Lesser Prairie-Chicken and Grassland Response to Intense Wildfire in Kansas

Nicholas Parker, Daniel Sullins, David Haukos, Kent Fricke, and Christian Hagen

Photo credit: Bo Rader Wichita Eagle

DS1

Largest Wildfire In Kansas History

The six largest fires in Kansas history came within the past 21 years

TV

Kansas Forest Service

Slide 2

DS1 Cool slide! Consider reducing the number of words in the diagonal banner and make it horizontal...something about the diagonal natures just makes this seem Fox News doomsday like to me.

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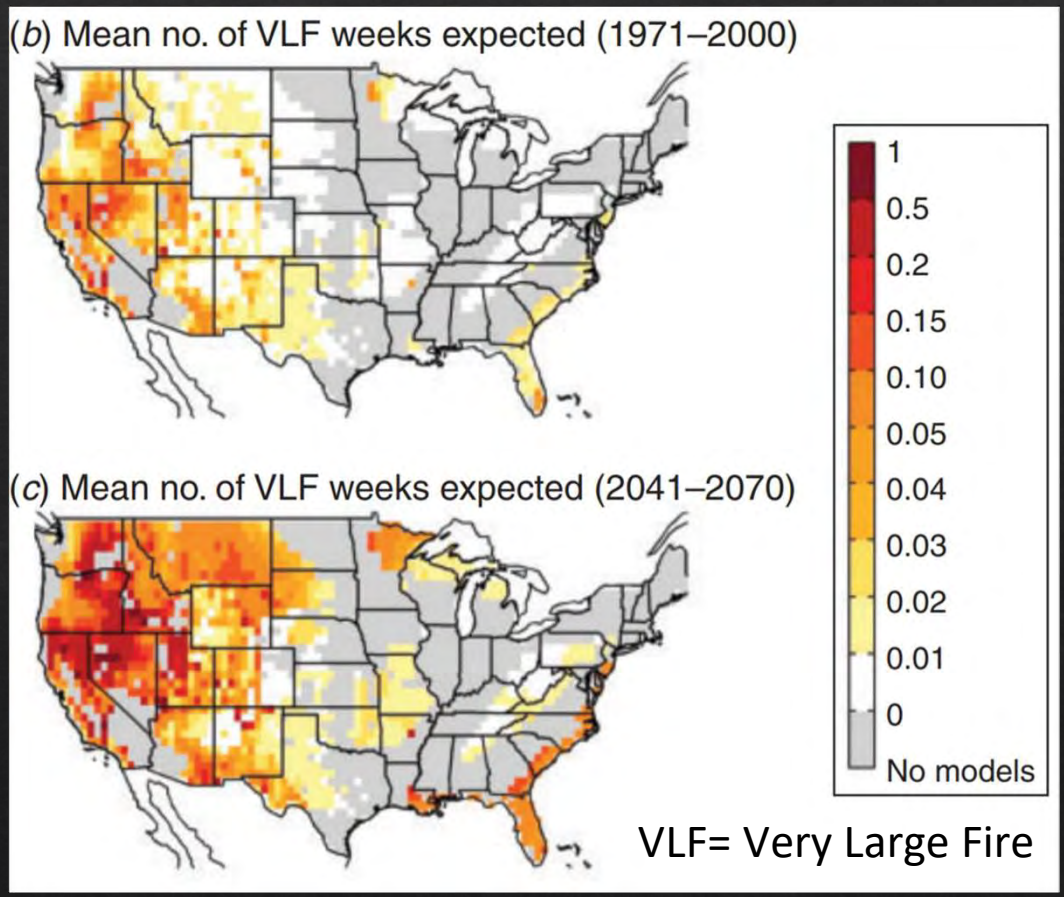
Background Intense Wildfire

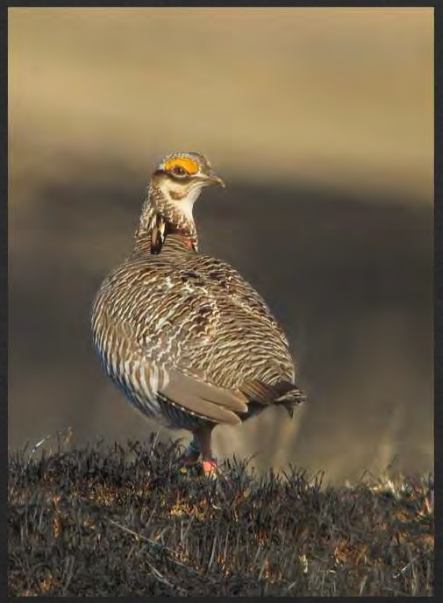
- Intense wildfires more prevalent
- Climate may become more conducive for extreme wildfire
- Weather patterns in 2016-2018 concur with predictions
- Impacts on lesser prairie-chicken habitat unknown



