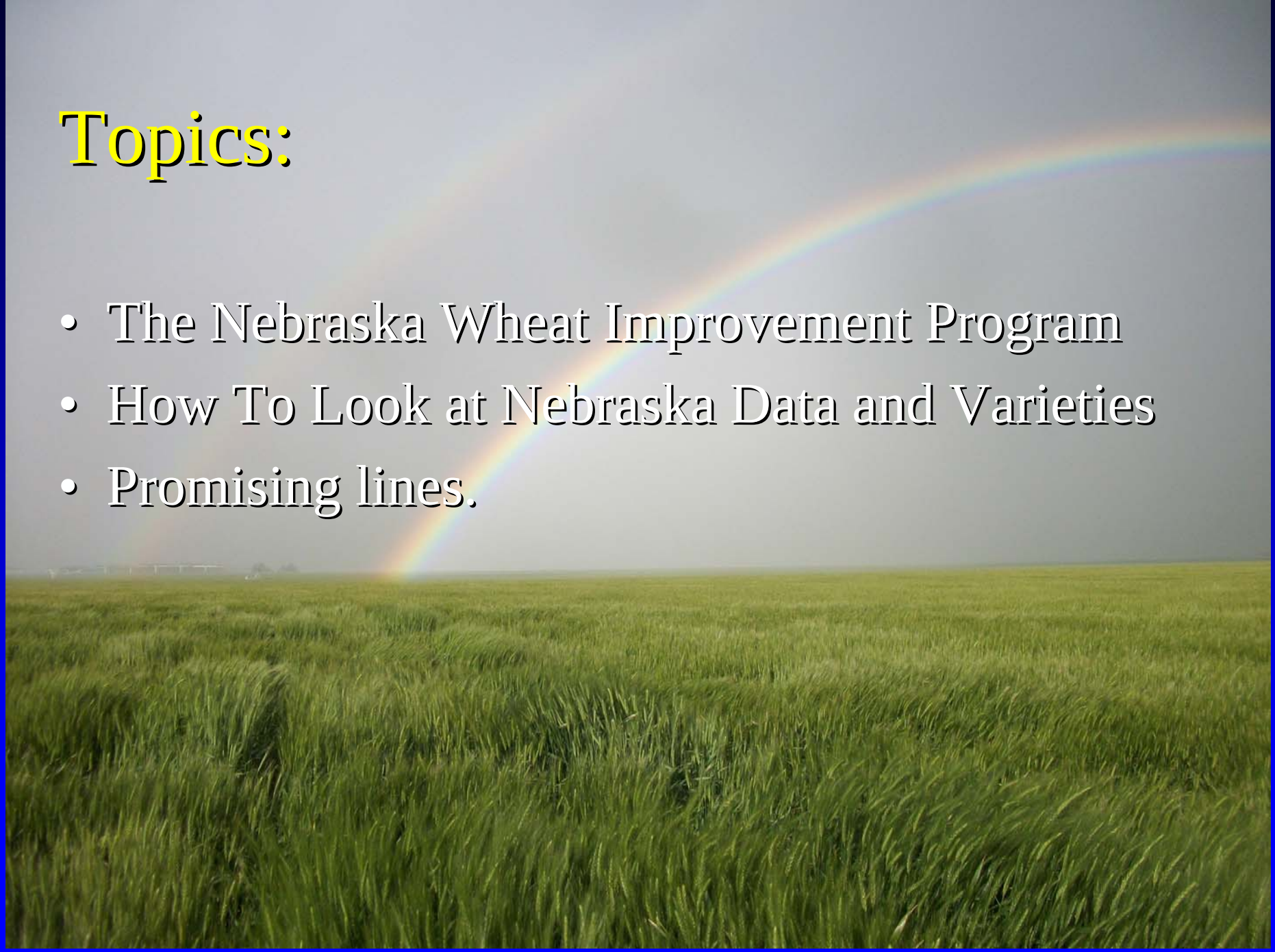
Nebraska Wheat Varieties from A Colorado-Kansas Persepective

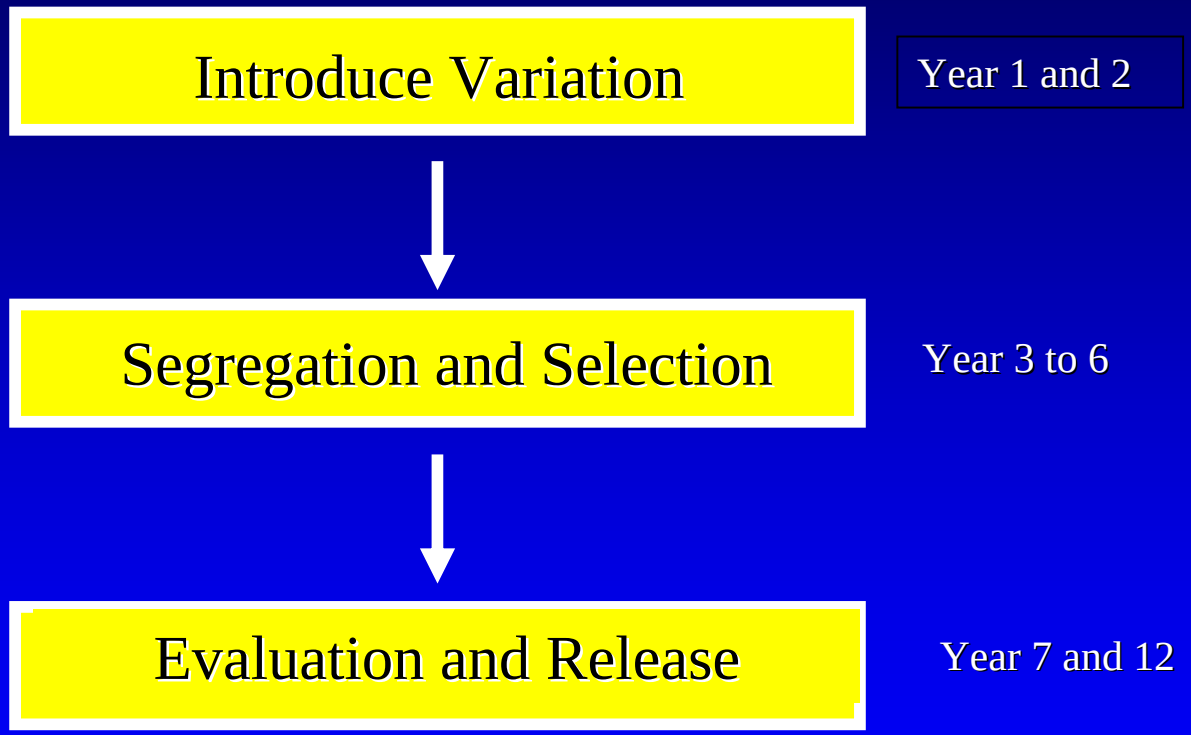
P. Stephen Baenziger and Friends
University of Nebraska-Lincoln

