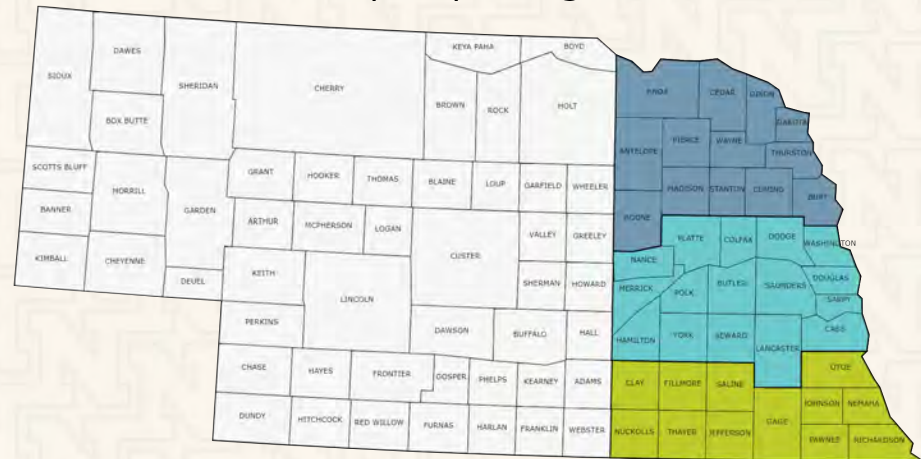




BMPs of Winter Wheat Production in Eastern Nebraska

USDA Crop Reporting Districts



Nathan Mueller Ph.D. CCA

Water & Integrated Cropping Systems Extension Educator

Introduction

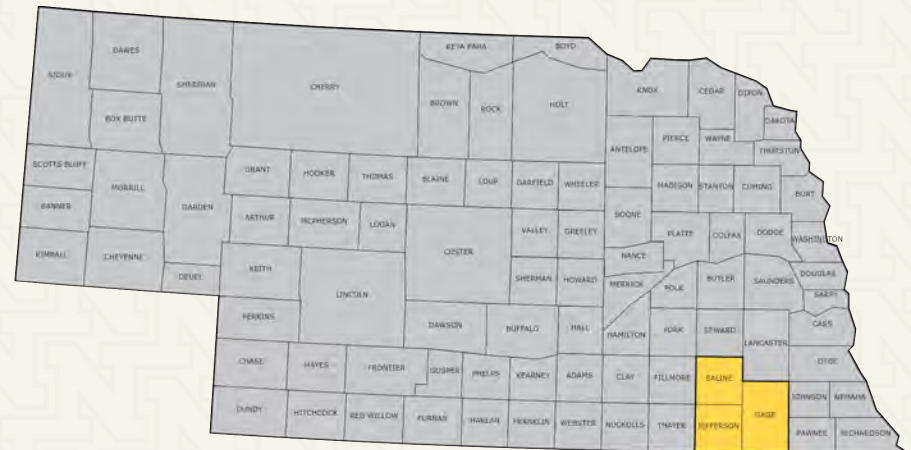


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Gage counties

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Best Management Practice (BMPs) of Winter Wheat Production in Eastern Nebraska

Rank	Management Factor	Yield Difference (bu/ac)
1	Variety Selection	10 - 20
2	Foliar Fungicide	10 - 16
3	Row Spacing, 15 vs 7.5"	15
4	Planting Date (2 wks)	10
5	Seeding Rate	5

Yields difference not all additive due to interactions

Topics

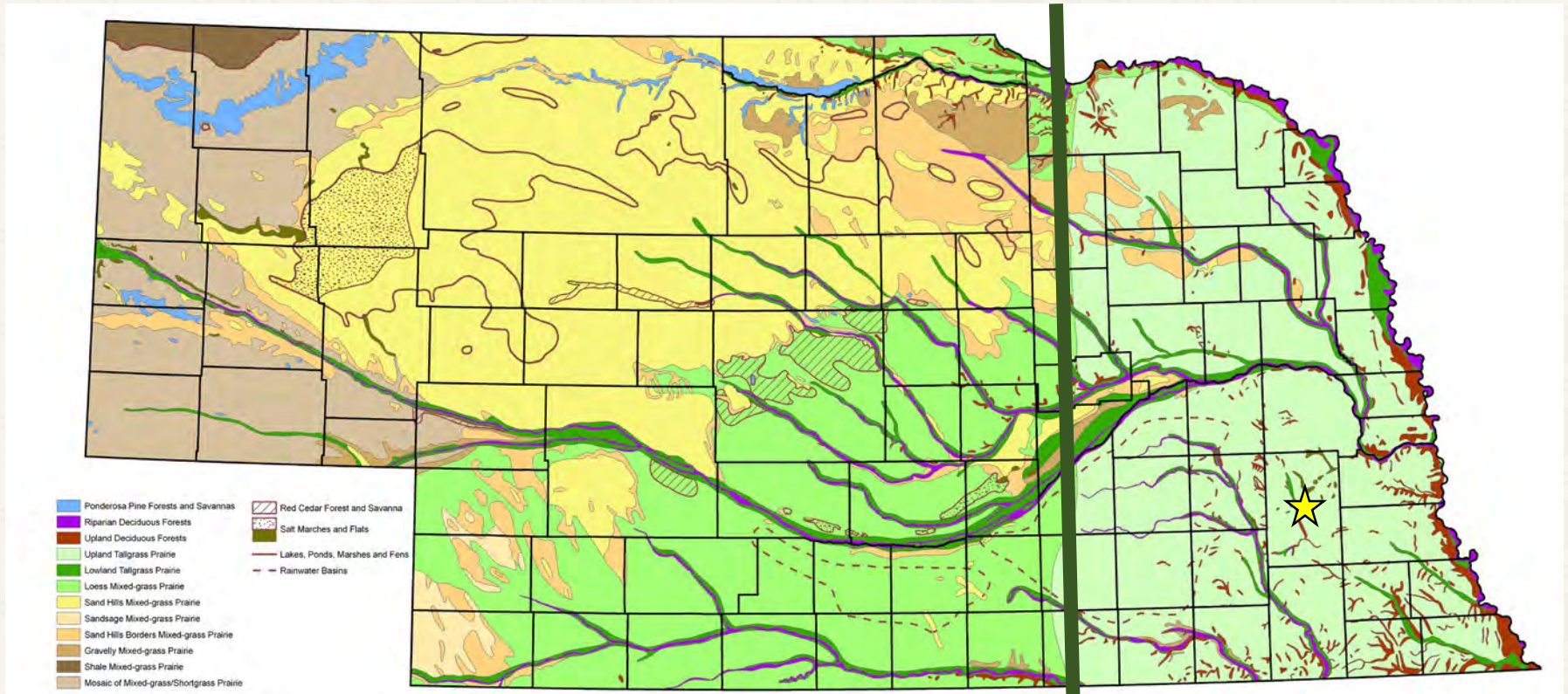
- Winter wheat management
 - Variety Selection
 - Diseases
 - Planting dates and rates
 - Nutrient management
- Yields, economics and weather risks
- Soil health aspect