Williams 2013, Barbero et al. 2015

Lesser Prairie-Chickens and Fire

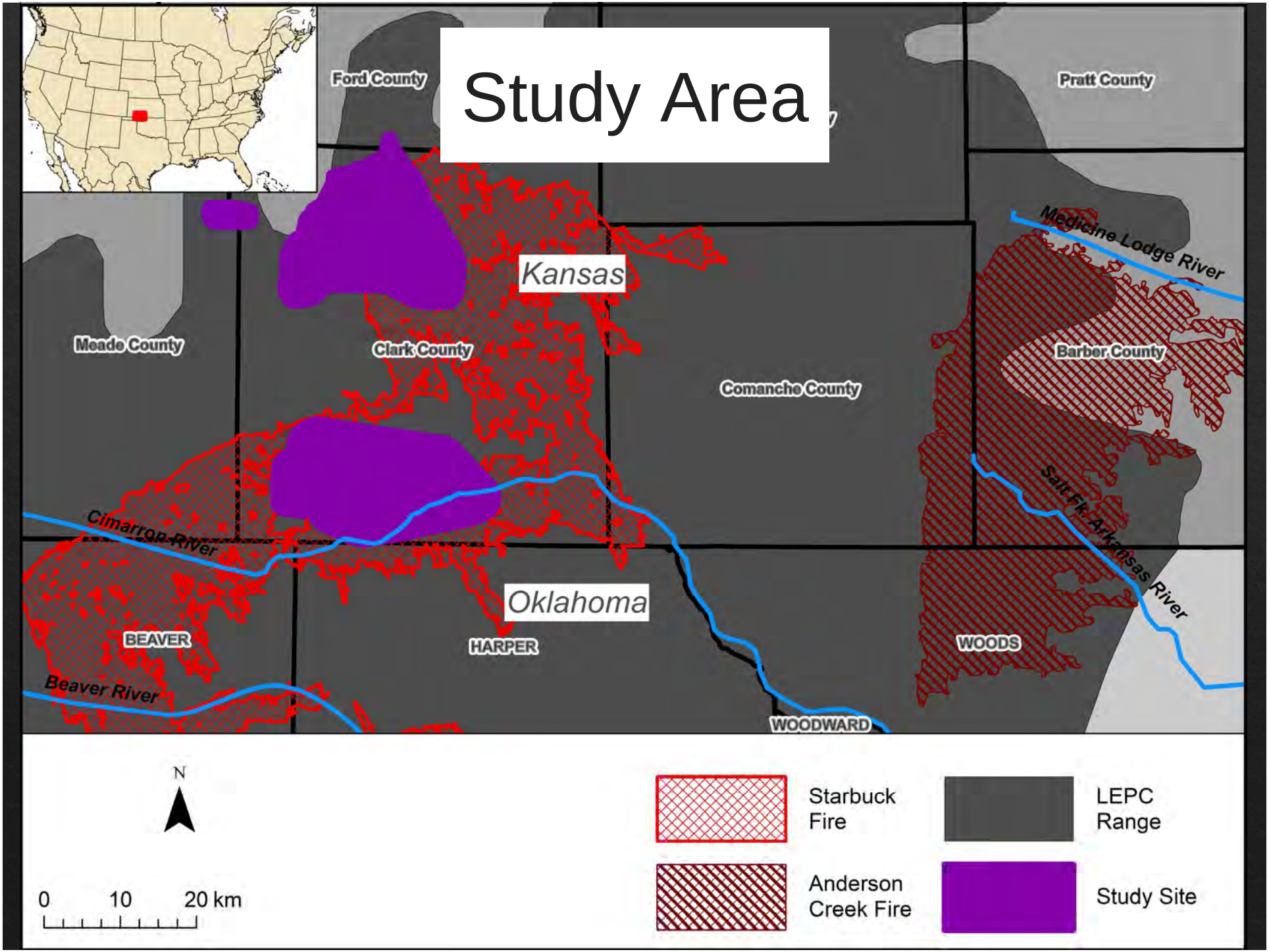
- Fire has long been a natural part of the great plains
- Fire maintained treeless landscape
- Along with grazing, created necessary heterogeneous landscape
- Small wildfires and patch burn grazing can have positive effects for LPCs (Jones 2009, Lautenbach 2017)



Photos by Jonathan Lautenbach


March 2017
Photo credit: Wichita Eagle


May 2018


Study Area
Ford County
Pratt County
Kansas
Meade County
Clark County
Comanche County
Barber County
Medicine Lodge River
Cimarron River
Salt Fk Arkansas River
Oklahoma
BEAVER
HARPER
WOODS
Beaver River
WOODWARD
N
0
10
20 km
Starbuck Fire
LEPC Range
Anderson Creek Fire
Study Site

Methods and Progress

BEFORE

- Captured, marked, and monitored lesser prairie-chickens in 2014 and 2015

AFTER (in progress)

- Lek observations: 2017-distant future
- Capture: spring 2018 & 2019
- Monitored marked individuals March 2018 – March 2020
- Collect vegetation data until March 2020

