



Old World Bluestem Identification and Control

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Outline of presentation

- Native bluestems
- Old World Bluestems
- Previous research
- Ongoing research
- Control options

Big Bluestem (*Andropogon gerardii*)



Little Bluestem (*Schizachyrium scoparium*)

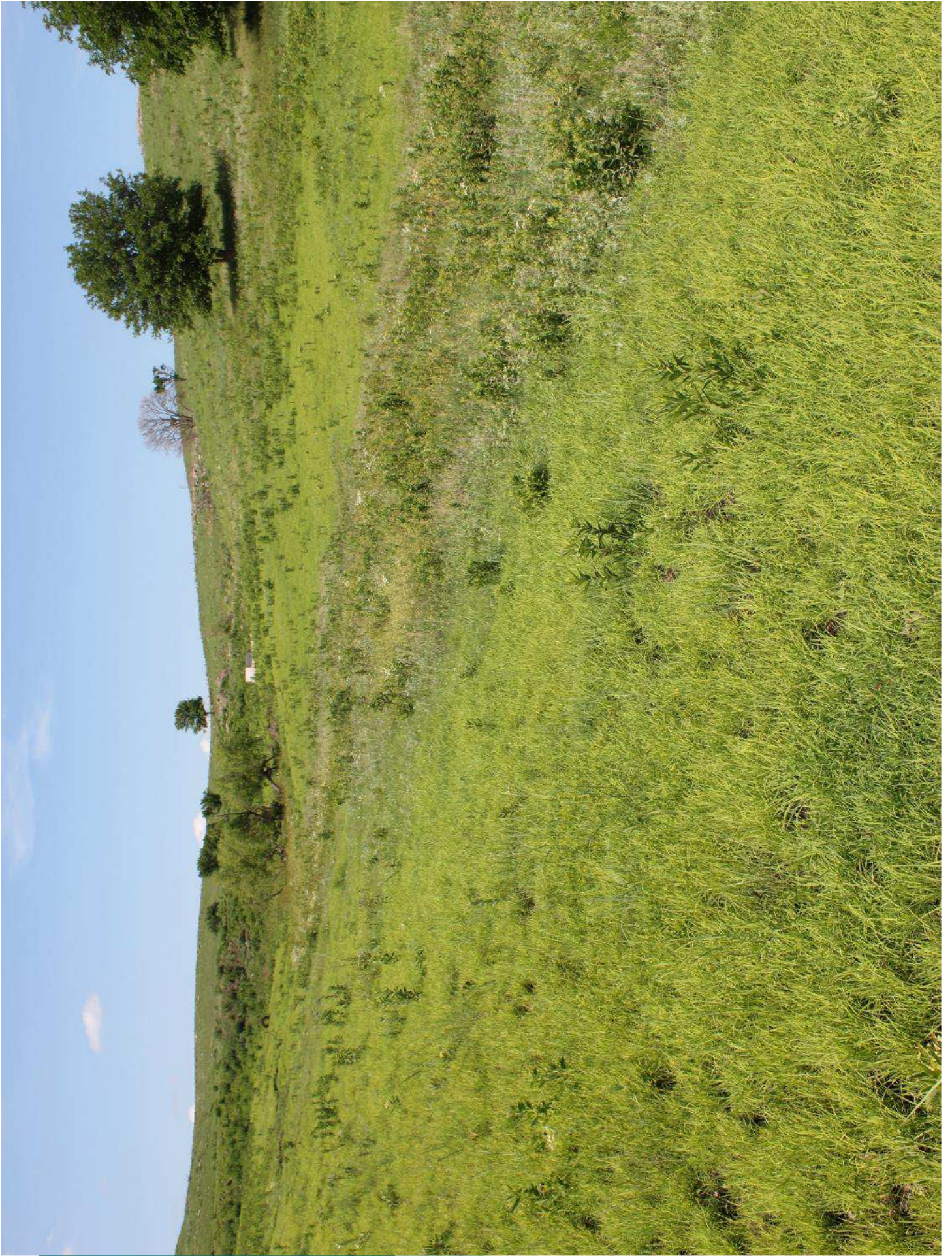


Silver bluestem

(*Bothriochloa laguroides*)



- Native, warm-season, perennial bunchgrass
- 2-4 ft tall
- Silver-colored seedheads
- Crooked stems
- Nodes with flattened hairs
- Also called silver beardgrass



Caucasian bluestem (*Bothriochloa bladhii*)



Photo by Mike Haddock

- Introduced South Asia and Australia
- 2-3 ft tall
- Stems glabrous
- Usually with long hair at base of leaf blade
- Leaves smell like terpineol when crushed
- Also called Australian bluestem, B. Dahl



Yellow bluestem

(*Bothriochloa ischaemum*)

- Introduced from China, Africa, Eurasia, Mediterranean
- Up to 3 ft tall
- Stems decumbent at base, grooved on one side, glabrous to short-hairy at nodes
- Also called King Ranch Bluestem, Turkestan Bluestem, Plains, WW-SPAR, Ironmaster
- Major identifying characteristic is digitate inflorescence