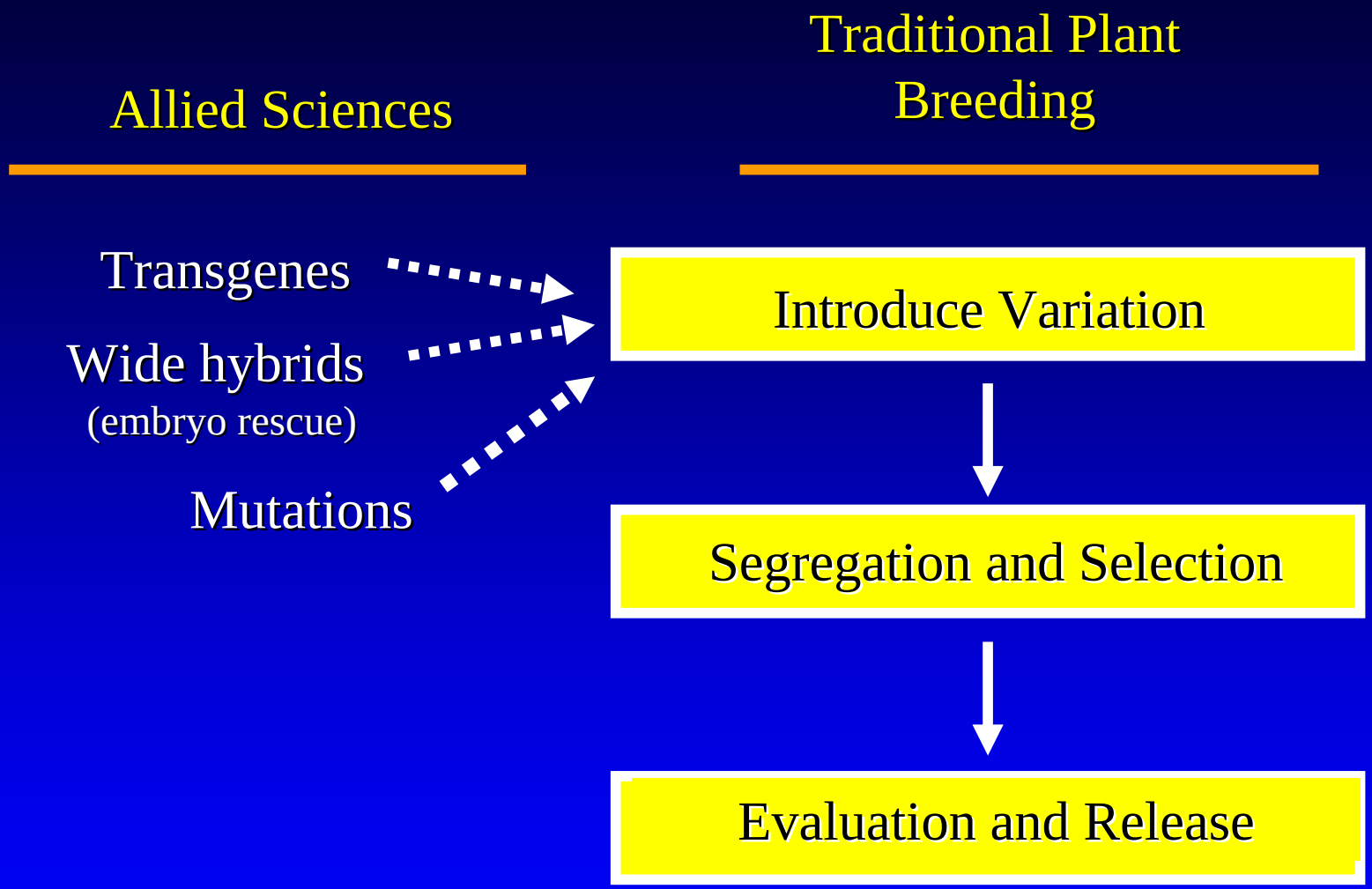


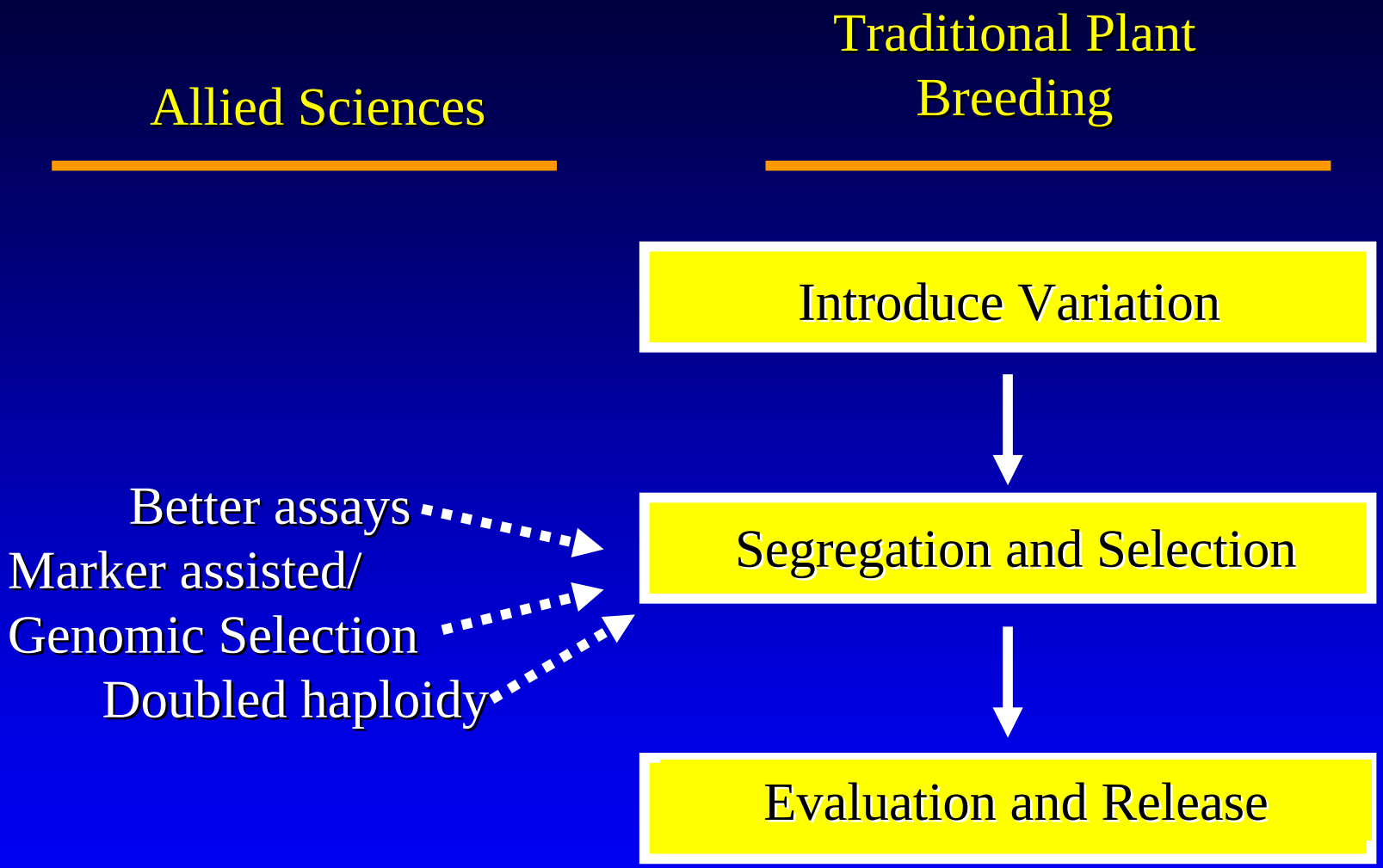
Topics:

- The Nebraska Wheat Improvement Program
- How To Look at Nebraska Data and Varieties
- Promising lines.

Traditional Plant Breeding




Allied Sciences
Traditional Plant Breeding
Transgenes
Wide hybrids
(embryo rescue)
Mutations
Introduce Variation
Segregation and Selection
Evaluation and Release


Allied Sciences
Traditional Plant Breeding
Introduce Variation
Segregation and Selection
Evaluation and Release
Better assays
Marker assisted/
Genomic Selection
Doubled haploidy

Allied Sciences

Traditional Plant Breeding