DS2

Slide 8

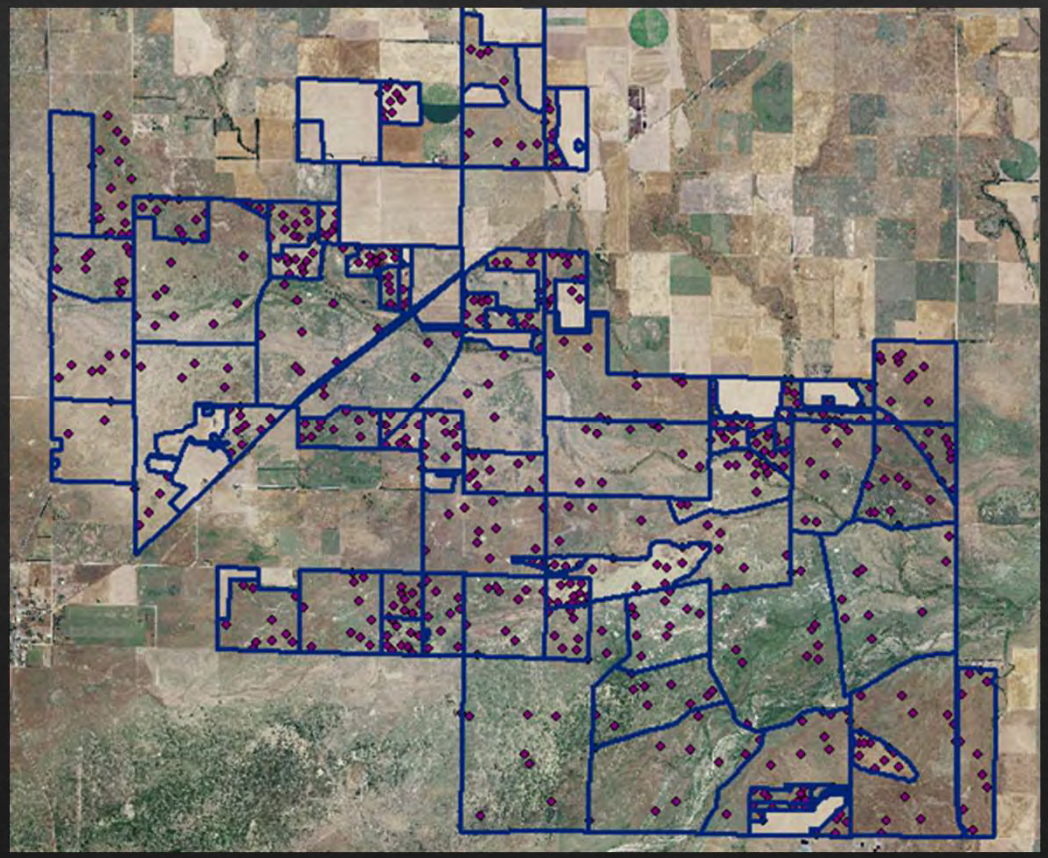
DS2 Can we use some of yours or my pics? I've got some of hannah, Ashley, Matthias, and Laura holding birds.
Dan Sullins, 11/3/2019