Caucasian Bluestem



Yellow Old World Bluestem

Photos by Mike Haddock



Old World Bluestems

- Caucasian bluestem (*Bothriochloa bladhii*)
- Yellow OWB (*Bothriochloa ischaemum*)

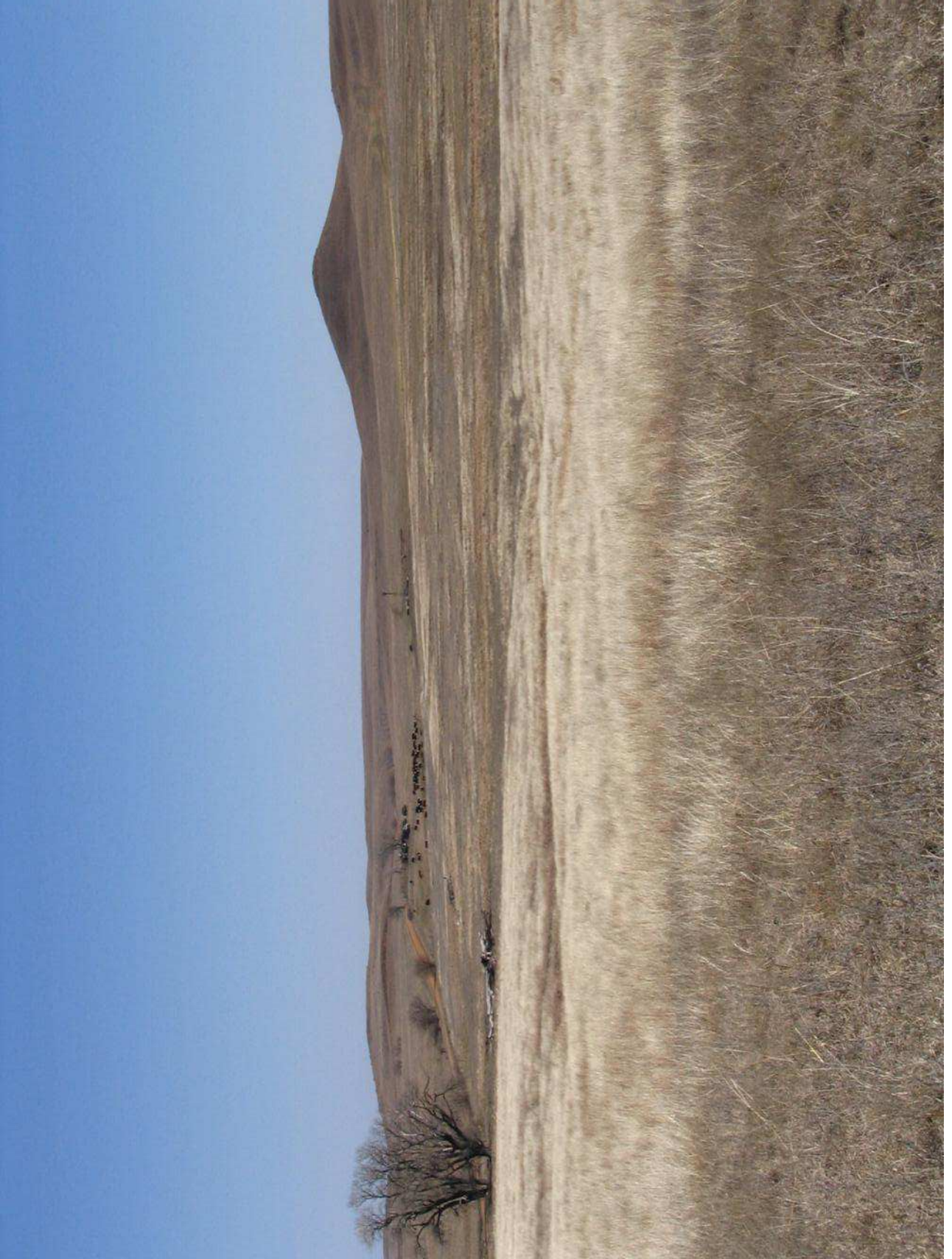
Planted in central and southern Great Plains

- Ease of establishment
- Production potential
- Available seed
- Cost



Characteristics of Old World Bluestems

- More abundant on heavy textured soils
- Reproduces by seed and roots
- Invades disturbed areas, waste ground abandoned fields, roadsides, and pastures
- Less palatable than most native grasses
- Allelopathy





Previous Research

- Medlin et al. 1998. Weed Tech.12:286-292
 - glyphosate < 72% control yellow OWB
 - disk and plow 87-100% control
- Harmony et al. 2004. Weed Tech. 18:545-550 (single applications at V4 stage)
 - 9 WAT: 3 lbs/acre glyphosate 94% control; 1.25 lbs/acre imazapyr 100% control yellow OWB
 - 1 YAT: OWB frequency 8-25% in imazapyr-treated plots; 93-95% frequency in glyphosate treatment



Frequency of Caucasian bluestem following treatment in 2003 and 2005 at Hays, KS

Herbicide	Rate (lbs/acre)	Frequency 1 YAT
Imazapyr	0.25	4
Glyphosate	1.0	1
Imazapic	0.09	98
None		98