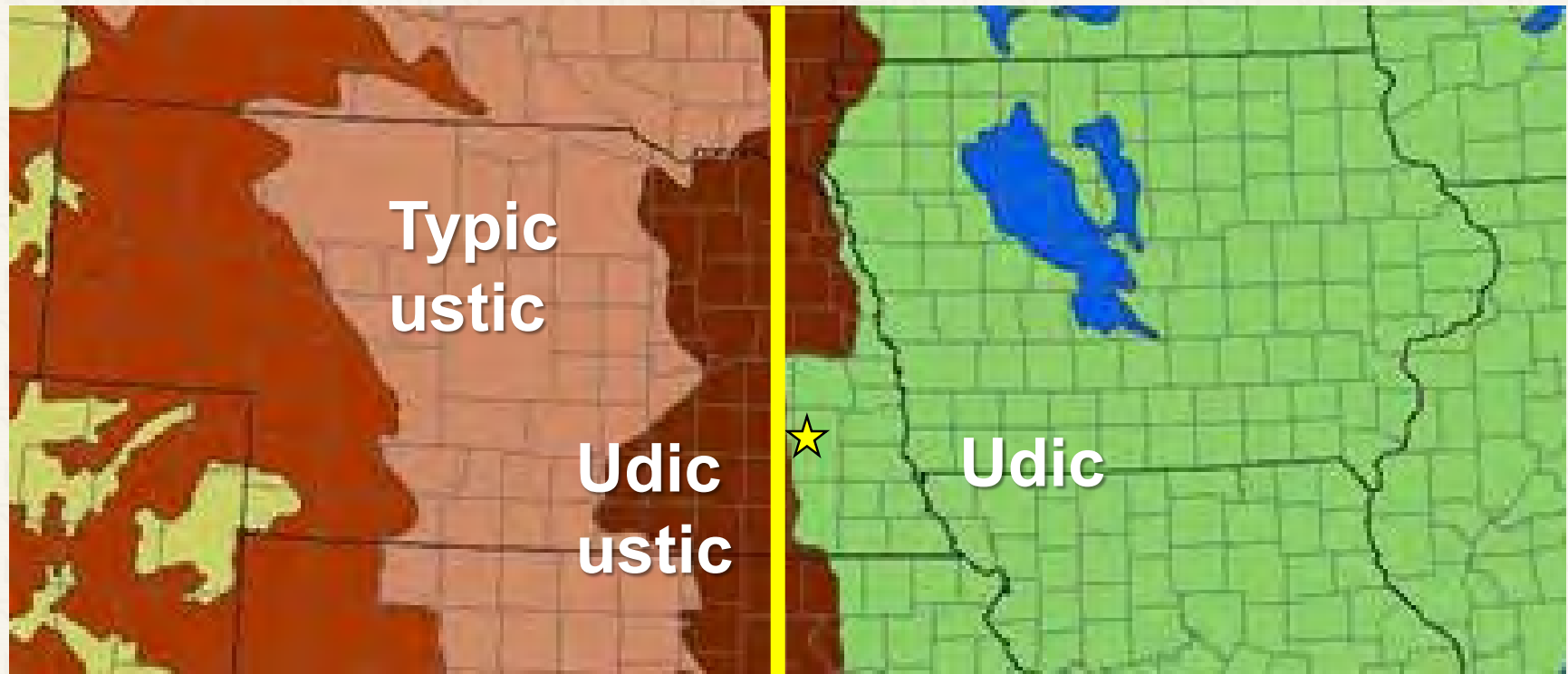
Wheat Production Regions

Native Vegetation



Hwy 14

Soil Moisture Regime – USDA-NRCS and K-State Research Analysis



97 degrees west longitude



Online Resources

Winter Wheat Cafe

Crop Tech Cafe

Know your crop, know your tech, know your bottom line... feeding you agronomic information for your farm in southeast Nebraska

HOME CROP TECH BOTTOM LINE LOCAL PROGRAMS ABOUT

Type and hit enter to Search

Winter Wheat Cafe for East and South Central Nebraska



2020 Winter Wheat Variety Trial near Fairbury in Jefferson County

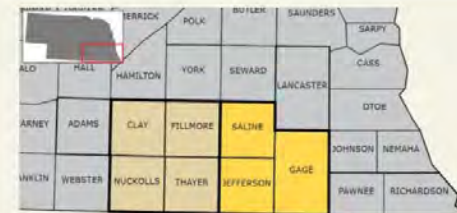
Positioning your farm to manage manure, control tough weeds, and improve soil health are just some of the advantages to growing winter wheat in east and south central Nebraska.

What's on this page?

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Serving Southeast Nebraska



Subscribe

View at croptechcafe.org/winterwheat



Eastern Nebraska Wheat Email Group

- **194 current members**
- Weekly Email Update: What's Up This Wheat?
- Opportunity for members to email others with questions
- Opportunity to be aware of upcoming Extension events related to wheat

Sign up at croptechcafe.org/winterwheat



Variety Selection

Variety Selection is Critical

Variety	3-year yield average (bu/ac)
WB4303	91
Freeman	81

UNL Variety Trial Test Results

<http://cropwatch.unl.edu/winter-wheat-variety-test-results>

Colorado Wheat Variety Database

<http://ramwheatdb.com/database.php>



2021 Variety Testing Locations – East and South Central Nebraska

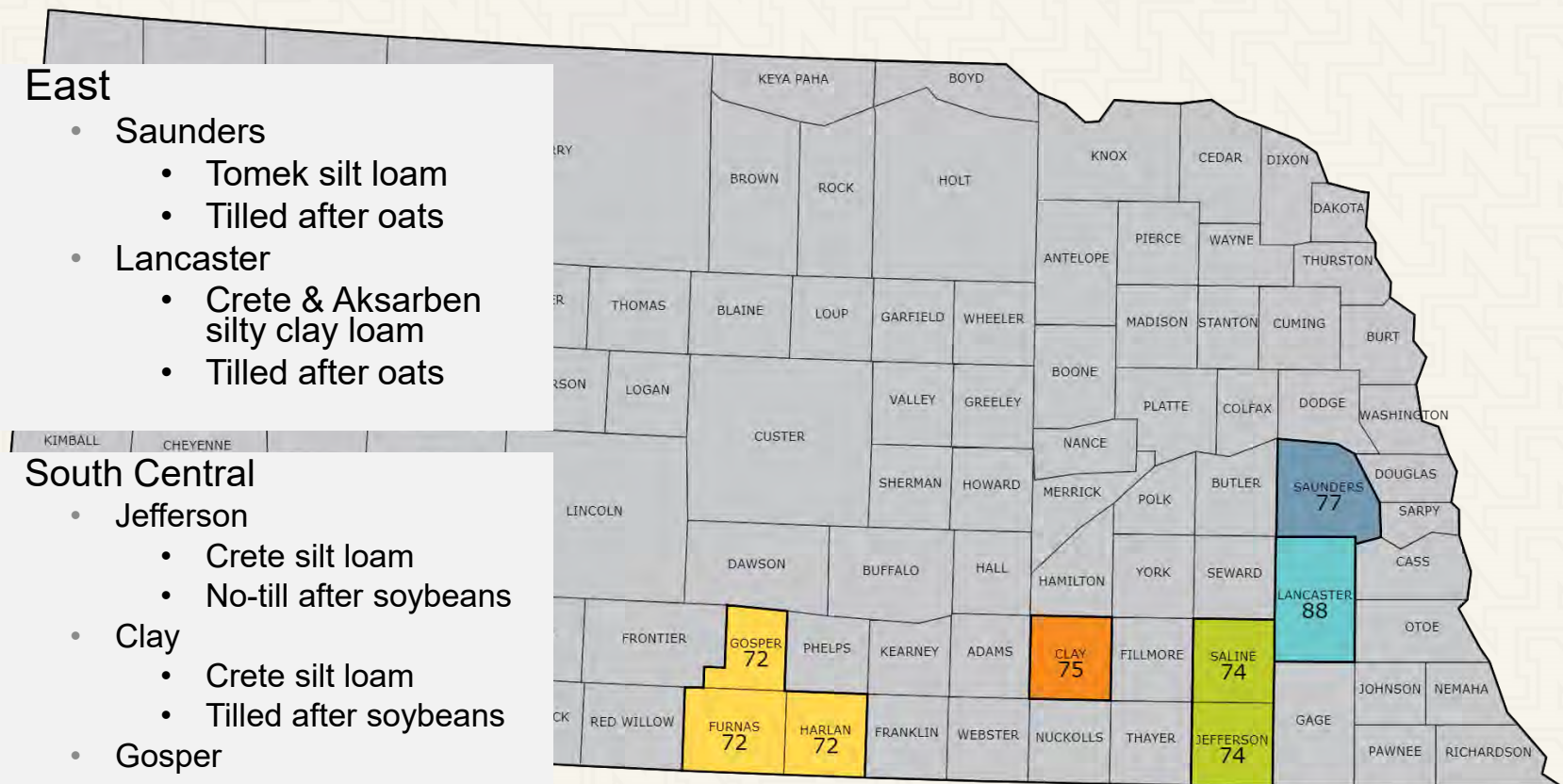
Average yield of top-yielding variety from 2002-2020