Photo points: 1 and 6 months after fire

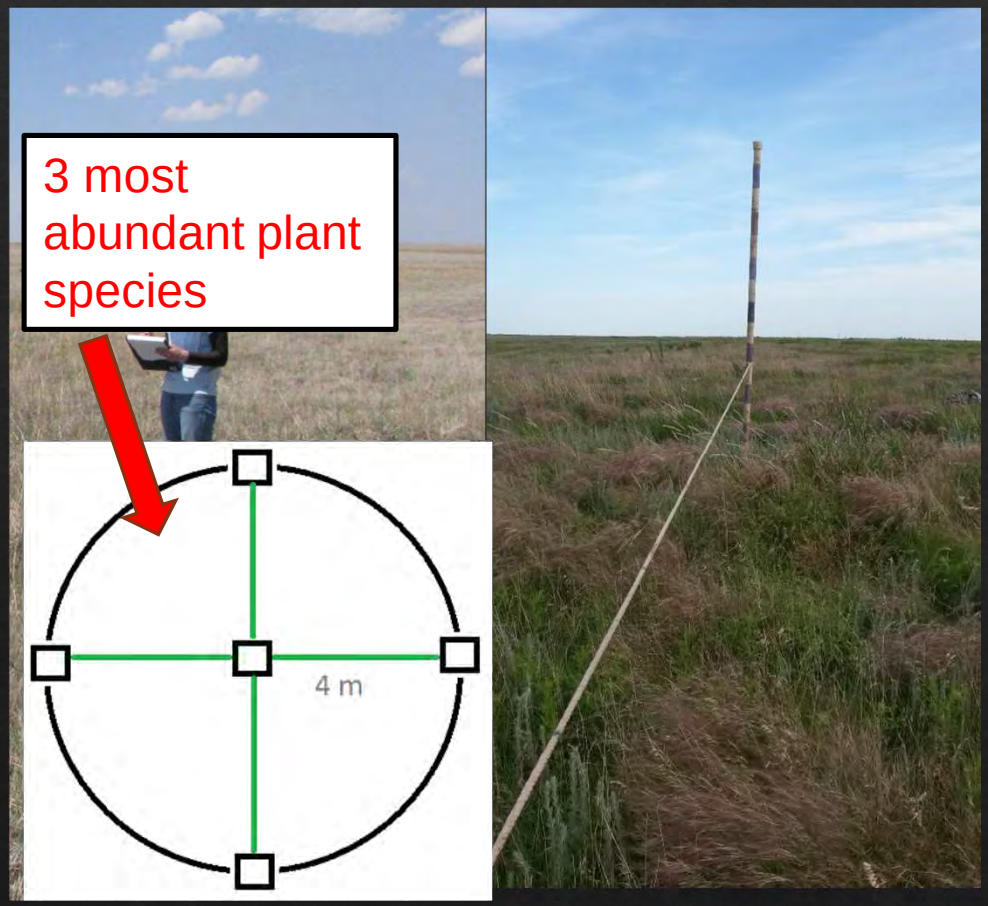

Spring 2017
PHOTO POINT: G12
DATE: 4/28/17
FIELD: NORTH CLUBHOUSE
BEARING: 0°
PHOTOGRAPHER: J. KARR
Fall 2017
Spring 2018
Photopoint G12
Date 5/7/18
Pasture North Clubhouse
Bearing 0°
Photographer LLK
Fall 2018
Spring 2019
Fall 2019

Methods

- Random points in 2014, 2015, 2018, and 2019
- Randomly generated throughout study areas within patches
- Patches identified using aerial imagery

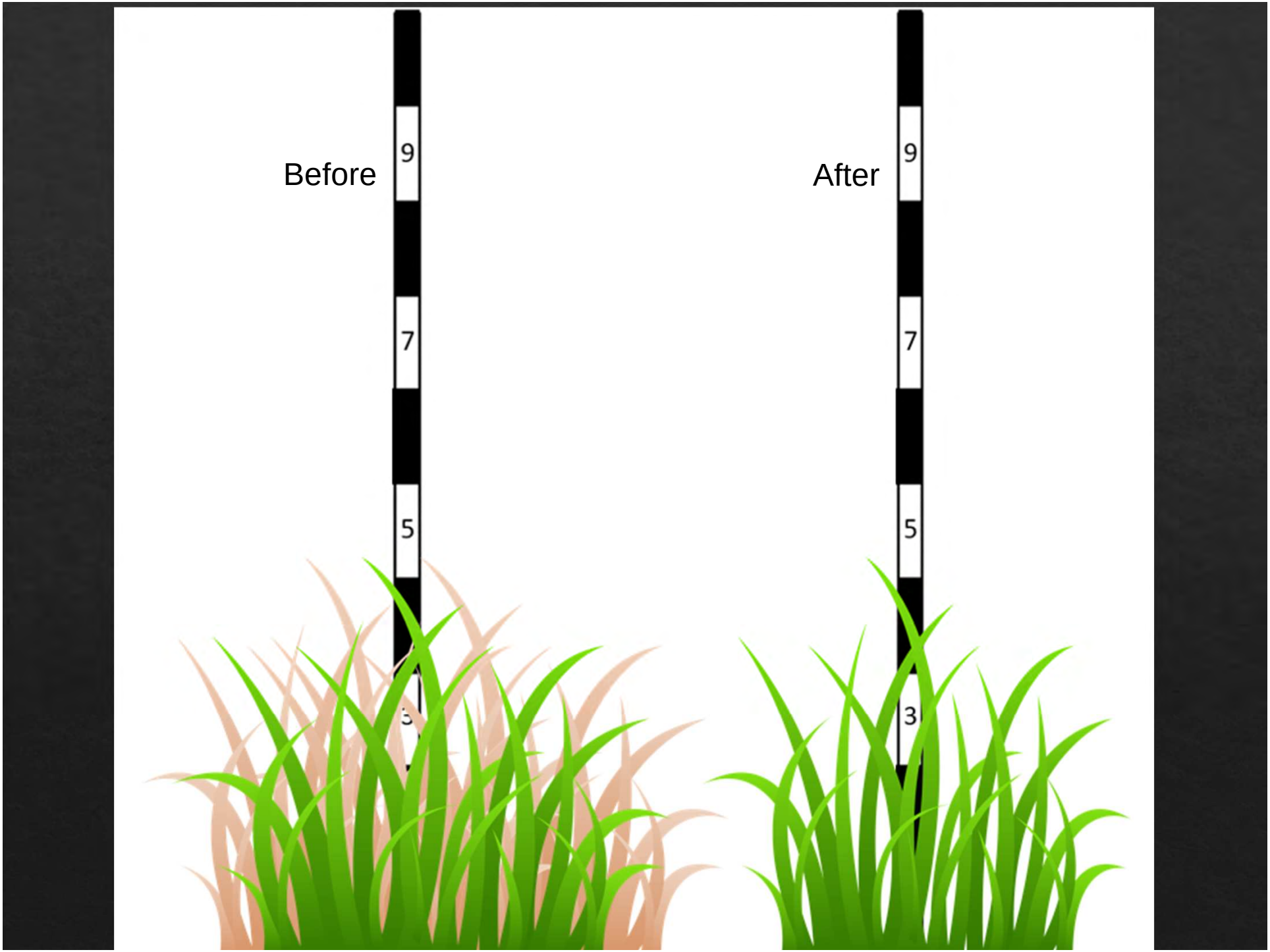


Methods: Vegetation Sampling



- Visual Obstruction
- Litter depth
- Daubenmire frame
  - Percent cover of forbs, grass, litter, shrubs, and bare ground
- 3 most abundant plants within 4m

