

A wide-angle photograph of a vast, flat field of golden wheat stretching to the horizon. The sky is filled with soft, grey clouds, and a single water tower is visible in the distance. The text is overlaid on the center of the image.

Developing small grains varieties for Nebraska

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The UNL small grains program

- Winter wheat
 - Hard red
 - Hard white
 - Herbicide resistance
 - Hybrid wheat research
- Winter barley
- Winter triticale
 - Forage
 - Grain

Guiding concerns for NE small grains programs

- Acreage in NE, optimizing yields
- Pests and diseases
 - (West) Wheat stem sawfly + Wheat streak mosaic virus
 - (East) Stripe rust and fusarium head blight
- Protein and quality for domestic and export markets
- Input prices and push for sustainability
- Unpredictable weather



2023 In Review

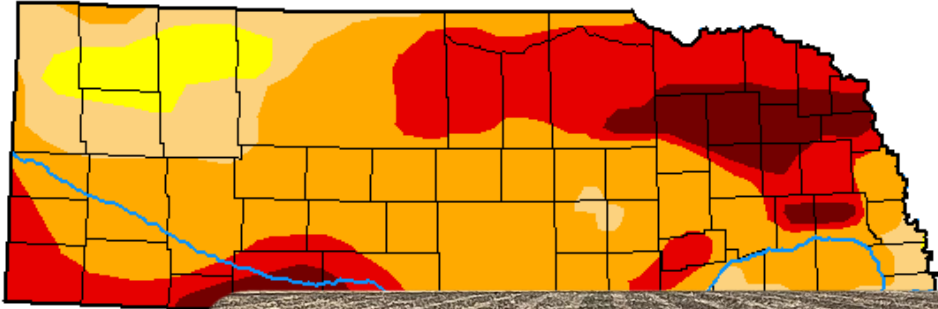
U.S. Drought Monitor

Nebraska

September 27, 2022

(Released Thursday, Sep. 29, 2022)

Valid 8 a.m. EDT



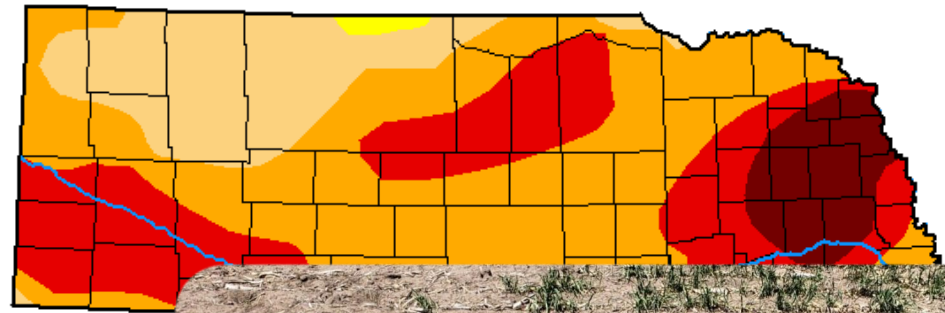
U.S. Drought Monitor

Nebraska

March 21, 2023

(Released Thursday, Mar. 23, 2023)

Valid 8 a.m. EDT



Should I worry about winter hardiness?

- Lots of winterkill in 2023, why?
 - Drought, late planting, drought, no snow cover, cold temps, and more drought!



SIEGE

Siege was developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2020. Siege is a narrowly adapted wheat to Eastern and Southcentral Nebraska where its grain yield, disease resistance, and straw strength make it particularly attractive. It is resistant or moderately resistant to leaf rust, stripe rust, stem rust, and wheat soilborne mosaic virus. It is also resistant to the current field races of Hessian fly. It is a semi-dwarf with very good straw strength and consistent high grain yield where it is adapted good test weight. Its end use quality is acceptable. U.S. Protected Variety: Seed of Siege is protected and may be sold only as a class of Certified seed. Contact a NuPride Genetics Network Affiliate and find out more about this variety.