Harmoney et al. 2007



Previous Research

- Harmony et al. 2007. *Weed Tech.* 21:573-577
 - Two applications: 4-5 leaf stage and 8 weeks later
 - 1 lbs/acre glyphosate at each application only treatment to reduce frequency and tiller density; 0.25 lbs/acre imazapyr at each application also reduced frequency of Caucasian bluestem 1 YAT
 - Both herbicides also controlled remnant native vegetation on plots




Objectives - Fick, 2009

- Determine the efficacy of glyphosate and imazapyr for control of Caucasian bluestem
- Determine the impact of these herbicides on associated species



Caucasian bluestem at 4-5 leaf stage





% Control of Caucasian Bluestem June 1, 2006

Herbicide	Rate (lbs/A)	4 MAT	1 YAT
Glyphosate	2	42	76
Glyphosate	3	75	94
Glyphosate	4	66	77
Imazapyr	1	99	99
Imazapyr	1.25	100	96
Check	--	0	1

$LSD_{0.05} =$ 17 20

3 lbs/acre Glyphosate – 4 days after treatment




3 lbs/acre Glyphosate – 4 months after treatment



3 lbs/acre Glyphosate – 1 year after treatment





% Control of Caucasian Bluestem June 5, 2007

Herbicide	Rate (lbs/A)	4 MAT	1 YAT
Glyphosate	2	91	88
Glyphosate	3	96	97
Glyphosate	4	96	93
Imazapyr	1	100	99
Imazapyr	1.25	99	100
Check	--	0	4

$LSD_{0.05} =$ 4 8

1 lbs/acre Imazapyr – 4 months after treatment



1 lbs/acre Imazapyr – 1 year after treatment



**Warm-season grass response (% change)
to herbicides applied June 1, 2006**

Herbicide	Rate (lbs/A)	4 MAT	1 YAT
Glyphosate	2	-100	-93
Glyphosate	3	-100	-100
Glyphosate	4	-100	-99
Imazapyr	1	-62	-32
Imazapyr	1.25	-22	+10
Check	--	-35	+15