Introduce Variation

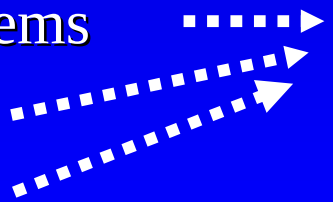
Segregation and Selection

Evaluation and Release

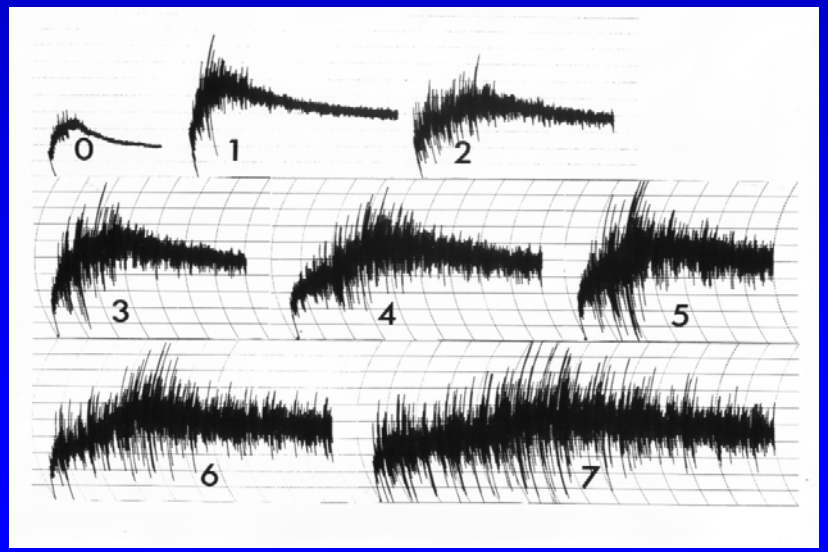
Cropping Systems

Biometry

Modeling



The Four Key Traits: K.I.S.S.



A Nebraska Wheat Variety must have:

The four key traits: winterhardiness, stem rust resistance, agronomic performance, and end-use quality.

Opportunities: WSMV, Leaf rust, Russian Wheat Aphid, FHB, HF, Root Rots, Herbicide tolerance, quality

Traits: Drought, heat, winter survival, FHB, NUE, quality, hybrid systems.

Agroecological Zones in the Great Plains

What does this mean for you?