AGRONOMIC FEATURES

MATURITY	4
STRAW STRENGTH	5
PLANT HEIGHT	3
COLEOPTILE LENGTH	-
WINTER HARDINESS	4

DISEASE RATINGS

HESSIAN FLY	3
LEAF RUST	4
STEM RUST	2
STRIPE RUST	2
SOILBORNE	1
WHEAT STREAK MOSAIC	7
BUSHEL WEIGHT	2
GRAIN PROTEIN	4



2023 In Review

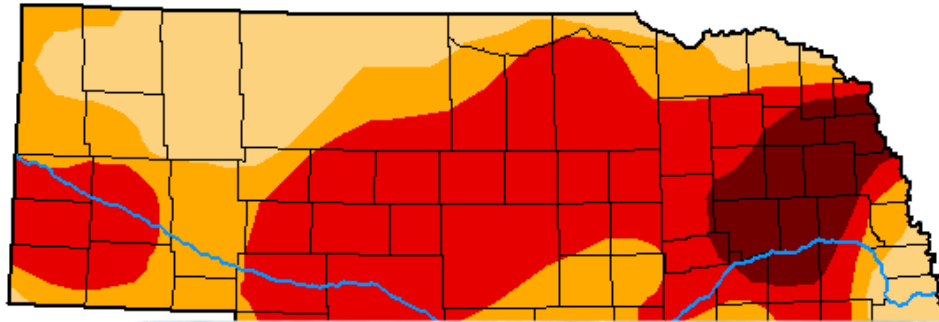
U.S. Drought Monitor

Nebraska

May 2, 2023

(Released Thursday, May. 4, 2023)

Valid 8 a.m. EDT



- No diseases in eastern NE in 2023
 - Challenge for selection
 - No observations on State Variety Trial by UNL Pathologists
- What to consider for 2024
 - Review published varietal information from multiple sources if possible
 - Look for:
 - Stripe rust rating
 - Fusarium head blight (Scab/FHB)
 - Leaf and stem rust
 - Soilborne mosaic virus

2023 In Review

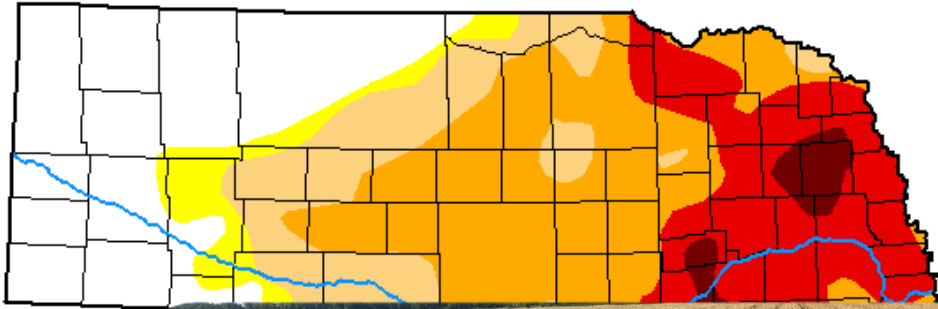
U.S. Drought Monitor

Nebraska

July 11, 2023

(Released Thursday, Jul. 13, 2023)

Valid 8 a.m. EDT



- No high-quality variety trials in eastern NE in 2023
- What to consider for 2024
 - Review 2022 SVT results, especially regional or multi-year summaries
 - Try out the UNL variety tool @ <https://cropwatch.unl.edu/wheat-variety-app>
 - Look for:
 - Consistent vs racehorse performance
 - Bushel weight and protein content