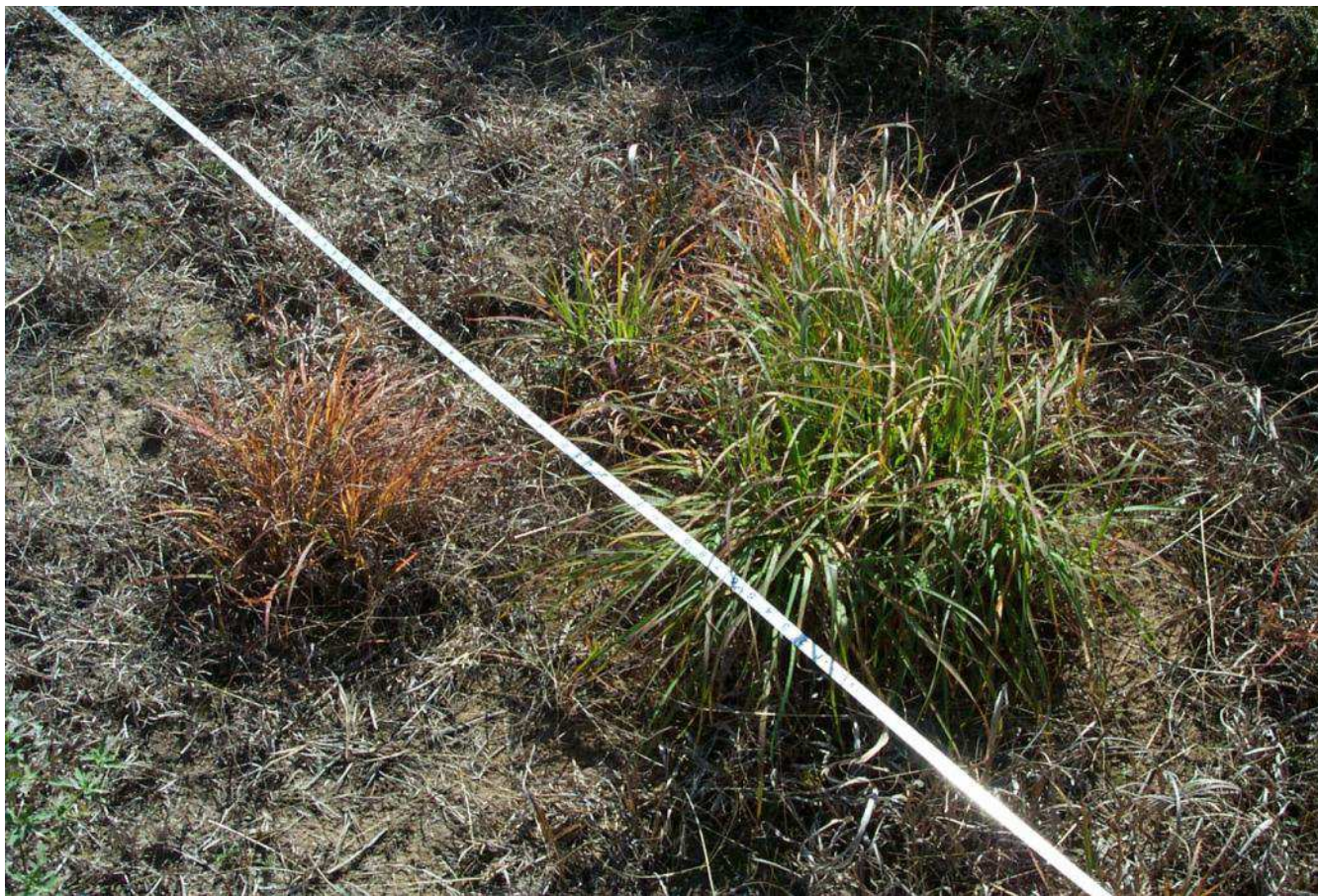
LSD_{0.05} = 59 83

**Warm-season grass response (% change)
to herbicides applied June 5, 2007**

Herbicide	Rate (lbs/A)	4 MAT	1 YAT
Glyphosate	2	-100	-99
Glyphosate	3	-100	-100
Glyphosate	4	-100	-100
Imazapyr	1	-29	-21
Imazapyr	1.25	-74	-78
Check	--	+23	-43

LSD_{0.05} = 48 35

Remnant native grass 4 MAT with Imazapyr






Summary (Fick, 2009)

- Caucasian bluestem control - 2006
 - Imazapyr provided nearly 100% control and glyphosate 42-75% control 4 MAT
 - Glyphosate at 2 lbs/acre provided only 76% control 12 MAT
- Caucasian bluestem control – 2007
 - All treatments provided > 88% control 4 and 12 MAT



Summary (Fick, 2009)

- Warm-season grass response
 - Native w-s grasses were negatively impacted by all treatments in both years, but were more tolerant to imazapyr



Harmony et al. 2010. Invasive Plant Sci. and Manage. 3:310-314

- Rate (1, 2, 3 lbs/A glyphosate) and timing (early, late, sequential)
- Sequential applications that include one treatment either early or late at 2 or 3 lbs/acre best during dry years.
- With adequate moisture, a single late application of 2 or 3 lbs/acre or sequential applications with 1 lbs/acre at each application provide best OWB control.



Ropewick Study by Keith Harmoney at Hays, KS

- 50:50 mixture of glyphosate with water
- Spray 2 lbs/acre broadcast
- Applied at head emergence

	Y1	Y2	Y3
Ropewick, 1 pass	31	69	65
Ropewick, 2 pass	64	91	91
Spray	93	99	98



Fire/Mowing plus herbicides for control of Old World Bluestem

(Robertson, 2009 Oklahoma St. Univ.)

- Used single, double, or triple applications of glyphosate with and without mowing or burning
- Burning or mowing prior to a single herbicide application improved OWB control compared to herbicide alone
- Burning or mowing with 2 herbicide applications provided control similar to triple herbicide application

Chase County – June 13, 2014



Chase County – July 15, 2014 (0.25 lb/A Imazapyr)



Chase County – September 15, 2014

(1 or 2 applications of 0.25 lb/A imazapyr)