	Before Fire		After Fire			
variable	*mean*	*SD*	*mean*	*SD*	*t*	*p-value*
Veg height	64.93	22.06	58.83	28.02	-5.41	<0.001*
Visual Obstruction						
100%	1.06	1.10	0.53	0.66	-10.52	<0.001*
75%	1.94	1.51	1.40	1.27	-8.31	<0.001*
50%	2.65	1.77	2.04	1.67	-7.58	<0.001*
25%	3.97	2.27	3.28	2.48	-6.04	<0.001*
0%	6.98	2.91	7.00	4.17	0.16	0.869
Percent Horizontal Cover						
litter	9.83	10.31	11.13	10.14	2.34	0.021
grass	46.72	27.25	48.12	23.86	1.65	0.099
shrub	3.47	8.80	2.22	5.95	-4.57	<0.001*
forb	18.90	17.23	12.53	11.70	-9.03	<0.001*
bare	20.62	16.14	28.26	17.28	9.41	<0.001*
Litter Depth	1.27	1.44	0.93	1.03	-5.83	<0.001*
Litter Depth SD	1.38	1.49	0.82	0.68	-9.14	<0.001*


Before
9
7
5
After
9
7
5
3

Summary of herbaceous vegetation change

- Decreased visual obstruction, litter depth, percent cover of shrub and forb
- Decrease in forbs was unexpected
- Amount of thatch substantially decreased even though vegetation height did not change substantially
  - Clark County received ~53 cm of rain from April–September 2017

Slide 15

DS3 Reduce the amount of text on this slide and increas the font size.
Dan Sullins, 11/3/2019

Lesser prairie-chicken response to intensive wildfire

Capture and Transmitters Deployed

Birds Captured			
Year	**Female**	**Male**	**Total**
New			
2018	10	39	49
2019	22	20	42
Recapture			
2018	1	15	16
2019	1	6	7

Transmitters Deployed			
Year	**Female**	**Male**	**Total**
GPS			
2018	9	13	22
2019	18	4	22
VHF			
2019	4	0	4

Methods: Vital rate estimation

- Estimated nest survival in RMark
- All other survival parameters estimated directly using Kaplan-Meier functions

Photo by Ashley Messier

Results: lesser prairie-chicken lek response

2018

- 5 leks vacated
- Counts of males on leks decreased 66%
- Trapped 3 additional leks