- East

- Saunders
 - Tomek silt loam
 - Tilled after oats
- Lancaster
 - Crete & Aksarben silty clay loam
 - Tilled after oats

- South Central

- Jefferson
 - Crete silt loam
 - No-till after soybeans
- Clay
 - Crete silt loam
 - Tilled after soybeans
- Gosper
 - Holdrege silt loam
 - No-till after soybeans



Example: Zenda – Kansas Wheat Alliance Released 2016



Irrigated and Rainfed

Placement

- Southeast & south central NE

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



Disease Management: FHB, Leaf and Stripe Rust

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
 - Crop rotation (C-S-A)
 - Variety selection for resistance
 - Disease risk mapping
 - Scouting
 - Foliar fungicide at early flowering

Wheat Development and Growth



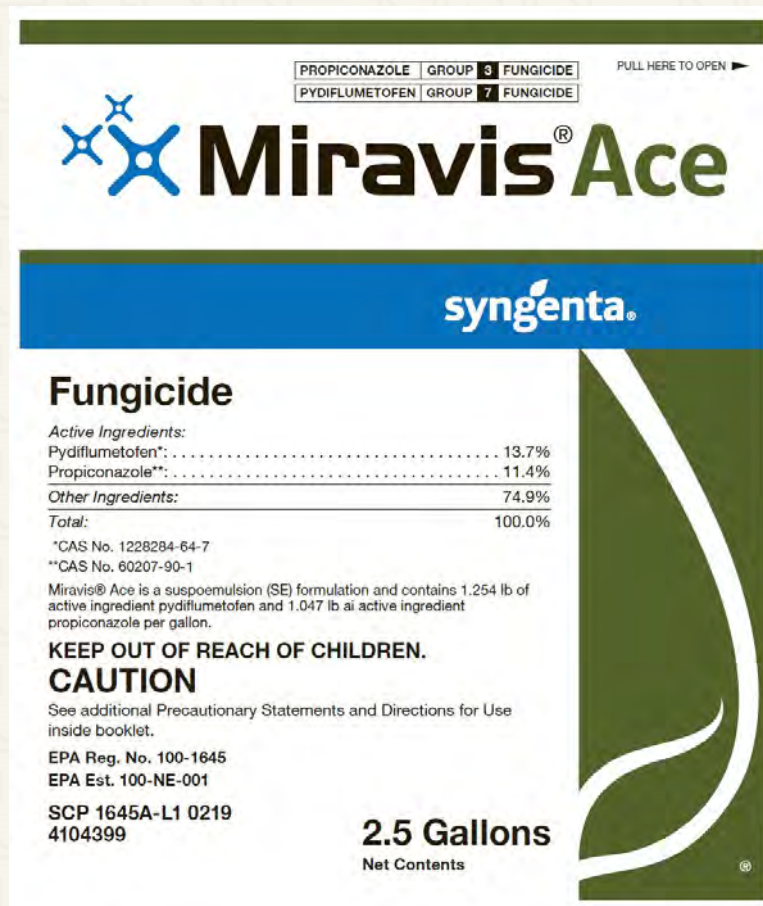
nathan.mueller@unl.edu

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
	6 First node of stem visible at base of shoot; jointing
STEM EXTENSION	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

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)



Varieties with Moderate Resistance for FHB

- Varieties in the Trials
 - WB4699 (4)
 - Overland (4)
 - Zenda (4)
 - SY Benefit (5)
 - WB4269 (5)
 - WB4401 (5)
 - KS Western Star (5)
 - LCS Valiant (6)