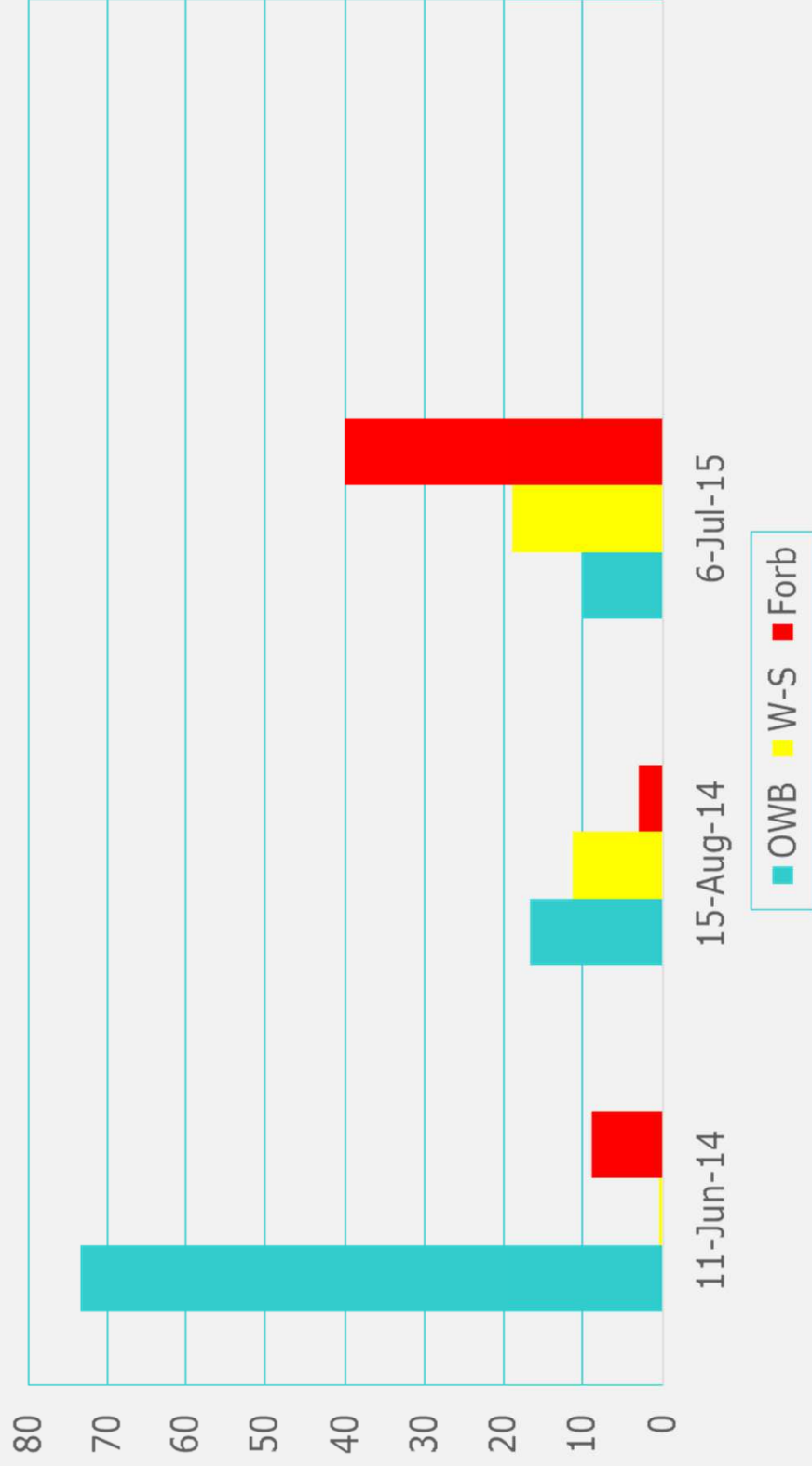


Chase County – 2014

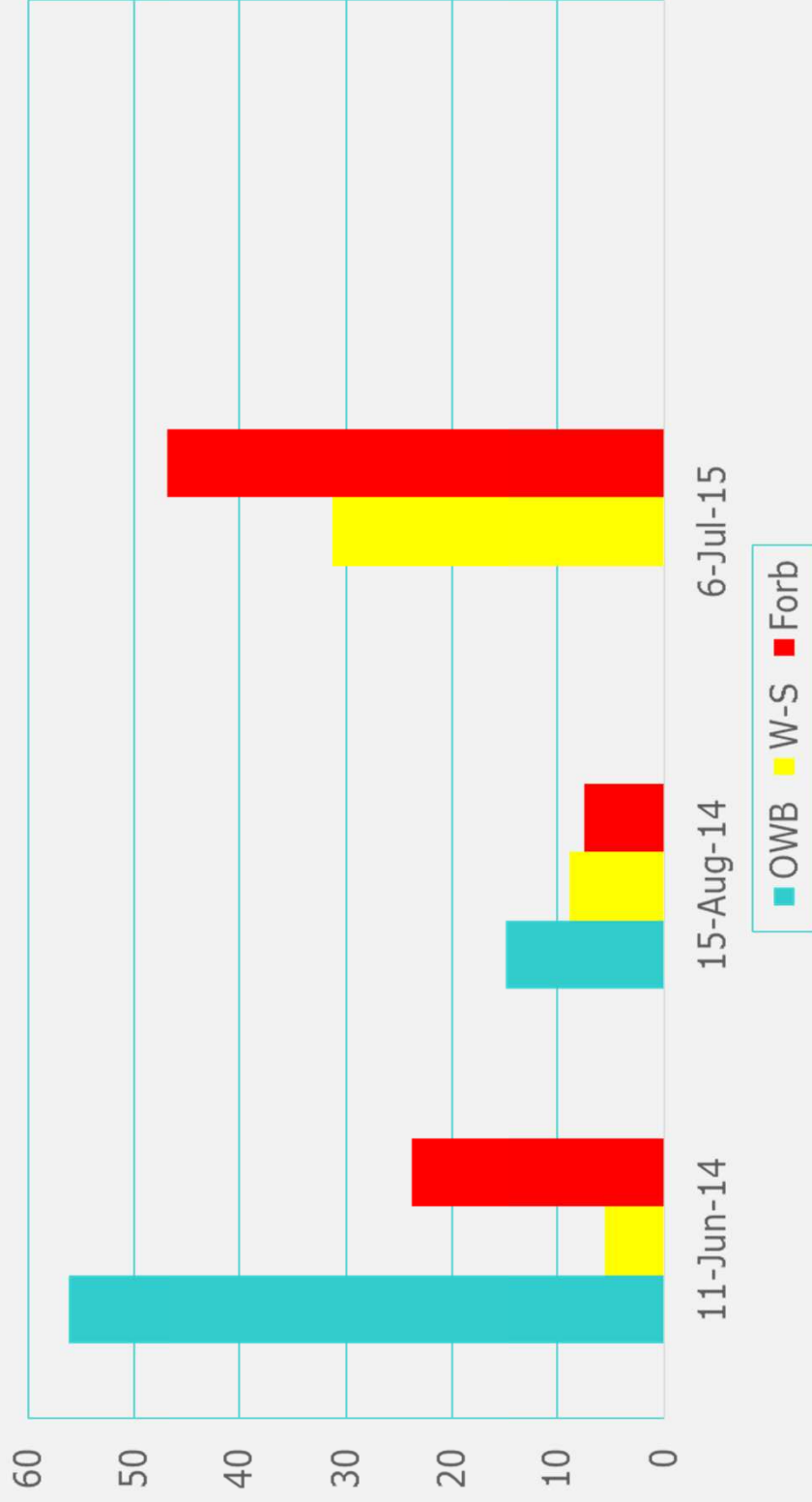
(% Composition after treatment with imazapyr)