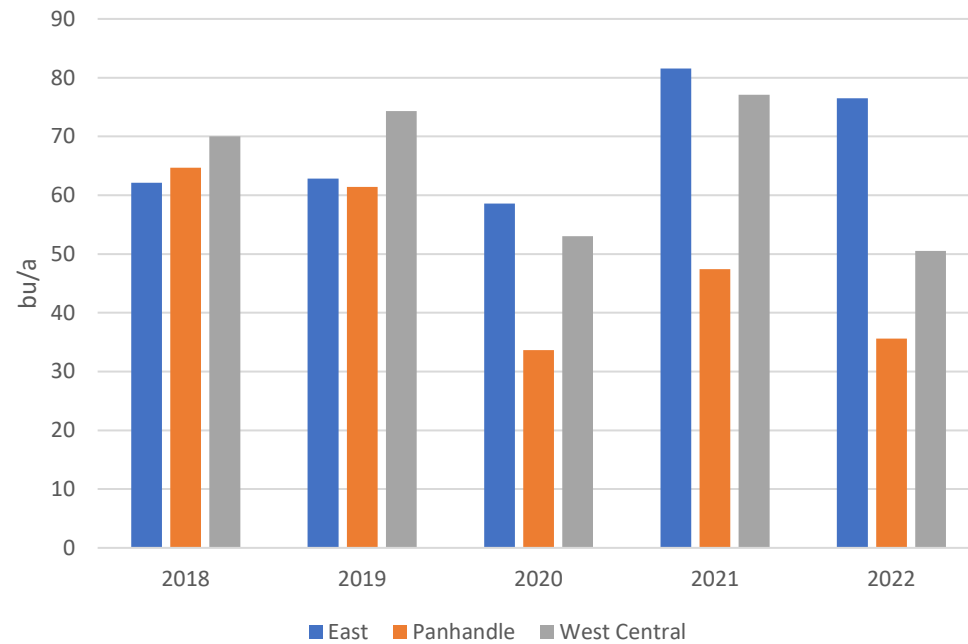
UNL Wheat Variety Tests

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

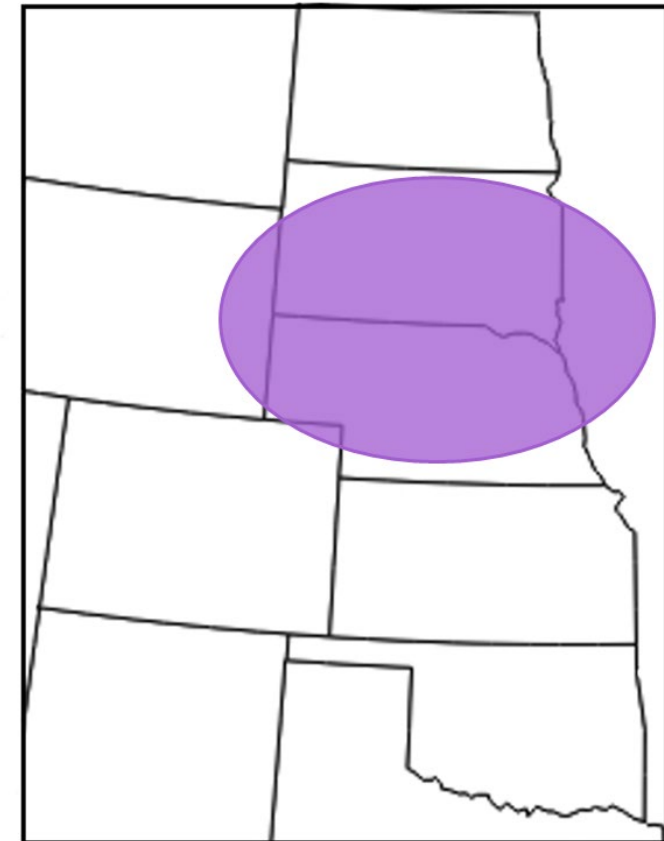
Upcoming wheat release- NHH17612

Pedigree

- Brawl_CL/NHH09655
- Two gene Clearfield line approved for release by BASF



Target Environment





2023 team



@FrelsInTheField

@HuskerWheat

What's going on with hybrid
wheat?



Why will hybrid wheat work now?