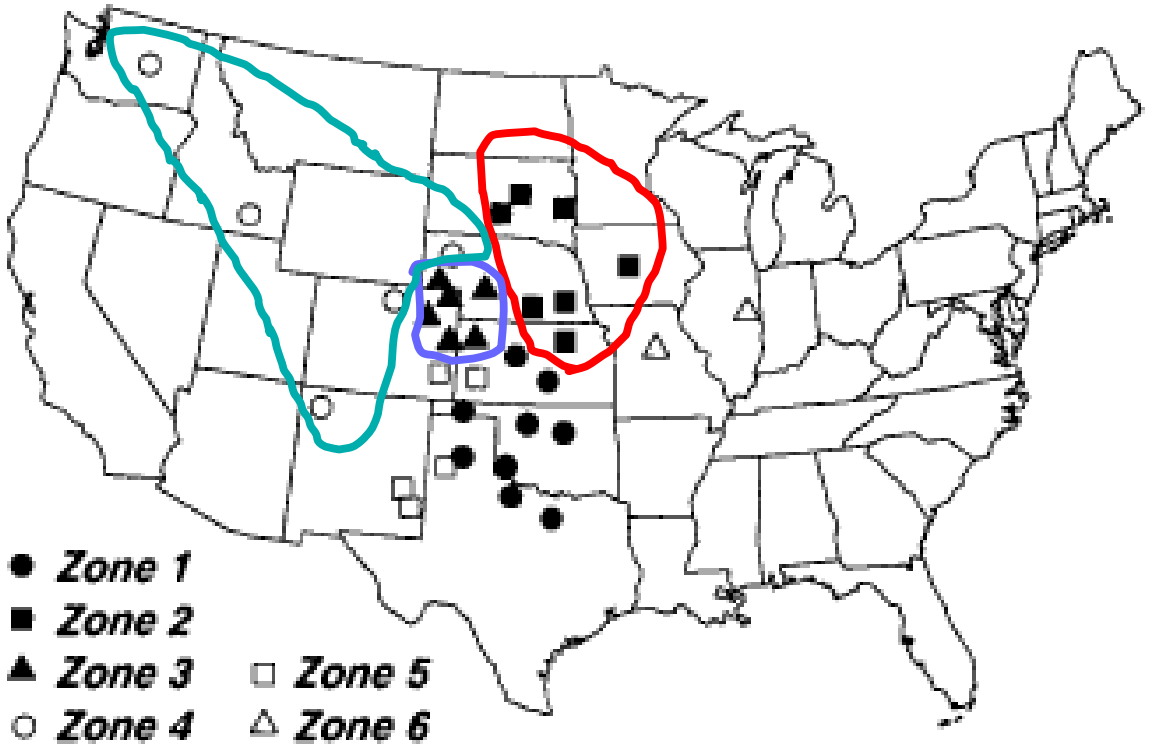


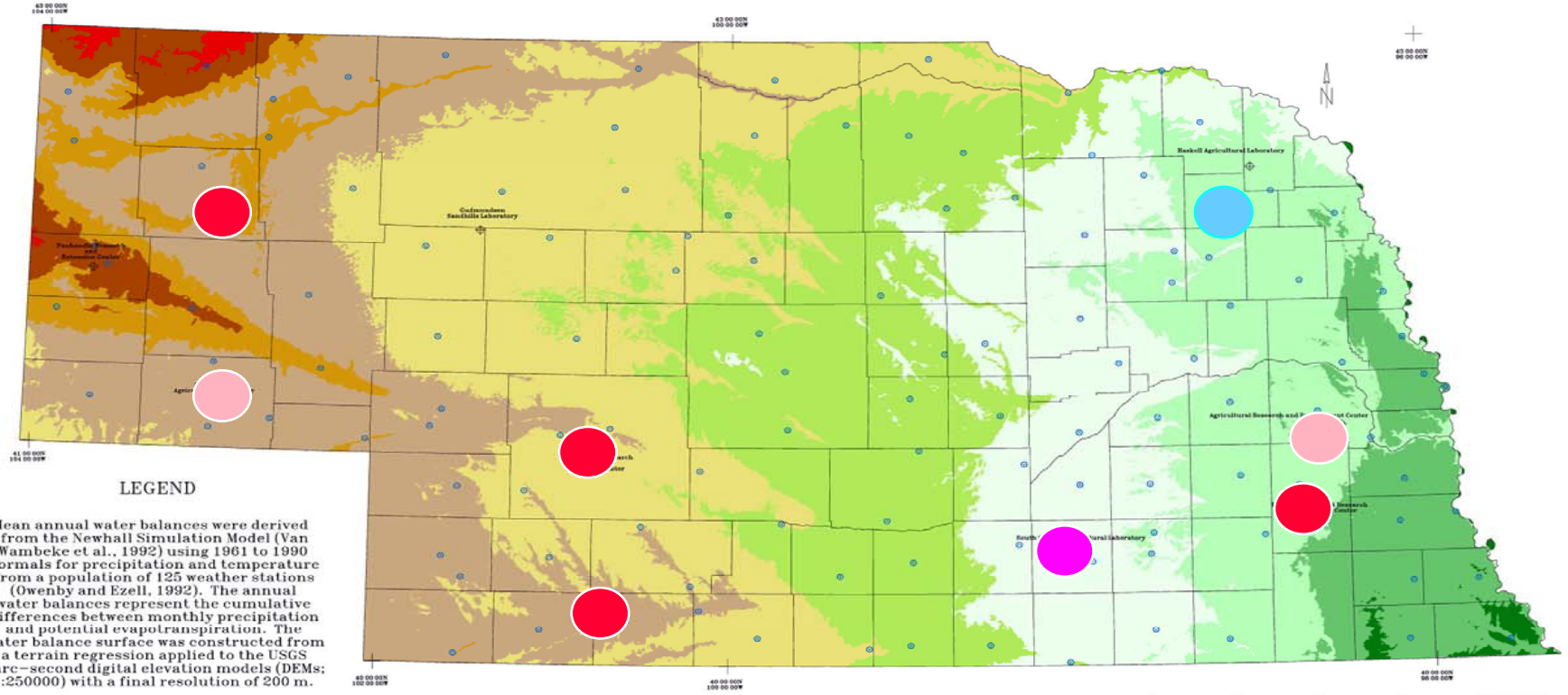
Fig. 1. Production zones for winter wheat in the Great Plains based on factor loadings for 34 locations in the Southern Regional Performance Nursery from 1959 to 1989.