Category	June 15	August 15	September 15
OWB	47	20	5
Warm-season	24	41	67
Cool-season	1	7	7
Forbs	28	31	21
Bare ground	10	16	21
Litter	1	22	29

Vegetative Cover With 0.25 lbs Arsenal Chase County



Vegetative Cover With 0.25 lbs Arsenal Applied Twice Chase County



Seeley: Pre-Arsenal June 11, 2014



Seeley: Arsenal – July 11, 2014



Seeley: Arsenal – September 12, 2014



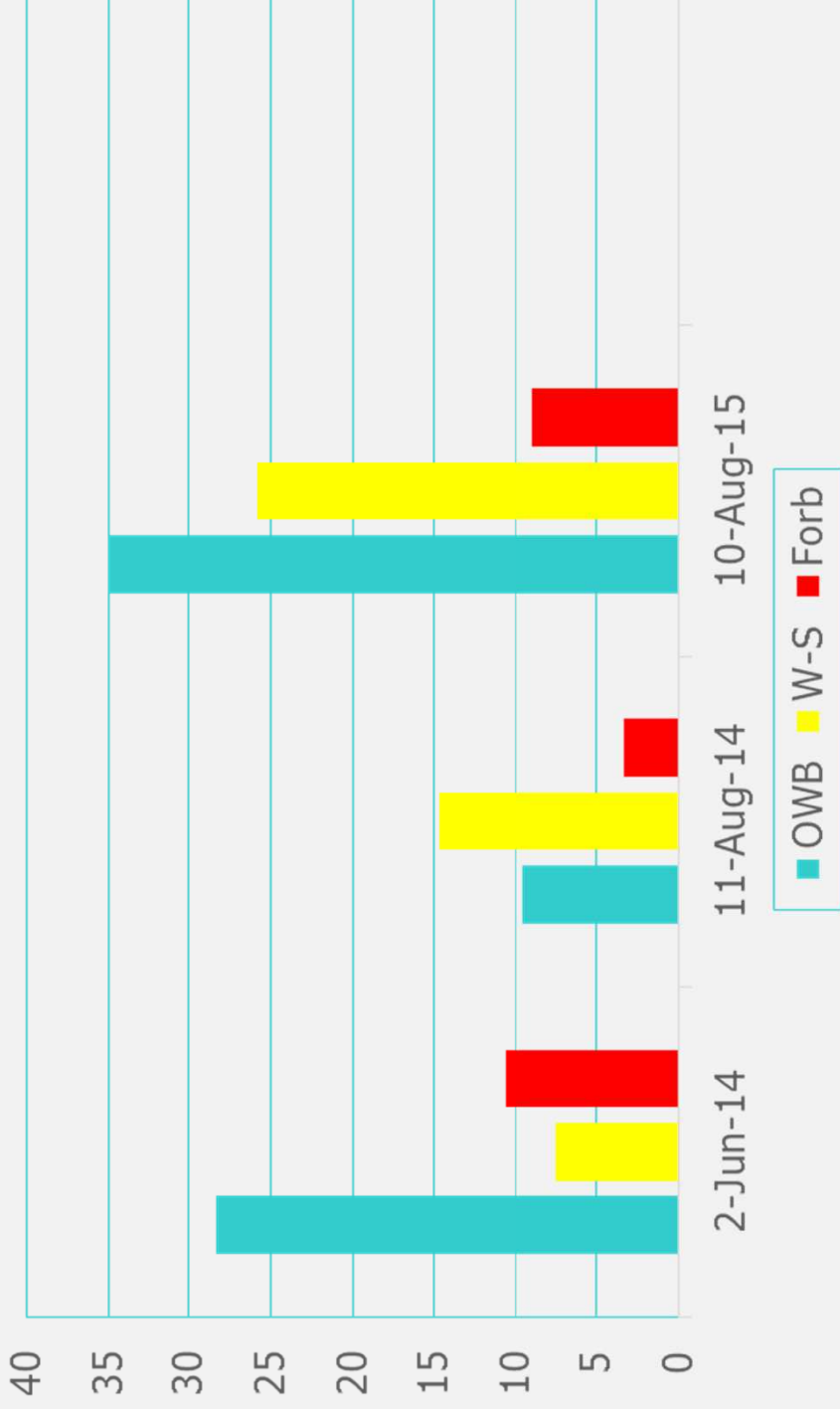


Greenwood County – 2014

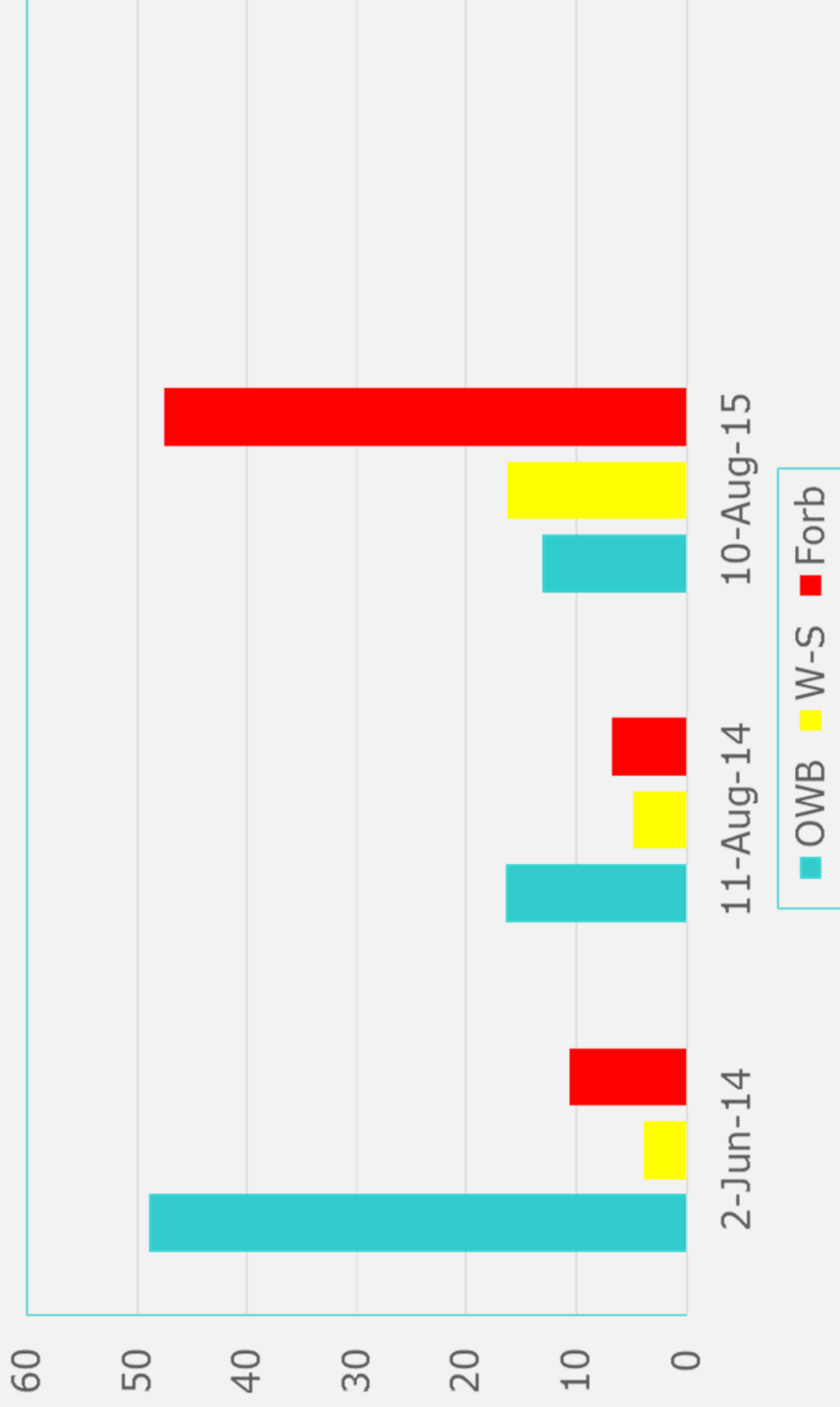
(% Composition after treatment with imazapyr)

Category	June 11	August 11	September 12
OWB	64	46	49
Warm-season	10	24	12
Cool-season	8	9	6
Forbs	18	21	33
Bare ground	20	21	33
Litter	4	29	49

Vegetative Cover With 0.25 lbs Arsenal Greenwood County



Vegetative Cover With 0.25 lbs Arsenal Applied Twice Greenwood County



Corn Steep Liquor

July 11, 2014



Corn Steep Liquor

September 12, 2014





Chase County – 2014 Rate Study

(% composition after treatment with imazapyr – September 15)

Category	0	0.25	0.5	0.75	1
OWB	56	12	4	12	2
Warm-season	28	69	87	77	88
Cool-season	5	6	6	5	6
Forbs	11	13	3	6	4
Bare ground	11	12	16	20	18
Litter	10	11	16	25	24