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

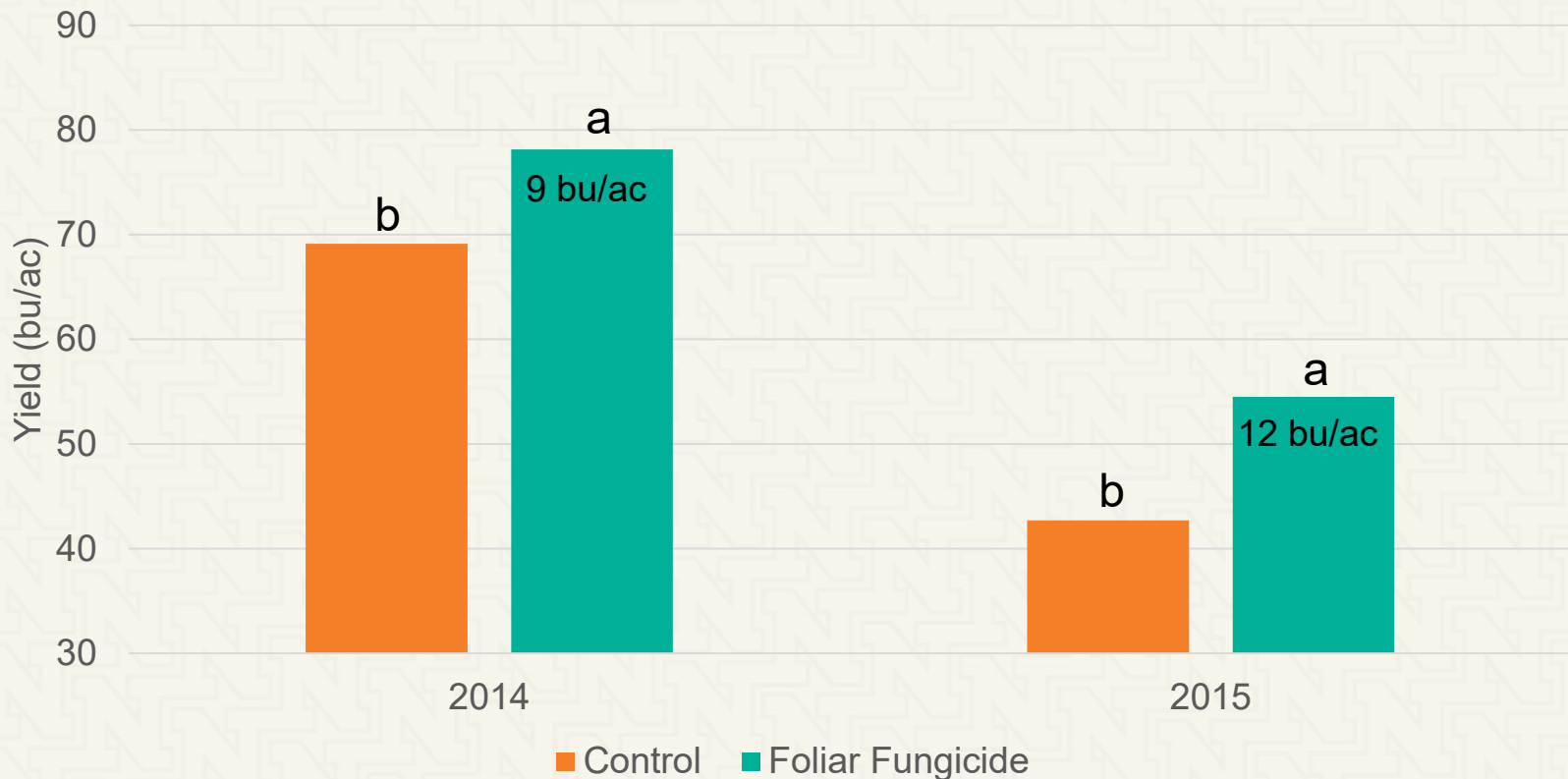
Stripe Rust



- 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

Foliar Fungicide at Flag Leaf

Lancaster County: Average across 6 varieties



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>.



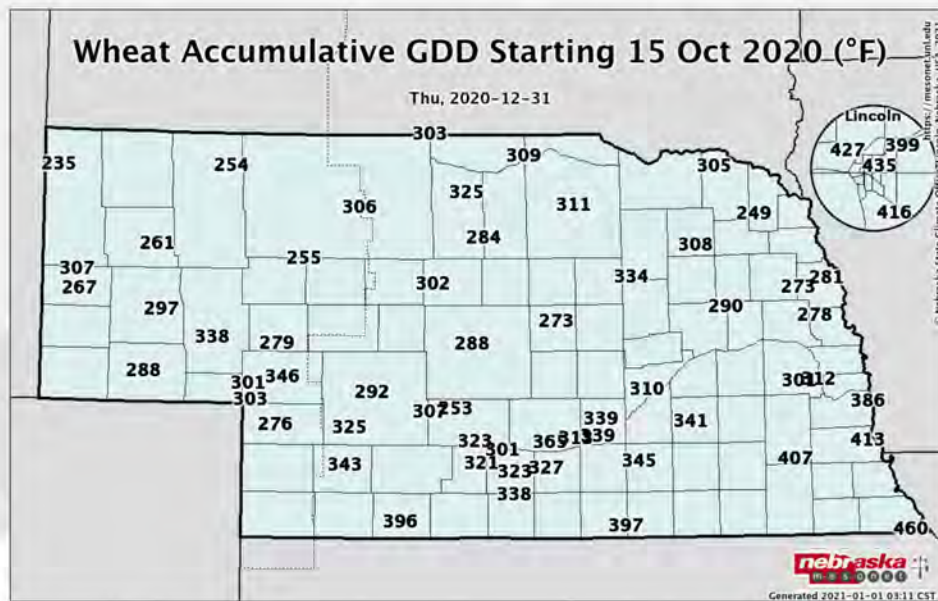
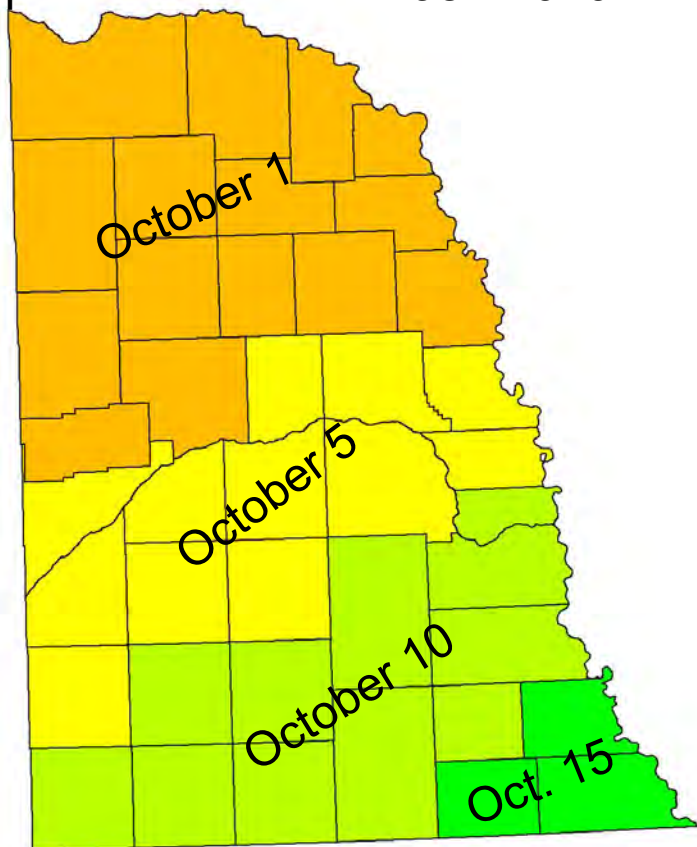
Planting Date and Seeding Rate

Target Planting Date Map

400 GDD (Base 40) accumulation
between planting and December 31

1980s work in southeast NE

Temperature norms – 1981-2010



New daily accumulated GDD map:
<https://mesonet.unl.edu/>

Use Certified Seed

How to Read a Certified Analysis Tag

PVP STATEMENT
This variety may only be sold as certified seed. Any other transfer or sale of this seed is prohibited by federal law.

CERTIFIED SEED TAG
The blue certified tags assure the buyer is getting quality certified seed.

GERMINATION
The percentage of pure seed that will germinate in a controlled lab environment.

LOT NUMBER
Each lot of seed has a unique number that appears on all documents so that it can be traced back to the field where it was grown.

ORIGIN
Origin is the state where the seed was grown.

BRAND NAME
HUSKER GENETICS OVERLAND BRAND

VARIETY NAME
NEO1643 HRW WHEAT

PURE SEED
The percentage of weight of seed that is the named species.

CROP SEED
The percentage of seeds by weight that is other than the named species not considered weeds. Crop seed must be listed by name if over 5 percent.

WEED SEED
The percentage of weed seeds in this lot.

NOXIOUS WEEDS
The amount of seeds of weeds prohibited by state law.

TEST DATE
The month and year this lot was lab tested.

TOTAL VIABLE
Germination percentage plus the hard or dormant seed.

UNAUTHORIZED PROPAGATION PROHIBITED. U.S. PLANT VARIETY PROTECTED. PVP 1994

NEO1643 HRW WHEAT

PURE SEED %	99.50	GERMINATION %	90
CROP SEED %	.00	HARD/DORMANT %	0
INERT MATTER %	0.50	TOTAL VIABLE %	90
WEED SEED %	.00	TEST DATE	08/13
NOXIOUS WEED SEEDS NONE PER LB.			