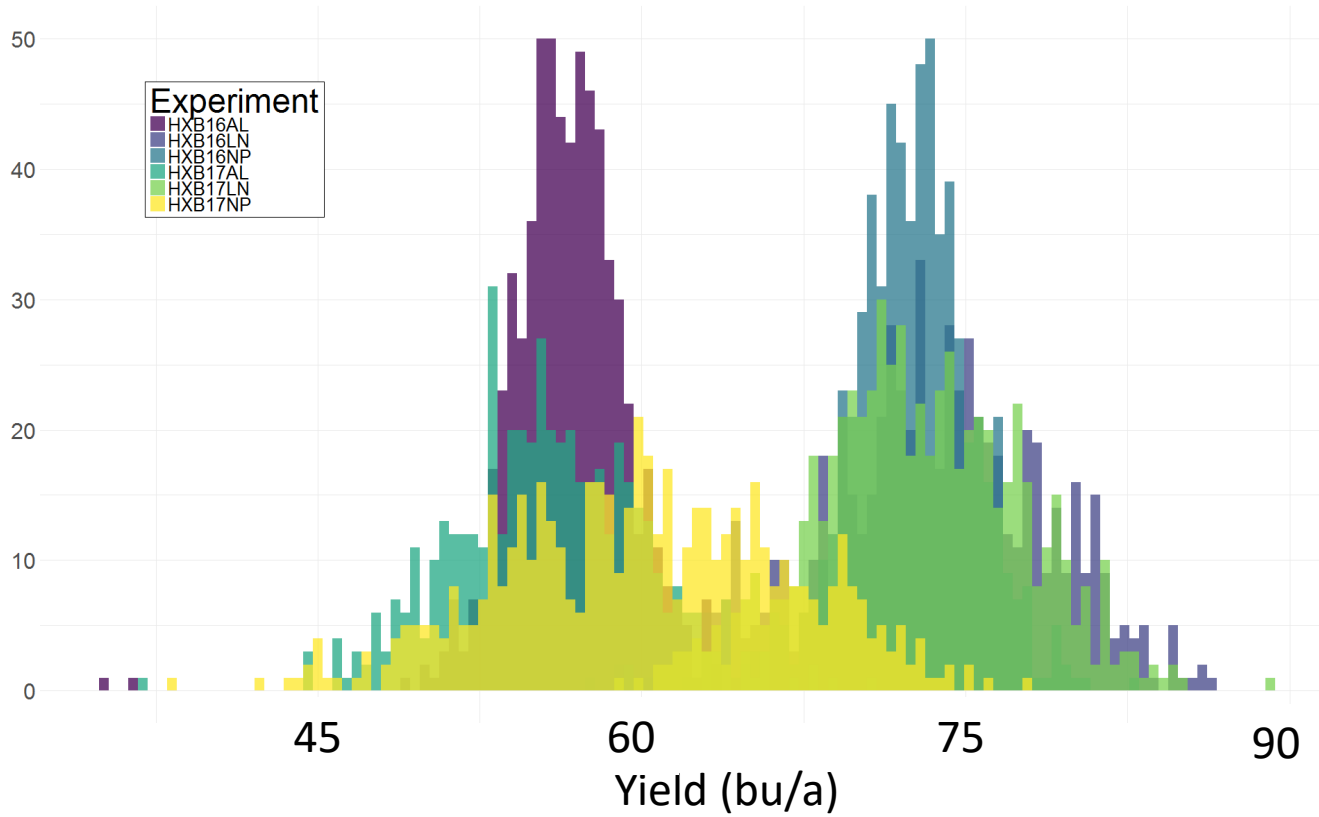
- Sequenced wheat genome
- Inexpensive genotyping
- Computing power
- Genomic prediction
- Improved CHAs
- Improved restoration for CMS
- Need for greater gains



Wheat breeding

- Cultivar development is based on manual emasculations to generate genetic variation and then inbreeding
- Generating hybrid wheat requires developing male and female germplasm and an efficient, cost-effective way to cross the two pools