Chase County – 0.25# Imazapyr 3 MAT



Chase County – 0.5# Imazapyr 3 MAT



Chase County – 0.75# Imazapyr 3 MAT



Chase County – 1.0# Imazapyr 3 MAT



**Chase County – 2014 Rate Study (0-1 lb/acre imazapyr)
(% cover 1 year after treatment)**

Category	0	0.25	0.5	0.75	1
Old World Bluestem	30	10	8	13	4
Warm-season grass	19	30	41	30	35
Cool-season grass	1	5	4	2	2
Forbs	21	16	18	22	20
Bare ground	14	21	18	30	28
Litter	3	3	2	2	2

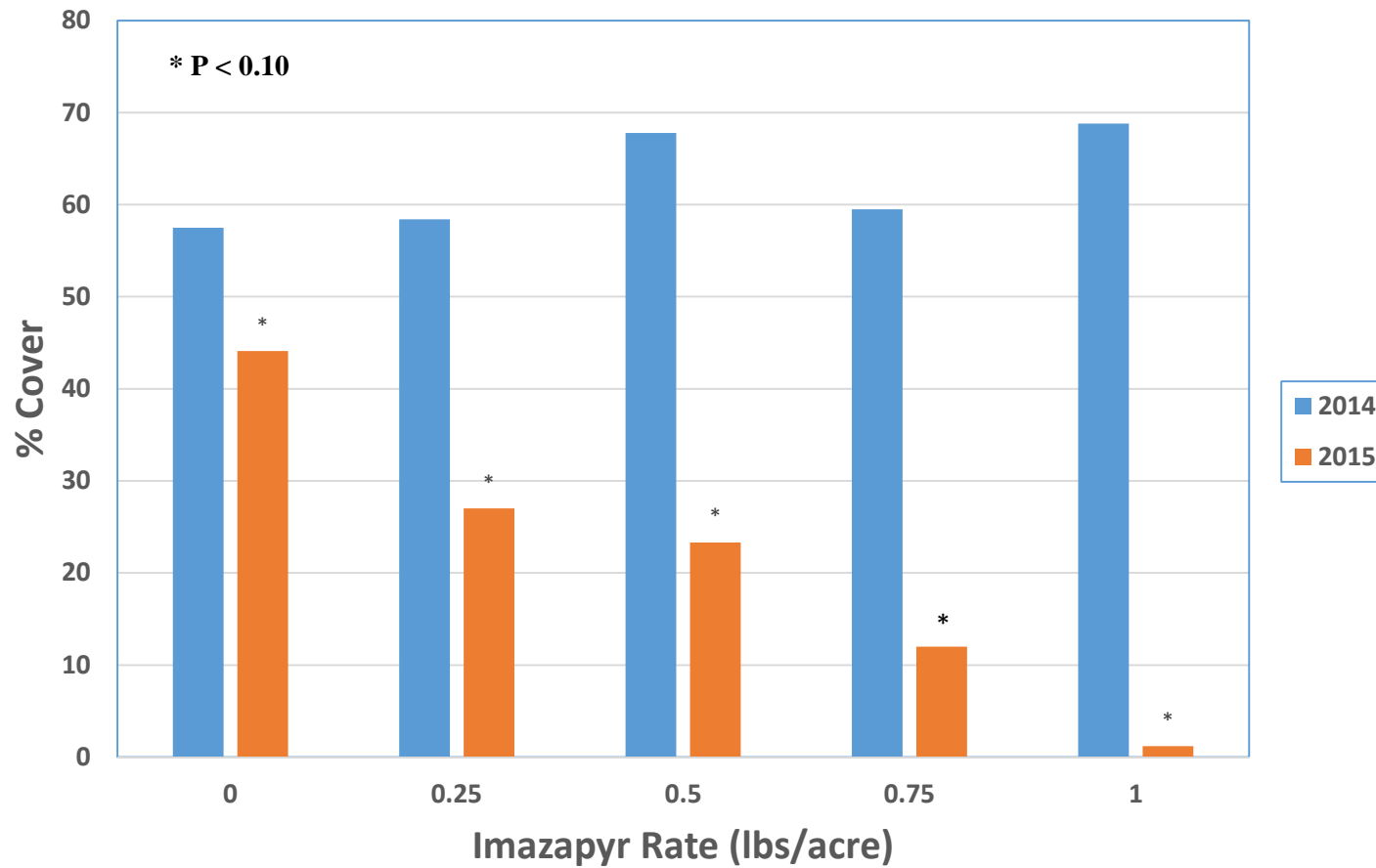
Old World Bluestem in Riley County



Riley County – 2014 Rate Study (0-1 lb/acre imazapyr) (% cover 1 year after treatment)

Category	0	0.25	0.5	0.75	1
Old World Bluestem	44	27	23	12	1
Warm-season grass	7	8	3	7	2
Cool-season grass	3	5	2	3	6
Forbs	28	37	43	44	43
Bare ground	9	23	39	44	52
Litter	12	3	6	4	8

Change in OWB Cover Riley County





Old World Bluestem Control Options

- Spot treatment with glyphosate
- Wiping or wicking glyphosate
- Tillage and planting Roundup Ready crop
- Burn or mow prior to herbicide application
- Imazapyr treatment
- Renovation of OWB infested sites needs further study



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