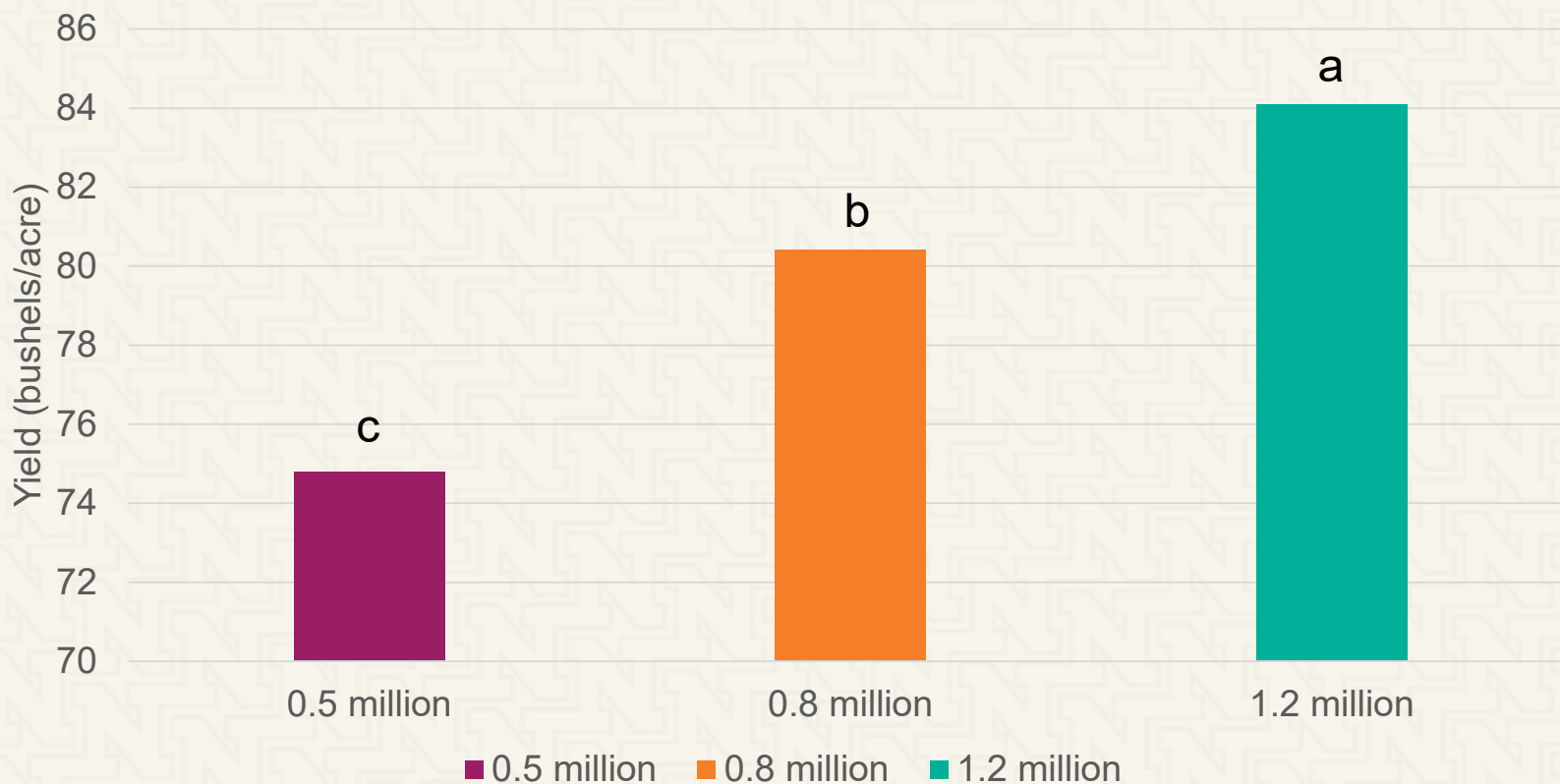
LOT# W0-428
ORIGIN: NE
12156 SEEDS/LB
LBS NET WT

Quality certified by NEBRASKA CROP IMPROVEMENT ASSOCIATION
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES

The Certifying Agency makes no warranty of any kind, expressed or implied, including merchantability, or fitness for purpose, or otherwise, which extends beyond the certificate and that the seeds inspected met the regulations of this agency. The Seller guarantees the seed to conform to the analysis shown. No further warranty is expressed or implied. Seller's liability is limited to the purchase price of the seed.

Seeding Rate

Lancaster County, planted Oct. 2, 2013



Bhatta et al., 2017. Seeding rate, genotype, and top-dressed nitrogen effect on yield and agronomic characteristics of winter wheat. *Crop Sci.* 57:951-963

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



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

Evaluating Winter Wheat Stands



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

Assessing winter wheat stands

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 the 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
For Saline, Jefferson, and Gage counties
402-821-2151 or nathan.mueller@unl.edu

Current Issue

Recommended seeding rates start at 1.2 million seeds per acre and increases as planting is delayed through October in eastern Nebraska up to 1.8 million seeds per acre. 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.

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

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

A large, bold, red letter 'N' with a slight shadow effect, positioned on the right side of the slide.

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

P

Sulfur and Chloride Management in Winter Wheat

S **C** **I**

Crop Tech Cafe article: <http://croptechcafe.org/spring-chloride-and-sulfur-for-wheat/>



croptechcafe.org/winterwheat



[@croptechcafe](https://twitter.com/croptechcafe)



