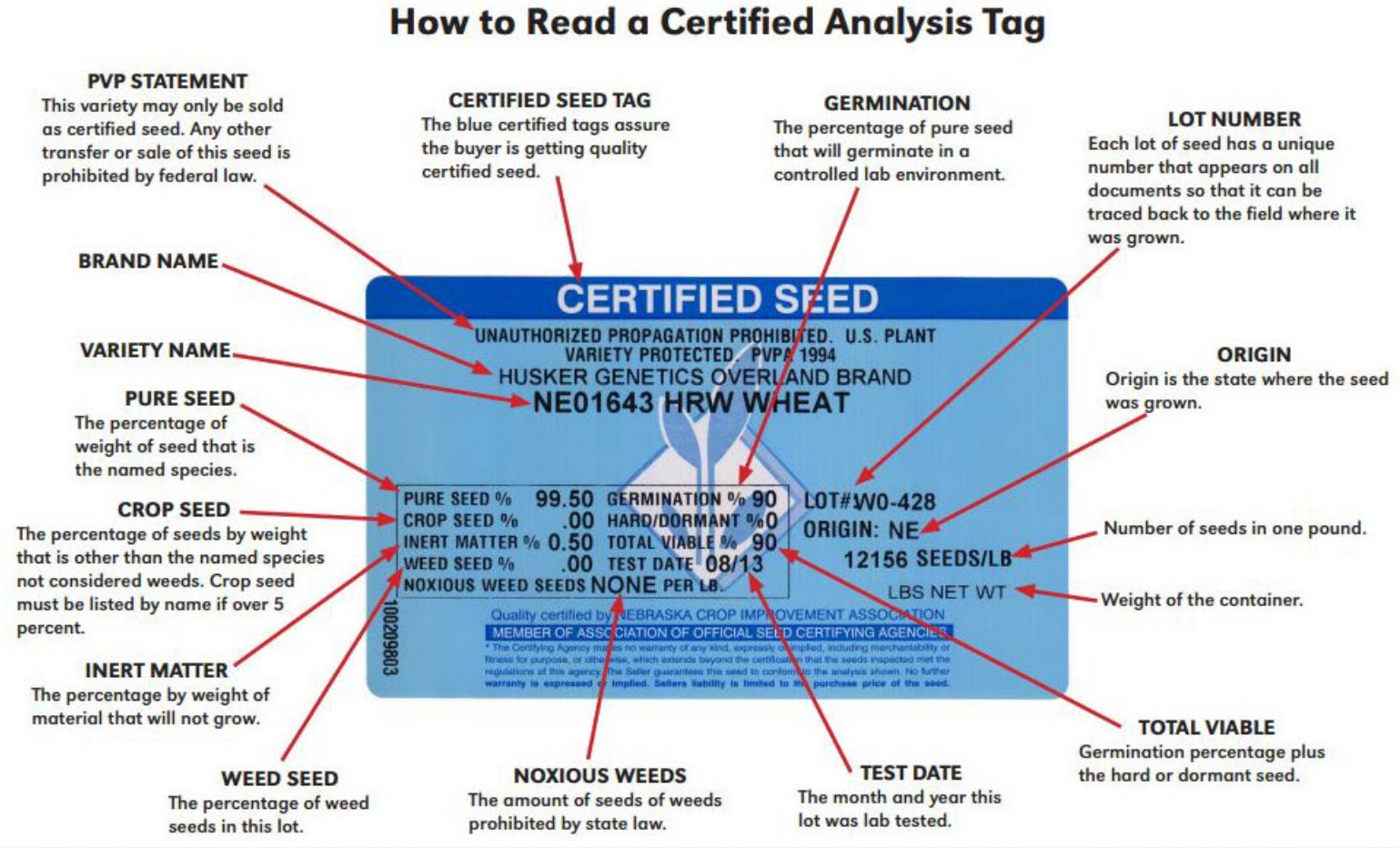
Use Certified Seed



Seeding Rate and Planting Date

Crop Tech Cafe Winter Wheat Seeding Rate Calculator for East Central Nebraska		
Estimated Planting Dates	**Oct. 7 - Oct. 14**	*Select estimated planting dates from drop-down*
Recommended Seeding Rate (Pure Live Seeds per Acre)	**1,350,000**	*Based on estimated planting dates selected*
Germination (%)	**95**	*Enter germination from seed tag*
Purity (%)	**99**	*Enter purity from seed tag*
Seed Size (seeds/lbs)	**15,000**	*Enter seed size from seed tag*
Contact Nathan Mueller at nathan.mueller@unl.edu with questions	**Seeding Rate (lbs/acre)**	**96**
	Seeding Rate (bu/acre)	**1.6**

- Plant certified fungicide-treated seed to control seed-transmitted and soilborne fungal diseases
- Plant at 1.5 inches deep no-till after soybeans

Download at croptechcafe.org/winterwheat

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Farmer Question: Seeding Rate

- A grower from Jefferson County contacts you on October 27 and asks you, “What seeding rate I should set my drill at tomorrow given the late planting date?”
  - You need to give them a recommendation and explain why.
  - Resources you have to help answer the question:
    - http://extensionpublications.unl.edu/assets/pdf/g2056.pdf
    - http://croptechcafe.org/winterwheat/
  - I will act as the grower, if you have questions, raise your hand and I will stop at your table.