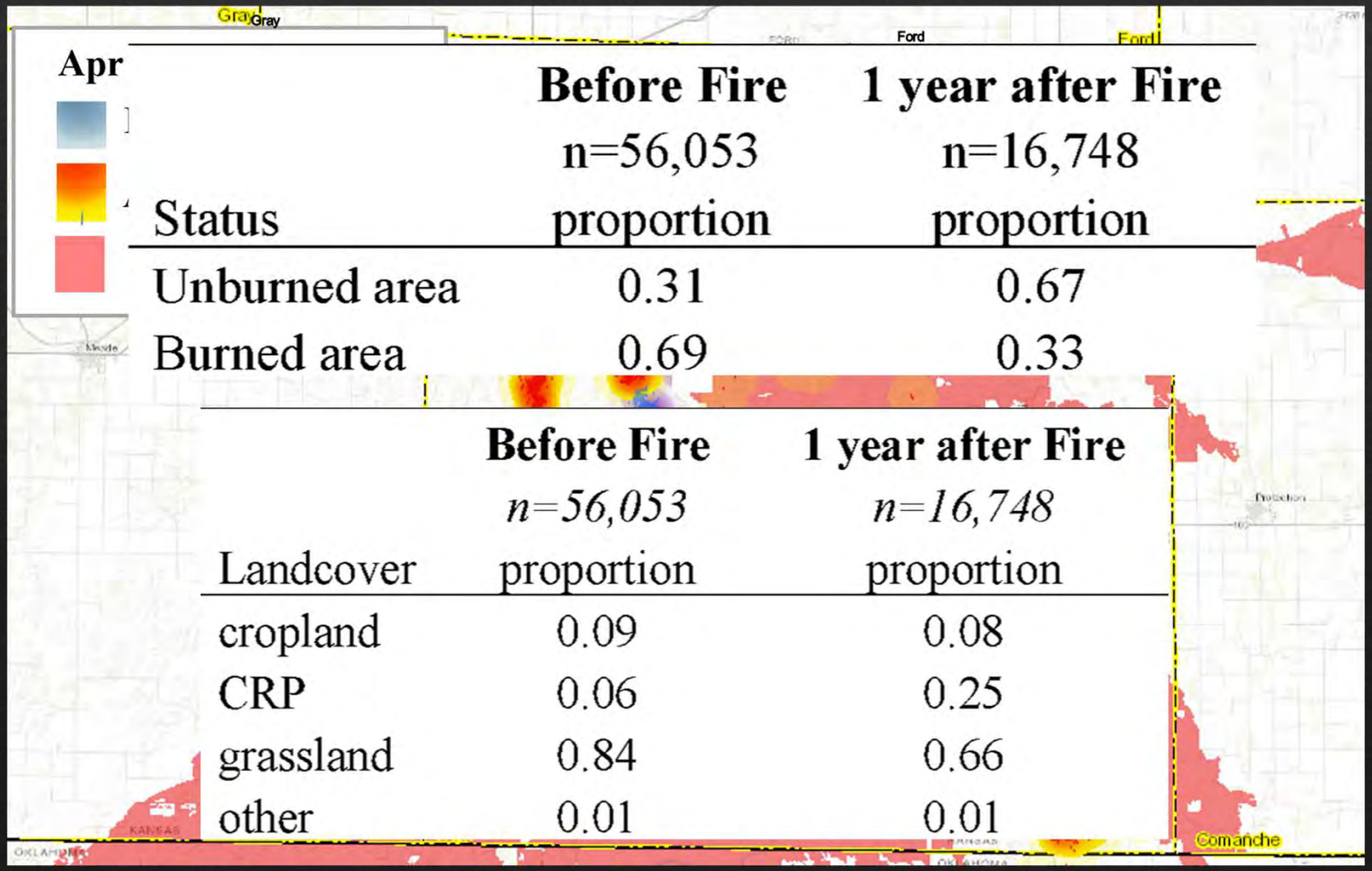
2019

- 1 additional lek vacated
- An additional 43% reduction in males
- Trapped 2 additional leks (8 and 12 males) and expanded study area

Max Male Counts

Lek	*Before* 2015	*After* 2018	*After* 2019	Within burned area
GAR2	20	0	0	yes
GAR3	4	0	0	yes
GAR4	4	5	2	yes
GAR5	18	0	0	yes
GAR6	11	2	1	yes
GAR7	8	0	0	yes
GAR8	13	3	0	yes
GAR9	9	0	0	yes
GAR10	20	20	12	on the edge
GAR11	17	9	4	yes
GAR12	22	4	9	yes
GAR13	7	1	0	yes
Seacat*		9	4	no
WIHA	11	14	6	no
TOTAL	**164**	**67**	**38**	

Results: space use in relation to fire



Status	Before Fire n=56,053 proportion	1 year after Fire n=16,748 proportion
Unburned area	0.31	0.67
Burned area	0.69	0.33

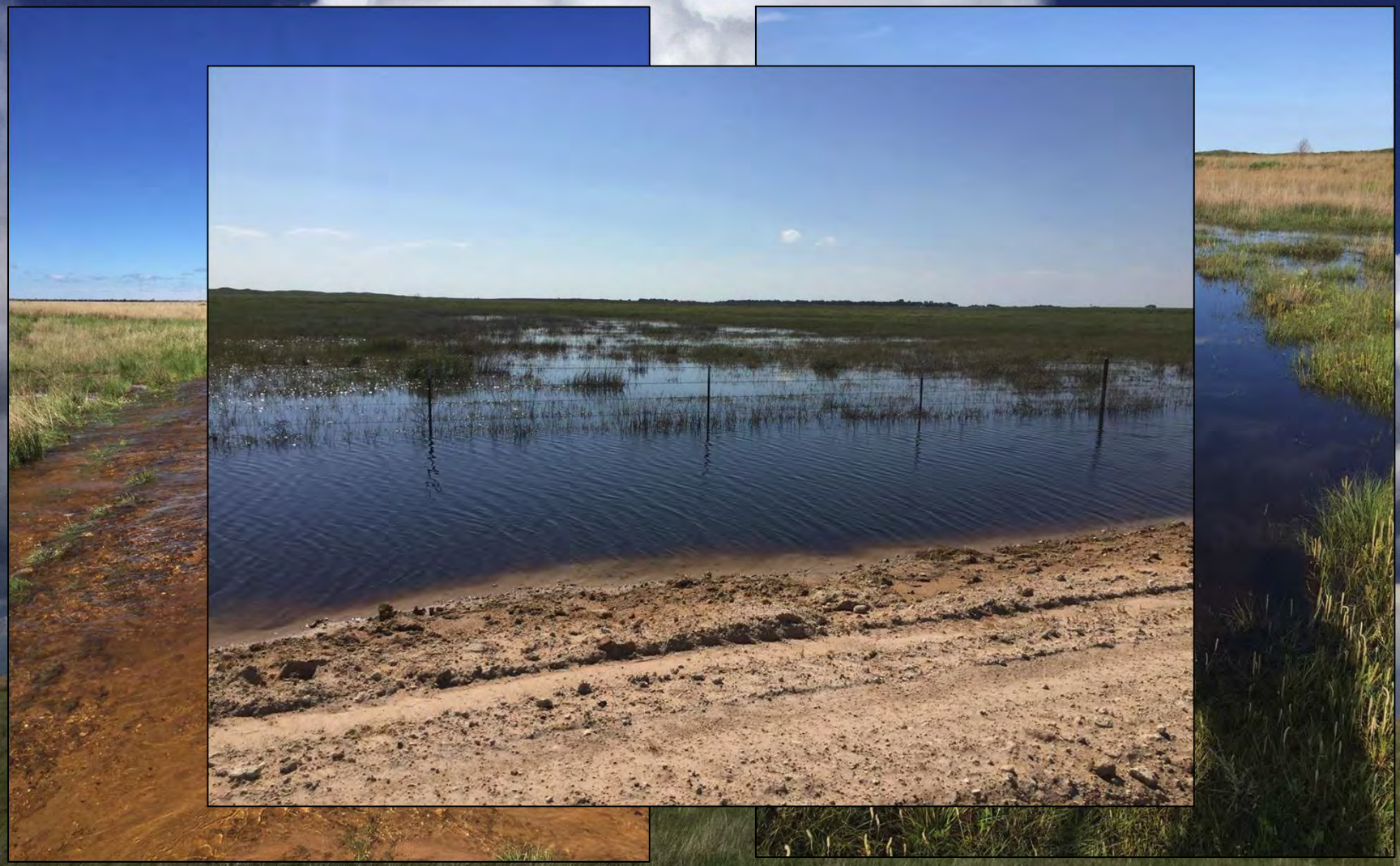
Landcover	Before Fire *n=56,053* proportion	1 year after Fire *n=16,748* proportion
cropland	0.09	0.08
CRP	0.06	0.25
grassland	0.84	0.66
other	0.01	0.01