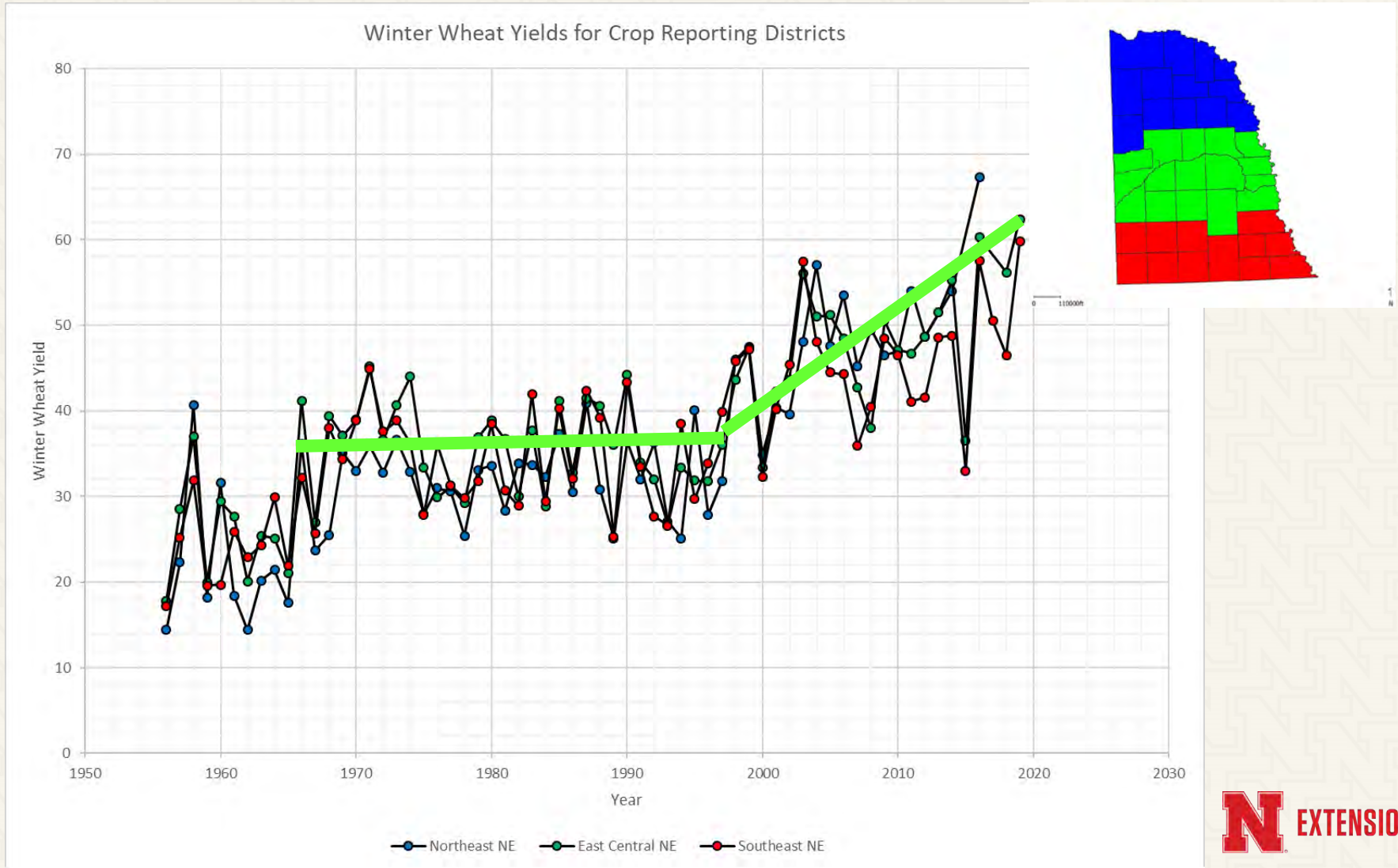
nathan.mueller@unl.edu

Thank You!



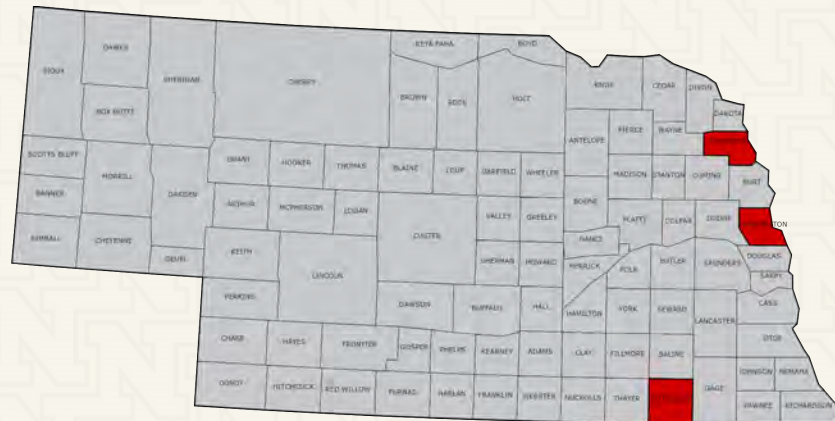
Economics, Weather Risks, and Soil Health Considerations