Mean Yields

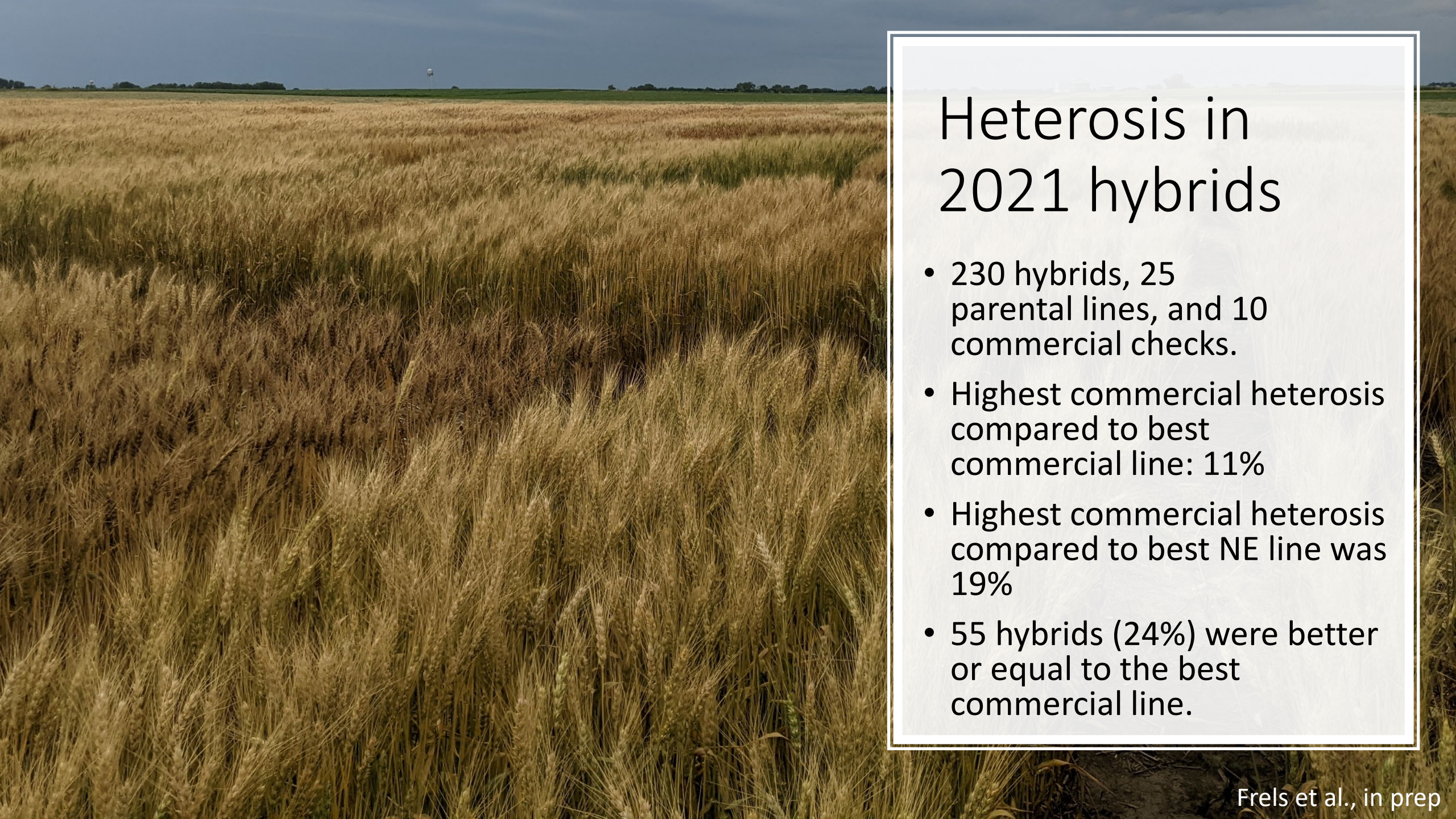


		Yield (bu/a)	
Experiment	N	Mean	Std Dev
HXB16AL	648	56.1	2.7
HXB16LN	650	72.9	5.1
HXB16NP	640	71.8	2.9
HXB17AL	492	55.2	4.4
HXB17LN	646	72.1	4.7
HXB17NP	552	59.7	6.6

Heterosis

- Midparent heterosis: is the hybrid better than the average of the parents?
- High parent heterosis: is the hybrid better than the best parent?
- Commercial heterosis: is the hybrid better than the best commercial check?