Peterson, 1992

UNIVERSITY OF NEBRASKA–LINCOLN

DEPARTMENT OF AGRONOMY AND HORTICULTURE

MEAN ANNUAL WATER BALANCE ACROSS NEBRASKA LANDSCAPES



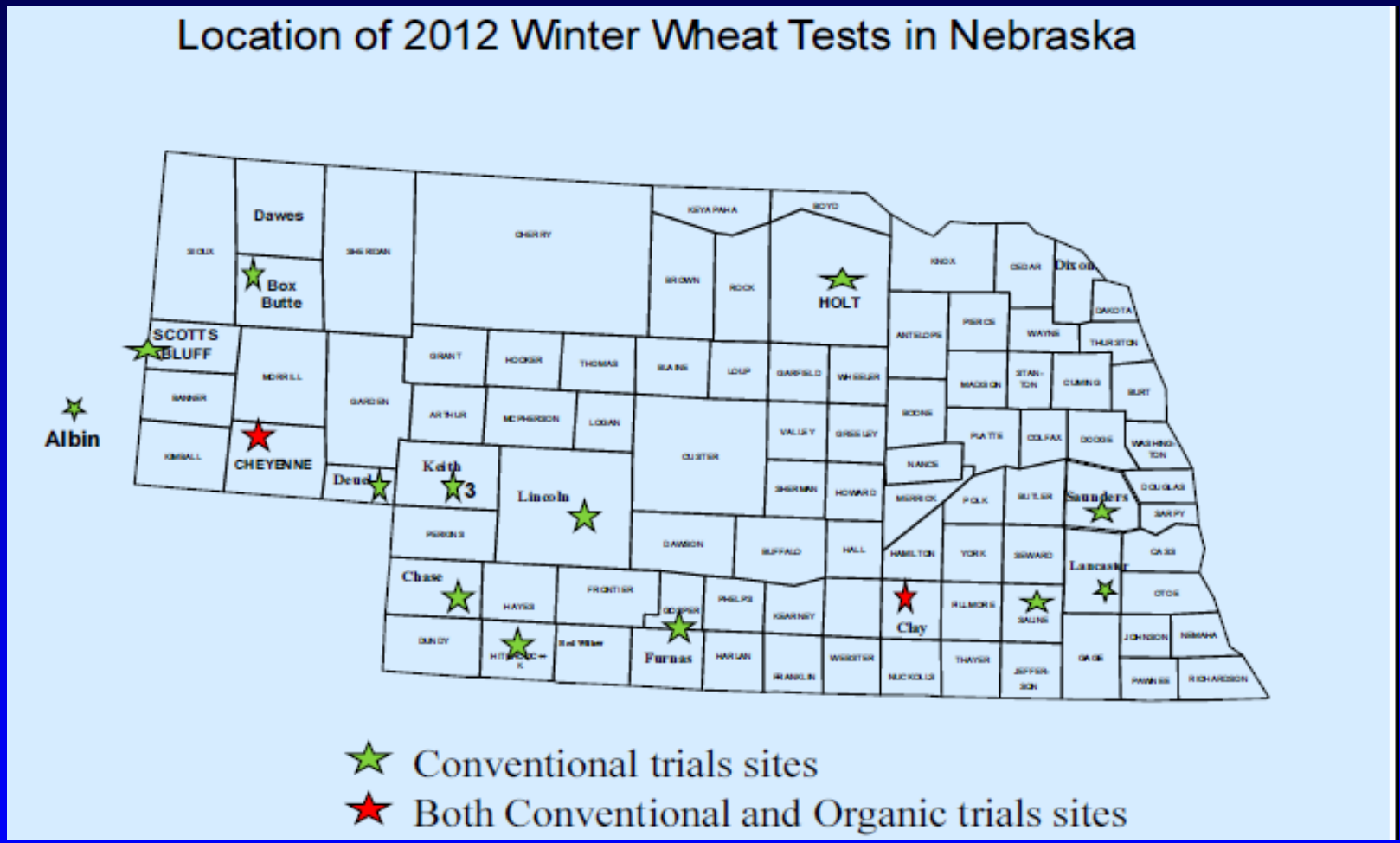
LEGEND

Mean annual water balances were derived from the Newhall Simulation Model (Van Wambeke et al., 1992) using 1961 to 1990 normals for precipitation and temperature from a population of 125 weather stations (Owenby and Ezell, 1992). The annual water balances represent the cumulative differences between monthly precipitation and potential evapotranspiration. The water balance surface was constructed from a terrain regression applied to the USGS 3 arc–second digital elevation models (DEMs; 1:250000) with a final resolution of 200 m.

- 101 to 150 mm
- 51 to 100 mm
- 0 to 50 mm
- −1 to −50 mm
- −51 to −100 mm
- −101 to −150 mm
- −151 to −200 mm
- −201 to −250 mm
- −251 to −300 mm
- −301 to −350 mm
- Agricultural Research and Extension Site
- Weather Stations

A cooperative project of the Departments of Agronomy and Horticulture and Computer Science and Engineering, University of Nebraska–Lincoln. Milner, M., D.A. Mortensen, K.G. Cassman, and W.J. Waltman. 2000. Geospatial Applications for Nebraska Agriculture. Univ. of Nebraska Cooperative Extension CD 6. Albers Equal Area Projection.

Data from the Nebraska State Variety Trial:



Regassa et al., 2012

What Does This Mean For You?

- Broadly adapted Nebraska lines tend to do best in the northern Great Plains.
- The lines that have the best chance in CO and KS are probably those more narrowly adapted to the southwest (possibly west) district of NE.
- Always use the three or more years of data from NE