USDA-NASS Winter Wheat Yield Trends



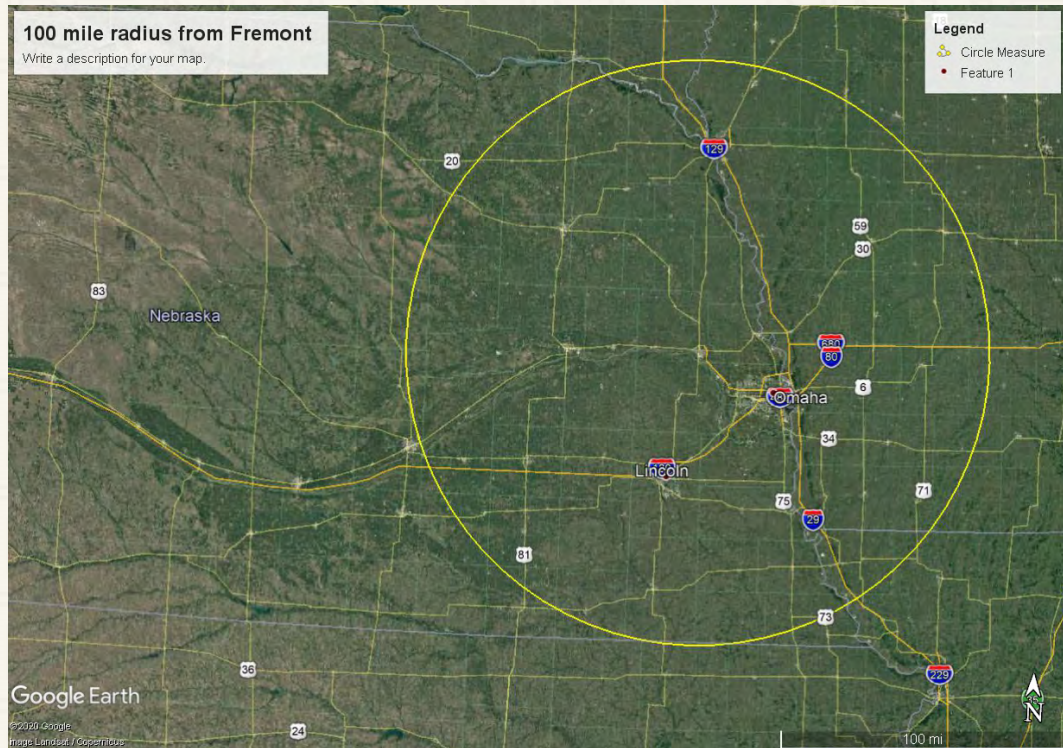
Local Success Stories

- 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

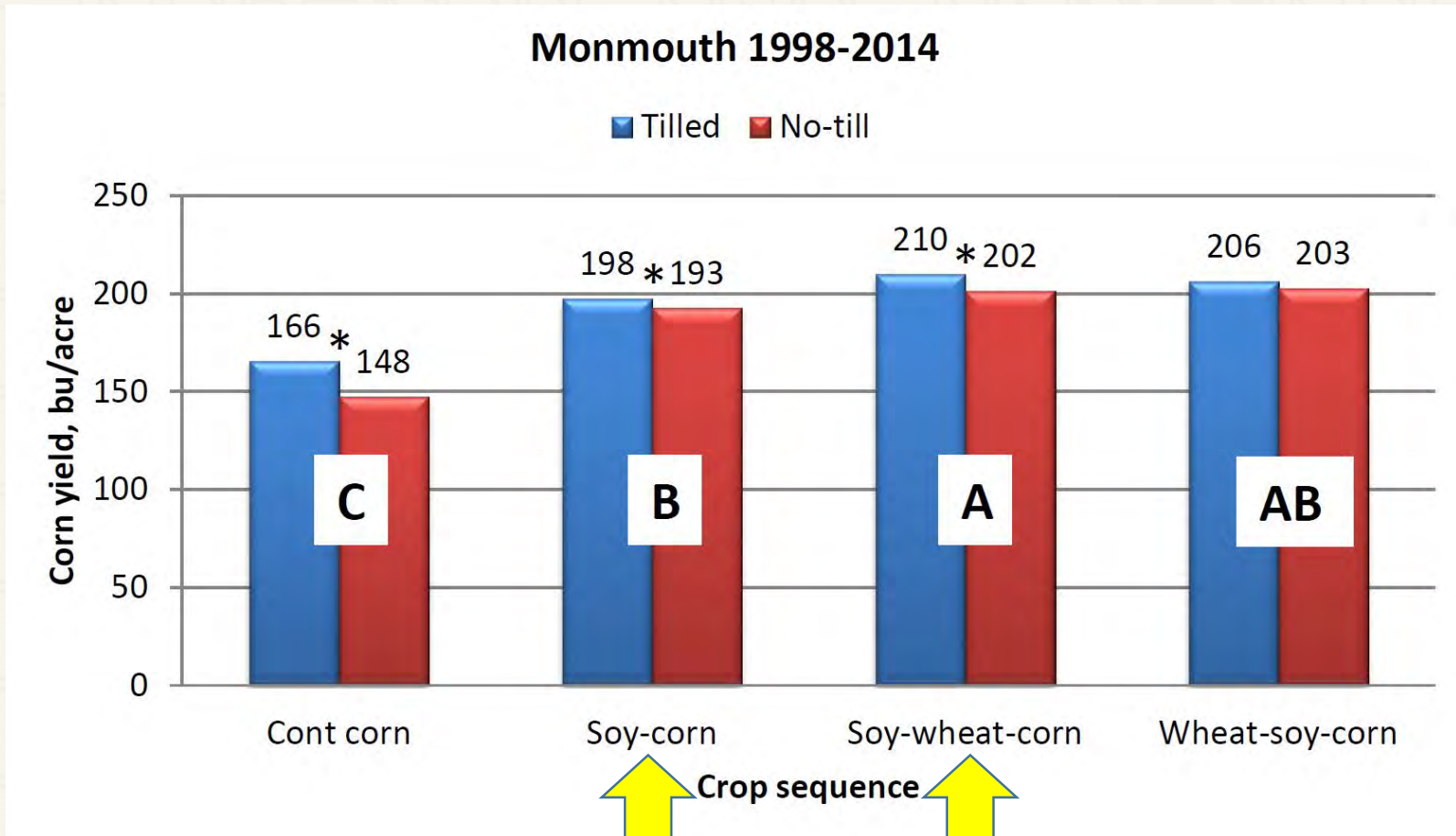


Eastern Nebraska Markets

- Grain - Strong Local Basis
 - ADM Lincoln = +0.20
 - Hansen-Mueller = +0.30
 - Scoular-Fremont = +
- Straw Prices
 - December 2020
 - \$80/ton