N EXTENSION

Evaluating Winter Wheat Stands

- Better option than a tape measure
- No need to glue together, so easy storage.
- Interpretations
  - Assesses yield components
  - Risk of weed pressure

EXTENSION

Eastern NE Cropping Systems

Evaluating Winter Wheat Stands

Current issue

Recommended seeding rates start at 1.2 million seeds per acre and increase as planting is delayed through October in eastern Nebraska. You can download the seeding rate Excel tool at croptechcafe.org/winterwheat Evaluating your winter wheat stand and determining how many plants you have on a per acre basis is something most growers find difficult and time consuming. It is normal to use a tape measure to help count plants for corn and soybean, but not as ideal for wheat. Knowing what percentage of your seeding rate became established as plants is critical information to have to make future planting adjustments and also to make a determination, when stands are poor, to use the wheat as a cover crop.

Making your own grid for 1/10,000 of an acre

Supplies:

- One 10 ft piece of ½ inch PVC & Four PVC elbows for ½ inch pipe
- Measuring tape, saw, & permanent marker

Cut and Assemble: Dimensions to cut pipe for each row spacing:

- 7.5 inch row spacing
  - 22.5" wide and 28" long
- 8 inch row spacing
  - 24" wide and 26" long
- 10 inch row spacing
  - 30" wide and 21" long

Mark: With your permanent marker, add 3 lines (7.5, 8, or 10) inches apart to represent rows on each two sides (the side that is 22.5, 24, or 30" wide).

Assess your winter wheat stand

Count the number of plants for the three rows inside the grid in the fall or early spring with a **tally counter (shown in picture)** in several different areas of the field and then average those values. Interpretation of your counts from 1/10,000 of an acre grid:

- **Less than 50 plants** – Likely due to high variability in the stand, consider replanting at an angle or using as a cover crop
- **50 to 65 plants** – Reduced yield, can still yield well with good tillering and weed control
- **65 to 95 plants** – Good, can obtain close to max yield potential
- **More than 95 plants** – Ideal

For more information

Nathan Mueller, PhD, CCA
Nebraska Extension Cropping Systems Educator
402-727-2775 or *nathan.mueller@unl.edu*

Wheat resources for eastern Nebraska at croptechcafe.org/winterwheat

N P K S Ca Mg

Nutrient Management

Fe Mn Cu Zn B Cl Mo Ni

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Nitrogen Management

- Based on regional UNL recommendations and local grower experiences
  - 80 – 110 lbs N/acre
- Apply most or all as wheat begins to green up in February/March
- Grain protein can be improved with late N applications
  - N at Flag leaf can still improved protein/yield

Phosphorus Management

- Higher soil test phosphorus needed compared to corn and soybeans
  - Similar to alfalfa and corn-after-corn
  - 25 ppm Bray P1 or more
- Helps with early growth, tillering, and winter hardiness

Sulfur Management

- Becoming more common in northeast and north central KS and southeast NE
- No-till, cold springs, low organic matter eroded areas
- Pale yellow color in the spring, entire plant, more so on younger leaves
- 10 to 20 lbs S/acre
- Dry ammonium sulfate or liquid ammonia thiosulfate

Photo by Stephen Wegulo, UNL

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Chloride Management

- Recent analysis in Kansas performed across multiple years and locations suggest an average yield response of 8% to chloride fertilization.
- Chloride has been shown to suppress take-all root rot, tan spot, stripe rust, leaf rust, and Septoria
- Research has shown equal performance to both preplant and topdress applications.

Cl

Table 5. *Soil test chloride interpretation and fertilizer recommendation.*

Category	Soil Chloride* lb/a	Soil Chloride* ppm	Cl Recommended lb/a
Low	< 30	< 4	20
Medium	30-45	4-6	10
High	> 45	> 6	0

**Interpretations valid for 0-24 inch samples on wheat, corn and grain sorghum.*

Summary

- Needs assessment by growers
- Wheat production in the region
- Economics and weather
- Soil health aspect
- Winter wheat management for new growers:
  - Variety Selection
  - Diseases
  - Planting dates and rates
  - Nutrients

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Thank You!

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