West Central Dryland Wheat Variety Tests 2008 - 2012

Brand	Variety	Grain Yield (bu/a)	Bushel Weight (lb/bu)	Kernel Weight (000/lb)	Grain Protein (%)	Plant Height (inches)	Lodging (%)
		Three year averages					
----	Settler CL	66	59	14	12	33	5
WESTBRED	Winterhawk	66	60	14	12	34	6
----	NE05496	66	58	14	12	36	7
----	Robidoux	66	58	15	12	35	8
-----	NE06545	66	58	15	12	34	6
WESTBRED	WB-Stout	66	57	14	12	34	7
----	McGill	65	58	15	12	37	8
WESTBRED	Armour	65	59	15	12	30	5
-----	NE06607	65	58	14	12	34	10
AGRIPRO-SYNGENTA	Art	64	60	16	12	34	6
Husker Genetics	Overland	64	60	14	12	37	3
----	Wesley	64	58	14	13	32	3
----	NW03666 (W)	63	59	14	12	35	8
----	Infinity CL	63	59	14	12	37	12
----	Alliance	62	59	15	12	37	9
NuPride	Camelot	61	58	13	13	37	6
-----	Snowmass (W)	61	59	14	12	35	4
----	Millennium	60	60	14	12	38	4
----	Arrowsmith (W)	60	58	15	12	39	6
----	NE05548	59	58	16	13	40	9
----	Goodstreak	57	60	15	12	41	9
----	Mace	57	57	16	12	33	9
----	Pronghorn	52	60	15	12	41	14
----	Scout 66	48	59	14	13	42	19
----	Turkey	44	58	16	13	42	19
Average of all entries		**61**	**59**	**15**	**12**	**36**	**8**
Difference required for significance at 5%		**6**	**2**	**1**	**0.5**	**1.2**	**NS**

LSD 0.05

West Dryland Wheat Variety Test 2008-2012

Brand	Variety	Grain Yield (bu/a)	Bushel Weight (lb/bu)	Kernel Weight (000/lb)	Grain Protein (%)	Plant Height (inches)
		Three year averages				
----	Robidoux	57	60	14	10	29
-----	NE06545	57	58	14	11	29
----	Settler CL	55	60	13	11	29
----	NE05548	55	59	13	11	31
WESTBRED	Armour	54	59	14	11	26
Husker Genetics	Overland	54	60	13	11	30
----	McGill	54	59	14	11	29
WESTBRED	Winterhawk	54	60	13	11	29
-----	NE06607	53	59	14	11	30
----	Hatcher	52	60	13	11	28
----	NW03666 (W)	52	60	13	11	29
----	Alliance	52	59	14	11	29
----	Infinity CL	51	60	13	11	30
WESTBRED	WB-Stout	51	58	13	12	29
----	Goodstreak	51	60	14	11	32
-----	Snowmass (W)	51	60	13	11	29
----	Arrowsmith (W)	50	59	14	11	31
NuPride	Camelot	50	59	12	11	29
-----	Thunder CL	50	59	14	10	28
----	NE05496	50	60	13	11	29
----	Millennium	50	60	14	11	30
----	Wesley	49	59	13	11	28
----	Bill Brown	48	60	14	11	28
----	Pronghorn	48	60	14	11	33
----	Buckskin	46	60	13	11	33
----	Mace	43	58	15	11	27
----	Scout 66	42	60	13	11	33
----	Turkey	40	59	14	12	32
Average of all entries		51	59	14	11	30
Difference required for significance at 5%		6	1	0.9	0.7	2

West Irrigated Wheat Variety Test 2008-2012

Brand	Variety	Grain Yield (bu/a)	Bushel Weight (lb/bu)	Kernel Weight (000/lb)	Grain Protein (%)	Lodging (%)	Plant Height (inches)
		Three year averages					
WESTBRED	Aspen (W)	90	59	13	13	1	30
WESTBRED	Armour	89	58	16	13	4	29
-----	NI07703	87	58	14	13	3	31
----	Settler CL	85	58	13	13	4	31
-----	NE06607	83	56	12	13	17	32
-----	NI08708	82	57	15	13	9	31
Husker Genetics	Overland	82	58	17	13	3	33
NuPride	Camelot	82	57	14	14	9	32
----	Wesley	82	57	15	13	2	31
----	NI06737	81	58	16	13	3	31
-----	NE06545	81	56	16	13	14	31
WESTBRED	Hitch	81	56	17	12	2	29
----	Bond CL	81	57	14	13	4	32
-----	NI06736	80	57	15	13	3	34
-----	Thunder CL	80	58	15	13	6	31
----	Robidoux	79	57	16	13	14	32
----	NW03666 (W)	79	58	14	13	15	32
AGRIPRO-SYNGENTA	SY Gold	78	57	16	13	1	31
----	Antelope (W)	78	58	14	13	0	31
----	Anton (W)	78	56	16	14	0	31
----	Mace	77	56	17	13	0	31
----	NE05548	76	57	15	14	15	35
----	NE05496	75	57	14	13	8	32
Average of all entries		81	57	15	13	6	31
Difference required for significance at 5%		8	2	2.3	0.7	8	NS

West Irrigated Wheat Variety Test 2007-2011

Brand	Variety	Grain Yield (bu/a)	Bushel Weight (lb/bu)	Grain Protein (%)	Kernel Weight (000/lb)	Plant Height (inches)	Lodging (%)
		'Three year averages					
WESTBRED	Armour	95	59	12.8	11.7	27	8
WESTBRED	Aspen (W)	95	59	12.2	11.1	27	1
----	Settler CL	94	59	12.0	11.5	30	5
----	Wesley	92	58	12.6	11.7	30	1
----	NE04490	90	59	11.9	12.4	31	1
----	McGill	90	58	11.9	14.1	32	16
Husker Genetics	Overland	90	59	11.9	12.9	32	8
----	Bond CL	88	58	11.6	12.2	30	9
----	Robidoux	88	58	12.0	13.6	30	11
----	NE03490	88	58	12.2	13.2	27	12
NuPride	Camelot	88	58	13.0	11.6	31	8
WESTBRED	Hitch	88	57	11.3	14.6	28	1
----	NI06737	88	58	12.4	13.7	29	2
----	NI06731	87	58	12.1	11.8	30	1
----	NW03666 (W)	85	59	12.6	12.0	31	13
----	NE05548	84	58	12.9	12.4	33	19
----	Anton (W)	84	57	12.8	13.3	30	0
----	NE05426	82	58	12.4	12.9	29	9
----	Antelope (W)	81	60	12.7	11.3	29	2
----	Mace	81	57	12.6	14.9	29	3
Average of all entries		**88**	**58**	**12.3**	**12.6**	**30**	**6**
Difference required for significance at 5%		**7**	**1**	**0.5**	**1.4**	**1**	**9**

Nebraska Lines to Consider

- Robidoux
- Settler CL
- NE06545 (Husker Genetics Brand Freeman)
- Potential Newcomers:
  - NE05548
  - NE05496

NI04421: Robidoux

- NE96644/Wahoo (sib) where the pedigree of NE96644 is ODESSKAYA P./CODY//PAVON 76/*3 SCOUT66.
- Medium maturity, medium height semi-dwarf wheat with good winterhardiness and medium straw strength.
- MR/MS to leaf rust and stem rust.
- MS to soilborne wheat mosaic virus and MS/S to Hessian fly and wheat streak mosaic virus.
- Susceptible to common bunt (syn. stinking smut) and seed treatments are recommended. Once the problem was cleaned up, has not returned.
- Above average end-use quality.