Results: nest survival

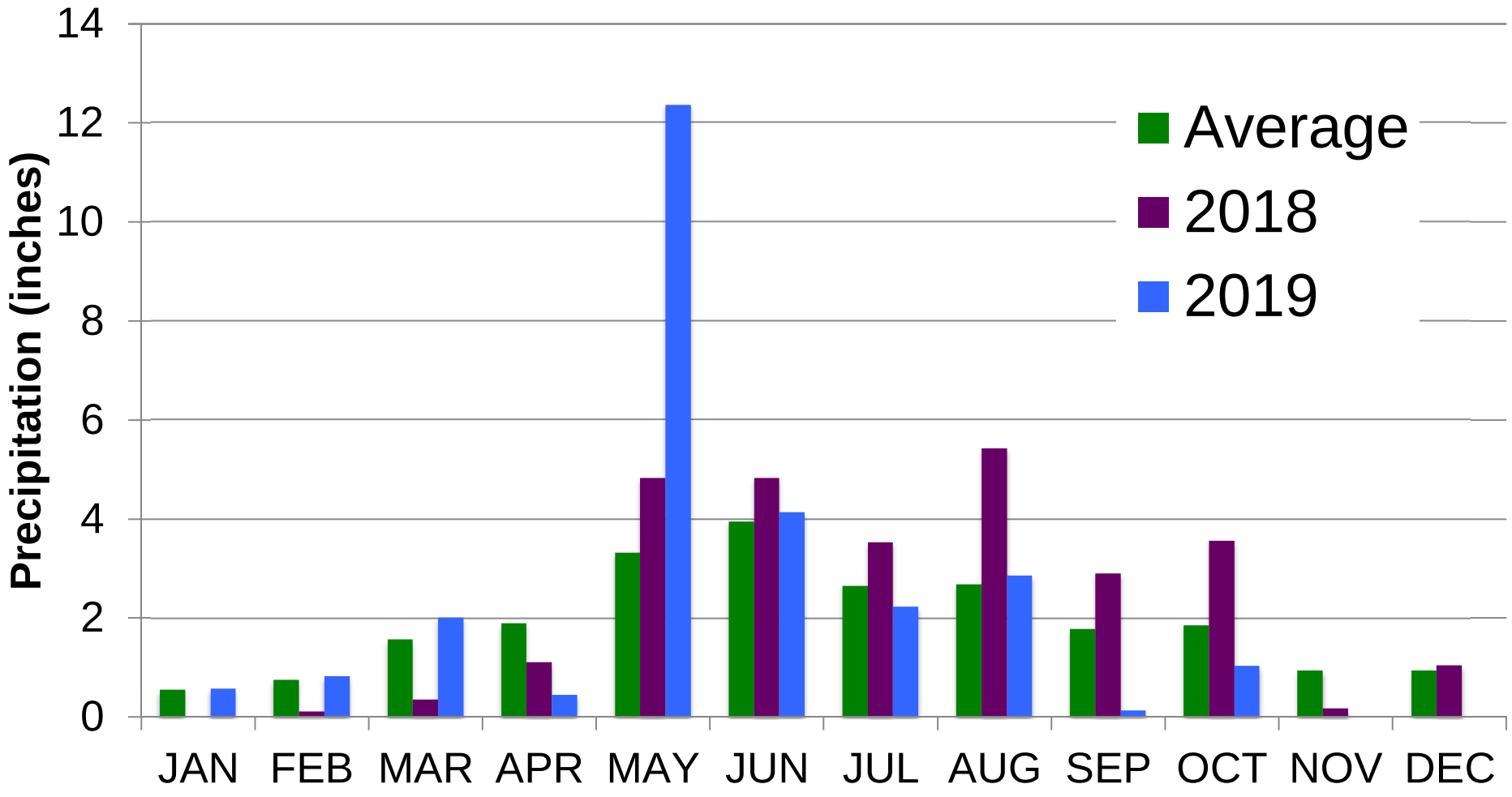
Year	Survival Estimate
2014	0.39 (SE=0.08)
2015	0.51 (SE=0.10)
2018	0.33 (SE=0.13)
2019	0.27 (SE=0.08)

- Includes laying and incubation period ~35 days
- Nest survival rate highest in 2015 and before the fire
- High rates of snake predation after the fire
- Effects of weather?