Heterosis in 2021 hybrids

- 230 hybrids, 25 parental lines, and 10 commercial checks.
- Highest commercial heterosis compared to best commercial line: 11%
- Highest commercial heterosis compared to best NE line was 19%
- 55 hybrids (24%) were better or equal to the best commercial line.

Possibilities

- Increased food production to enhance food security
- Reduced risk through improved stress tolerance and climate resiliency
- Increased investment in wheat
 - Genomics
 - GMO and high value traits
 - Inputs

Trade-offs

- Increased seed costs for producers
- Challenges with export markets if GMO traits introduced
- Wheat breeding will shift away from public sector towards private breeding companies

Integrating *Fhb1* in elite NE germplasm

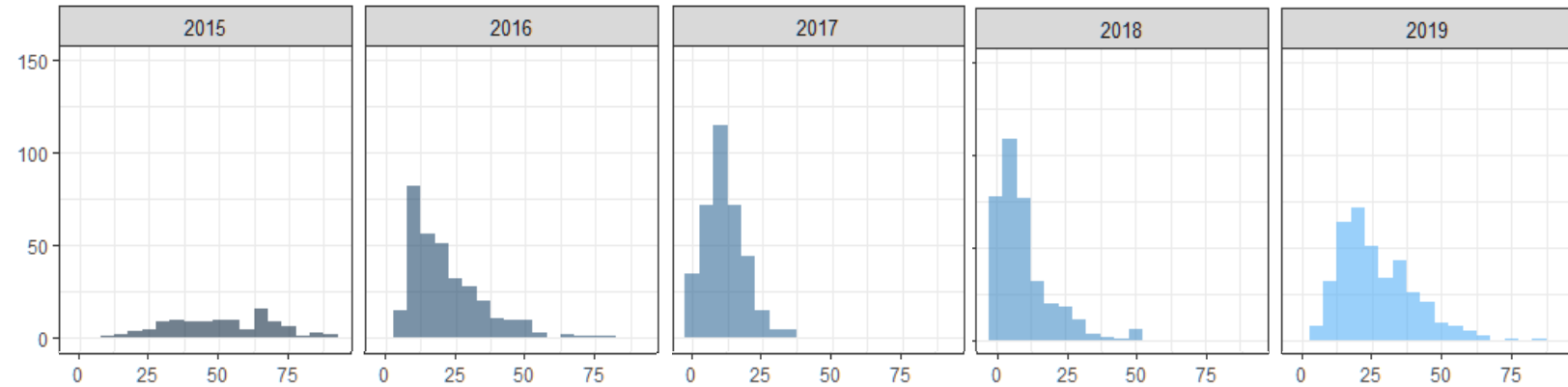
Name	Pedigree	FHB severity (%) (Field)	FHB severity + <i>Fhb1</i>
NE14696	NE05537/Overland	11	1
NE14421	NE05426/Overland	27	7
NE16562	HV9W02-942R/Camelot	19	3
NE15624	NE05537/KS05HW15-2	21	9
NE14434	SD98W175-1/ NW03666//Freeman	16	4
LCS Valiant	NI03418/Camelot	24	3
Overland	'Millennium' (PI613099) sib/ ND8974	39	na