NH03614 CL: Settler CL

- Formerly NH03614 (Wesley sib//Millennium sib/ Above sib)
- Semi-dwarf, herbicide tolerant, bright chaff
- Does well in NE, SD, and WY
- MR to stem rust and WSBMV
- MR to MS for Hessian fly
- MS for leaf rust, stripe rust, scab,
- S to WSMV
- Good test weight, acceptable end-use quality.

NE06545: KS92-946-B-15-1/ALLIANCE

- KS92-946-B-15-1 = ABI86*3414/JAG//K92
- Medium early, medium height semi-dwarf wheat with good winterhardiness, and average straw strength.
- MR/R to wheat soilborne mosaic virus, stem rust and leaf rust.
- MS/MR to Hessian fly.
- MR/S to yellow (stripe) rust.
- S to Russian wheat aphid and wheat streak mosaic virus.
- MS to scab.

NE06545: KS92-946-B-15-1/ALLIANCE

- Coleoptile length is long for a semi-dwarf (similar to Settler CL)
- Broadly adapted and best suited for production to in virtually all parts of Nebraska and states north and west of Nebraska.
- Based upon our end-use quality data to date, NE06545 would be similar in end-use quality to McGill.
- PVP will be applied for and will be marketed as **Husker Genetics Brand Freeman** in honor of Daniel Freeman, the first applicant under the Homestead Act (1862).

NE06545: (kg/h)

	Mead	Lincoln	C. Center	N. Platte	McCook	Sidney	Alliance	Average	RANK
	4*	5	5	5	3	4	5	31	
	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	
Camelot	3476	4202	3120	4032	4543	4443	3804	3333	7
Goodstreak	3405	4031	3052	3928	4112	4189	4129	3279	8
McGill	3659	4784	3588	4123	5458	4212	3660	3606	4
NE06545	3727	4882	3730	4535	5428	4466	4189	3803	1
Robidoux	3549	4538	3751	4072	5609	4501	4220	3675	2
Overland	3863	4389	3726	3998	5512	4255	4043	3638	3
Scout 66	2345	2744	2079	3013	3856	3527	3147	2447	9
Settler CL	3358	4316	3491	3993	5238	4297	4124	3509	5
Wesley	3427	4131	3188	3888	5065	3976	3860	3362	6
Mean	3355	4113	3201	3905	4911	4165	3871	3342	

* Years tested

NE06545:

	Trials	Variety	NE06545	%	Significance
Alliance	19	58.97	65.72	89.70	**
Camelot	41	56.18	63.61	88.30	***
Goodstreak	36	55.69	64.08	86.90	***
McGill	34	60.32	63.29	95.30	**
Robidoux	33	62.38	64.00	97.50	n.s.
Overland	46	62.24	65.36	95.20	**
Settler Cl	38	58.97	63.51	92.80	***
Wesley	46	57.49	65.36	88.00	***


NE06545

What's next?

- We are trying new ways of releasing lines.
- We are letting certified seed growers try them out and see if the line has merit.
- The first two lines are NE05496 and NE05548.

NE05496: (KS95HW62-5/Hallam)

- Medium early maturity, short to medium height semi-dwarf wheat with good winterhardiness and good straw strength
- Longer coleoptile for a semi-dwarf wheat.
- R to stem rust and wheat soilborne mosaic virus, MR to Hessian fly, MS/MR to leaf rust, MS/S to yellow (stripe) rust, and S to the Russian wheat aphid and wheat streak mosaic virus.

NE05496: (cont.)

- Higher level of resistance to an emerging disease, wheat blast (found in South America)
- MS to scab reaction and susceptible for DON accumulation
- Good end-use quality
- Target region: Southwest Nebraska and west (McGill without the eastern adaptation).

NE05496:

	Trials	Variety	NE05496	%	Significance
Alliance	25	58.02	61.54	94.30	*
Camelot	43	56.72	58.62	96.80	n.s.
Goodstreak	42	55.9	58.76	95.10	**
McGill	40	60.47	58.95	103.00	n.s.
NE05548	48	60.96	61.78	98.70	n.s.
Robidoux	40	60.9	58.95	103.00	n.s.
Settler Cl	41	59.57	58.79	101.00	n.s.
Wesley	53	57.61	61.18	94.20	***


NE05496

NE05548: (NE97426/NE98574)

- Medium late maturity, “tall” wheat with good winter hardiness, and fair straw strength.
- Semi-dwarf coleoptile.
- MR to stem rust, yellow (stripe) rust, and Hessian fly
- MS to leaf rust
- S to wheat soilborne mosaic virus and Russian wheat aphid.
- MS to scab reaction and moderately resistant for DON accumulation.

NE05548: Yield bu/a

	Trials	Variety	NE05548	%	Significance
Alliance	25	58.02	60.88	95.30	n.s.
Camelot	40	56.98	57.75	98.70	n.s.
Goodstreak	39	55.84	57.82	96.60	n.s.
McGill	39	60.50	57.82	105.00	**
NE05496	48	61.78	60.96	101.00	n.s.
Robidoux	39	61.25	57.82	106.00	**
Settler Cl	40	59.61	57.75	103.00	n.s.
Wesley	48	58.00	60.96	95.10	***

NE05548: Height (in)

	Trials	Variety	NE05548	%	Significance
Goodstreak	28	39.58	39.30	101.00	n.s.
NE05496	29	34.88	39.29	88.80	***
Robidoux	28	35.13	39.30	89.40	***
Settler Cl	28	34.16	39.30	86.90	***


NE05548

New Barley Release: P-845

- Krasnodar ‘K304/2’/NB90701
- NB90701=Sabbaton/Meimi*2/Decatur/3/Dundy// Nebar sel./Dundy/4/OK77422
- Highest yielding line in Colby and Lincoln, NE.
- Good winter hardiness.
- Average test weight.
- Relatively short compared commercially available cultivars.