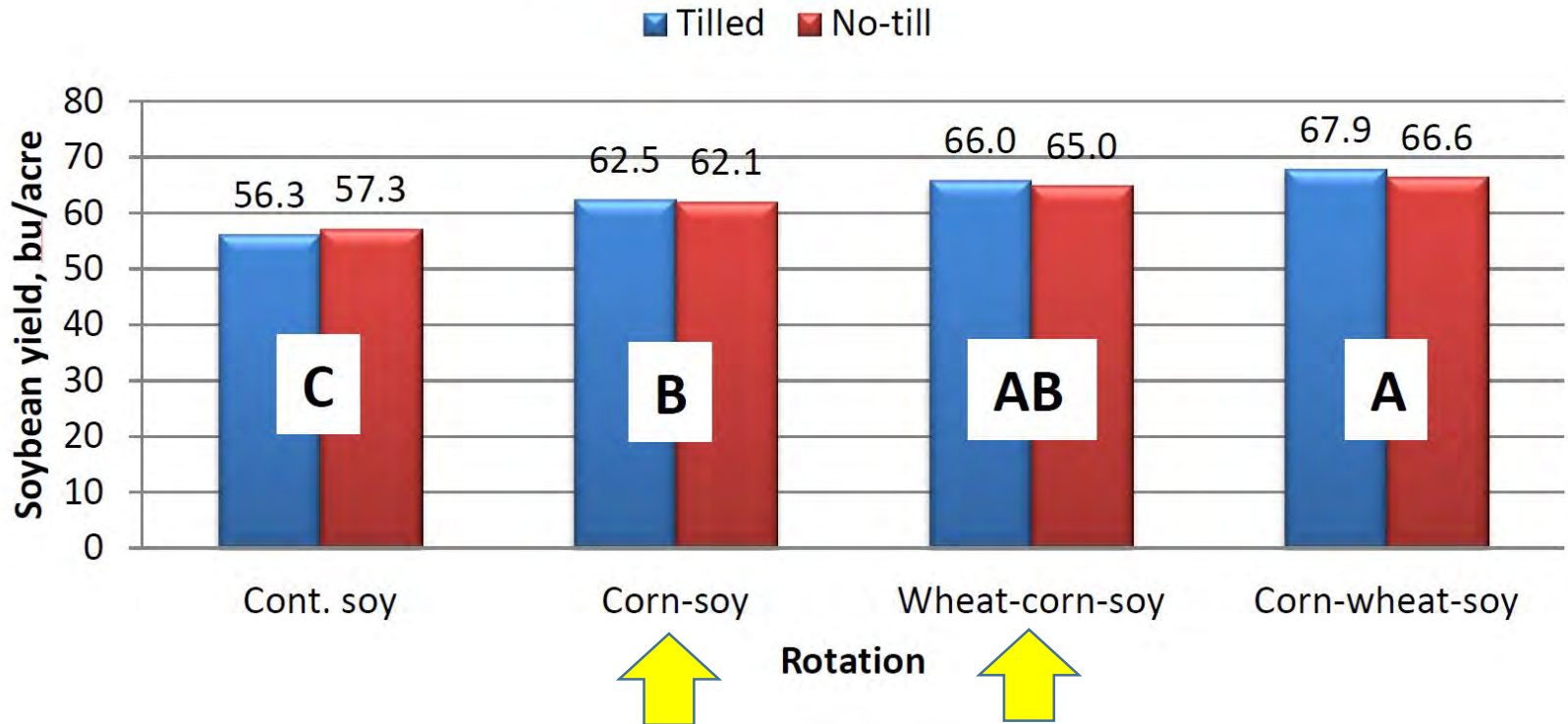


Corn Yields in w/Wheat in Rotation



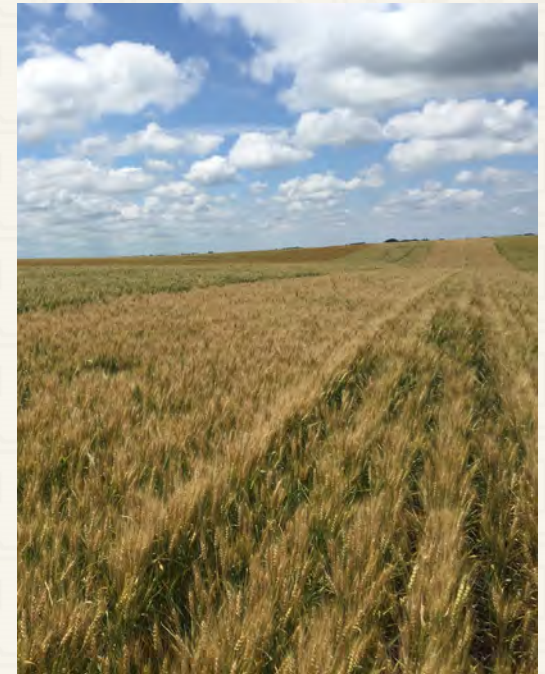
Soybean Yields w/Wheat in Rotation

Monmouth 1998-2014

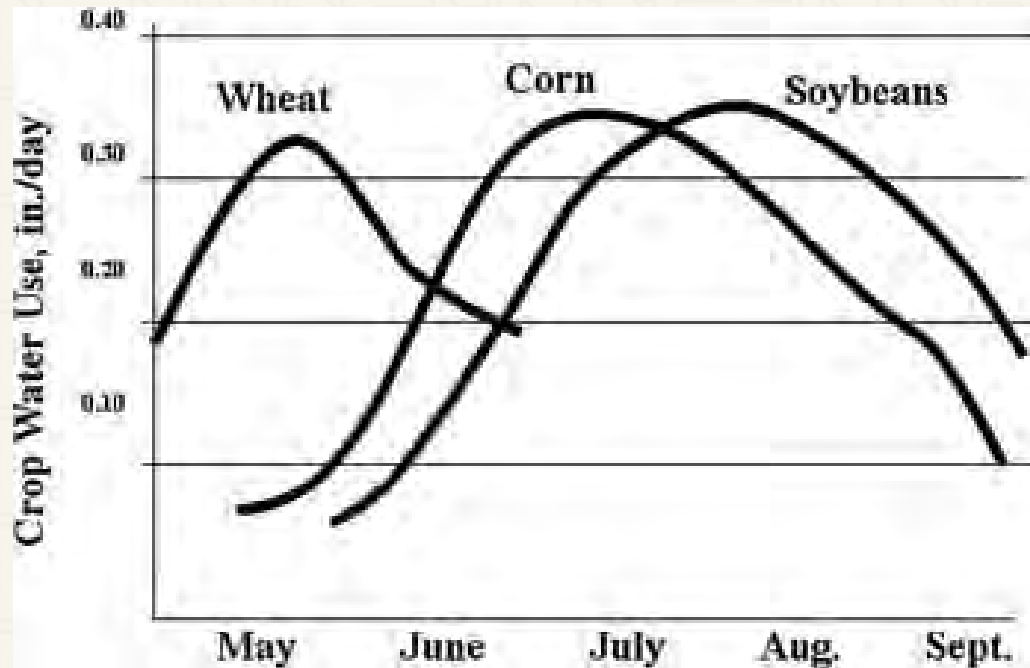


Winter Wheat Can Help

- 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
 - Marestalk, Palmer Amaranth, & Waterhemp
- Soil health and conservation
 - Soil structure, erosion control, cost-share and priority
- Workload management
- Manage weather risks



Managing Risks from Extreme Weather



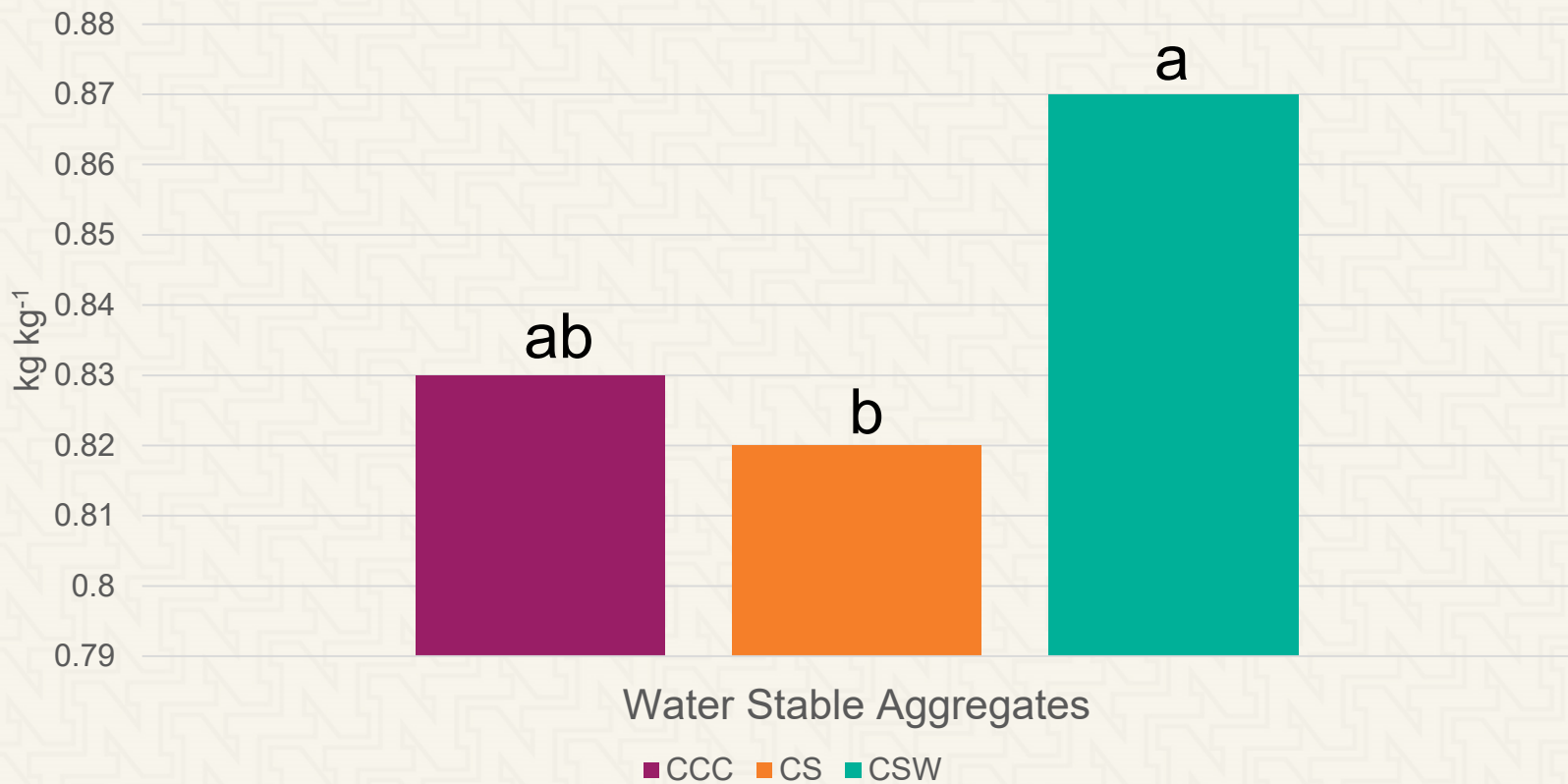
Seasonal crop water use (ET) in Eastern Nebraska when water is not limiting.

Crop	Inches/year
Corn	21-24
Soybean	20-22
Winter Wheat	16-18
Alfalfa	31-35

Source: water.unl.edu

Water Stable Aggregates

15-year rotation study – 0 to 8 inch depth



Improving Soil Health with Winter Wheat

- Aspects of soil health
 - Physical
 - Biological
 - Chemical

Improving Soil Health with Winter Wheat



Figure 1. Slake test proxy for water stable aggregates. Left to right: Alfalfa, CCSW(rc)-NT, CCSW(rc)-CT, CCCC-CT, CCSS-NT, and CCSS-CT. NT=No-till, CT=Conventional till, C=corn, S=soybean, W=wheat, rc=red clover. Photo credit: Bill Deen, Univ. of Guelph

Current Issue

Soil health (biological, physical, and chemical) has been a popular focus 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 benefits

The trifecta of soil health practices:

- No-till, cover crops, and diverse crop rotation

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, example in Figure 1)
2. Higher total nitrogen (N), potentially mineralizable N in soil, and N use efficiency
3. Reduced N rates needed in corn for maximum economic return
4. Higher yields in corn and soybeans

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 rotation 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 (Lincoln & Fremont), selling straw, growing forage crop after wheat, higher corn and soybean yield in rotation, and USDA programs payments
- 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 working 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

For more information

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Wheat resources for eastern Nebraska at croptechcafe.org/winterwheat