Utilizing genomic prediction

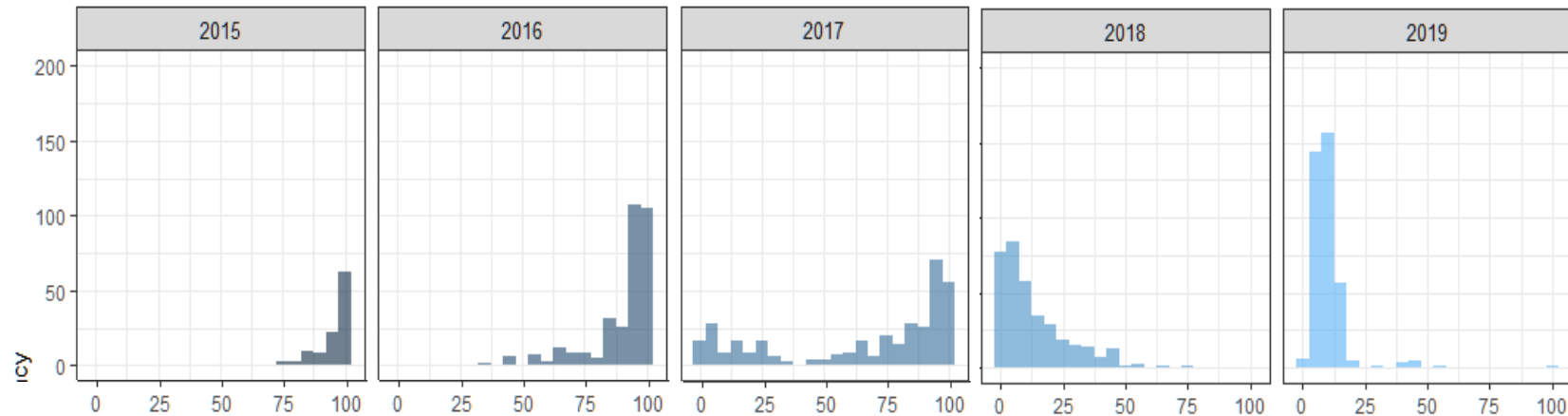
Predict across multiple years of inoculated FHB nursery

- 10-fold cross validation using 10-90% subsets of all phenotypic data for training data

Severity



Incidence



Agronomics by year (Breeding program data)

Year	Grain Yield (bu/a)	Test weight (lb/bu)	Height (in)	Protein (%)	Flowering date (Julian Date)	Stripe Rust
2018	65.9	56.4	31.1		145.7	
2019	66.3	59.6	32.4		147.9	
2020	49.9	59.2	30.0		150.6	
2021	74.4	51.6	33.6	13.2	142.4	4.8
2022	61.0	57.7	29.1	13.5		
Mean	62.8	55.3	31.6	13.35	145.5	--

Head-to-Head comparison cv. Ruth

Control	Line	N	Trait	Control Means	Line Means	% Control	Variance	(t)	Significance
Ruth	NHH17612	36	Grain Yield (bu/a)	58.97	61.21	103.8	106.195	-1.31	ns
Ruth	NHH17612	13	Test weight (lb/bu)	57.86	58.77	101.6	2.517	-2.06	+
Ruth	NHH17612	1	Protein %	13.6	13.5	99.3			n/a
Ruth	NHH17612	21	Height (in)	32.34	31.64	97.8	2.791	1.93	-
Ruth	NHH17612	6	Flowering date (Julian date)	146.94	146.24	99.5	1.101	1.62	ns

Disease and pest resistance

Disease/Pest	Rating	Comments
Stripe Rust	MR	Rated as 3 for inf. Type and <10 for severity in NRPN & SRPN 2020 & 2021 (4 trial:years) at Rossville, KS
Leaf Rust	S	Rated as 100S to 20MS in in NRPN & SRPN 2020 & 2021 at Castroville, TX and 7 inf. Type and 40 for sev (8 trial:years)
Stem Rust	MR	Consistently rated as MR in NRPN & SRPN 2020 & 2021 (4 trial:years)at St. Paul, MN
FHB	MR	Average Severity 25±10, Average Incidence 27±21 (10 trial:years, Wegulo mist nursery)
Soilborne Mosaic Virus	S	Segregating for SBMV marker, phenotypically susceptible in 2021 SRPN Nursery
Wheat Streak Mosaic/Triticum Mosaic Virus	S	Phenotypically susceptible in NRPN & SRPN 2020 & 2021 Nursery tested at Mead, NE
Sawfly	Susceptible	Average 5.6 for stem cutting in 5 trial:years at HPAL
Hessian fly	Seg, Susceptible	Rated as segregating NRPN & SRPN 2020 & 2021 (4 trial:years)