P-845

	Linc.		Mead		Sidney		Colby			
	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Average	Rank
VARIETY	Lbs/a		Lbs/a		Lbs/a		Lbs/a		lbs/a	
	(7)	(7)	(5)		(5)		(8)		(25)	
P-713	4433	3	3426	1	3341	1	3909	2	3846	2
P-721	4029	4	3036	4	3330	2	3657	4	3572	4
P-954	4486	2	3231	3	2858	4	3692	3	3655	3
TAMBAR 501	3972	5	2307	5	2437	5	3367	5	3138	5
P-845	4849	1	3415	2	2887	3	4246	1	3977	1

Small Grains Improvement Team

Genetics:
Bob Graybosch, USDA-ARS
Ismail Dweikat
Guihua Bai, USDA-ARS
Kulvinder Gill, WSU
Dipak Santra
Harkamal Walia
Brian Waters

Plant Pathology:
Stephen Wegulo
Roy French, USDA-ARS
S. Tatineni, USDA-ARS
Yue Jin, USDA-ARS

Variety Testing:
Teshome Regassa

Transformation:
Tom Clemente

Entomology:
Gary Hein, Jeff Bradshaw
Ming Chen, USDA-ARS

Cropping Systems:
Drew Lyon/TBA
Greg Kruger, Charles Shapiro,
Gary Hergert

End-use Quality:
Devin Rose, Lan Xu
Brad Seabourn, USDA-ARS

Biometry/Statistics:
Kent Eskridge
Walt Stroup
Aaron Lorenz/Dong Wang

Small Grains Improvement Team

Crop Modeling & Physiology:
Greg McMaster (USDA-ARS)

Triticale:
Dipak Santra
Ken Vogel (USDA-ARS)

Barley:
Leon Neher, Pat Evans
My graduate students

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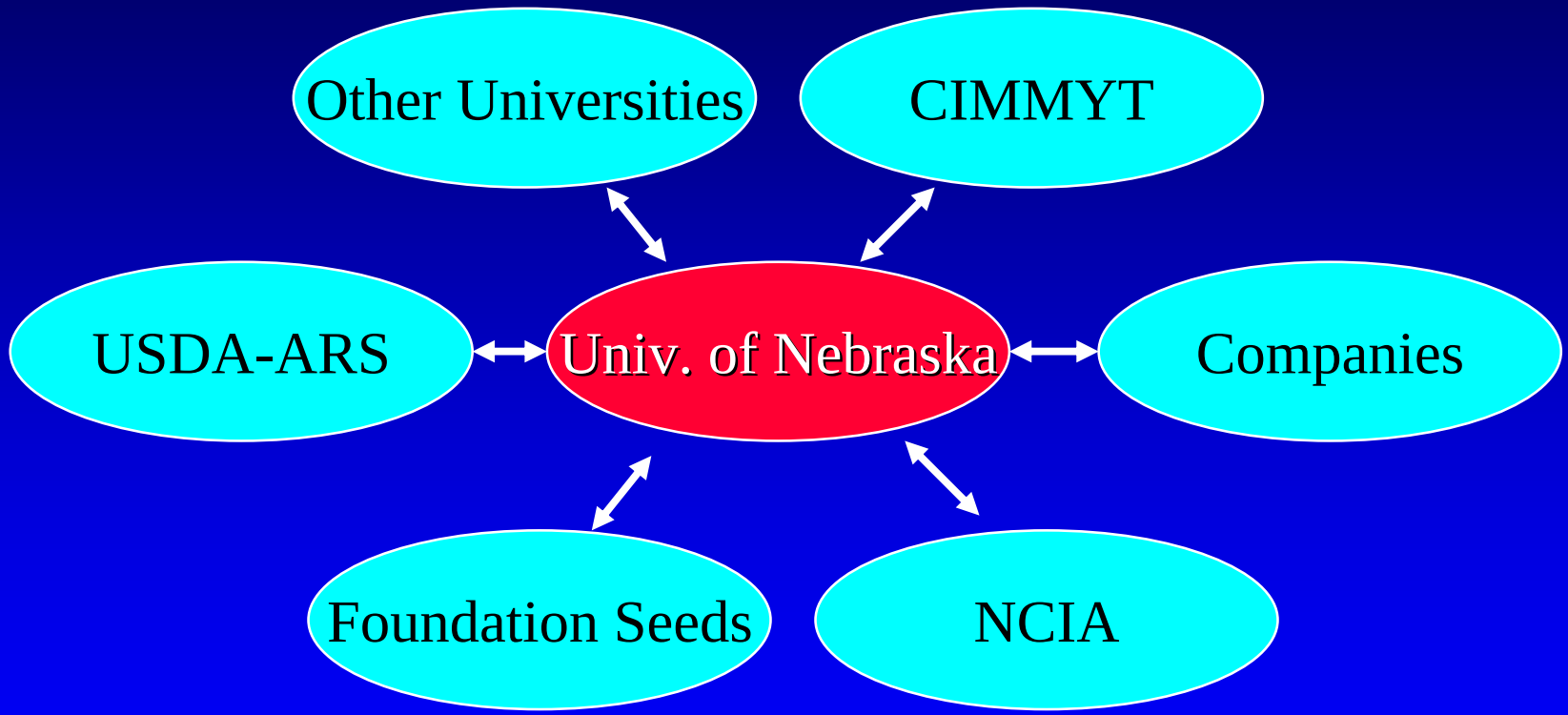
Collaborative Research

Nebraska Wheat

IANR

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Linkages:



Nebraska Wheat Board **Nebraska Wheat Growers Association**