Nesting Season (April-August) Weather



Monthly Rainfall in Ashland, KS



Kansas mesonet Usclimatedata.com NOAA SWDI

Nesting Season (April-August) Weather

2018

- 33 storm events
- 10 hail events
- 19.68 inches of rain

2019

- 31 storm events
- 7 hail events
- 22.14 inches of rain

- Humidity can influence nest detection (Palmer et al 1993, Conover 2007)
- Flooding of nests?
- Difference in invertebrate abundance/timing?
- Exposure?

Kansas mesonet Usclimatedata.com NOAA SWDI

Results: lesser prairie-chicken demographic response

Parameter	n	Before Wildfire Estimates (2014-2015)	n	After Wildfire Estimates (2018)	n	After Wildfire Estimates (2019)
Female Survival						
Breeding Season	56	0.63 (SE=0.08)	22	0.67 (SE=0.16)	25	0.63 (SE=0.1)
Nonbreeding Season	32	0.68 (SE=0.09)	5	0.6 (SE=0.22)	13	TBD
Reproduction						
Nest	40	0.44 (SE=0.06)	9	0.33 (SE=0.13)	26	0.27 (SE=0.08)
Brood	13	0.27 (SE=0.03)	1	Perished after 14 days	6	0.44 (SE=0.24)

Summary: lesser prairie-chicken response

Habitat Use

- Lesser prairie-chickens used unburned areas and areas near perimeter of fire

Vital Rates

- Mean nest survival was lower than in 2014 and 2015
  - Possibly not entirely an effect of the fire
- Brood survival was low in 2018, improving in 2019
- Female adult survival was comparable to 2014 and 2015

Conclusion

- Small scale prescribed fires and wildfires can be beneficial when occurring at appropriate intervals
- 600,000 acre wildfire was not effective at creating nest habitat adjacent to brood habitat
  - At least at the interior portions of the burn
- Although short-term impact appears negative thus far, fires present a large opportunity for conservation

Acknowledgements

- The Gardiner Angus Ranch and all private landowners
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K-STATE Kansas State University

LESSER PRAIRIE-CHICKEN INITIATIVE

USGS science for a changing world

Kansas Department of Wildlife, Parks and Tourism

The Nature Conservancy Protecting nature. Preserving life.

USDA NRCS United States Department of Agriculture Natural Resources Conservation Service

FSA FARM SERVICE AGENCY


Thank You!
njparker14@ksu.edu
sullins@ksu.edu

Table 1. Dominant plant surrounding nests of lesser prairie-chickens within northwest Kansas and eastern Colorado (NW; $n = 118$) and south-central Kansas (SC; $n = 141$), USA, and across all regions (total) during 2013–2016.

	NW		SC		Total	
Species	**Nests**	**%**	**Nests**	**%**	**Nests**	**%**
Alkali sacaton	0	0.0	4	2.8	4	1.5
Big bluestem	0	0.0	3	2.1	3	1.1
Blue grama	11	9.1	3	2.1	14	5.3
Broom snakeweed (*Gutierrezia sarothrae*)	0	0.0	1	0.7	1	0.4
Buffalograss	0	0.0	1	0.7	1	0.4
Cheat grass (*Bromus tectorum*)	6	5.0	12	8.5	18	6.9
Domestic wheat	2	1.7	0	0.0	2	0.8
Grama sp.	0	0.0	0	0.0	0	0.0
Indiangrass	2	1.7	0	0.0	2	0.8
Kochia	1	0.8	0	0.0	1	0.4
Little bluestem	17	14.0	45	31.9	62	23.7
Louisiana sagewort	0	0.0	6	4.3	6	2.3
Purple threeawn (*Aristida purpurea*)	1	0.8	3	2.1	4	1.5
Russian thistle	1	0.8	0	0.0	1	0.4
Sand dropseed	9	7.4	13	9.2	22	8.4
Sand lovegrass (*Eragrostis trichodes*)	0	0.0	1	0.7	1	0.4
Sand sagebrush	2	1.7	2	1.4	4	1.5
Sideoatsgrama	50	41.3	9	6.4	59	22.5
Soapweed yucca (*Yucca glauca*)	2	1.7	0	0.0	2	0.8
Switchgrass	3	2.5	1	0.7	4	1.5
Tall dropseed (*Sporobolus compositus*)	0	0.0	31	22.0	31	11.8
Vine mesquite (*Panicum obtusum*)	0	0.0	1	0.7	1	0.4
Western ragweed	0	0.0	2	1.4	2	0.8
Western wheatgrass (*Pascopyrum smithii*)	6	5.0	0	0.0	6	2.3
Unidentified grass sp.	3	2.5	0	0.0	3	1.1
Not recorded	5	4.1	3	2.1	8	3.1

DS4

Conclusion: lesser prairie-chicken response

- Either individuals fled the burned area and/or they perished in the fire
- Alternative predictions as to why they have not returned or recolonized:

1. Lack of cover, particularly nesting cover
2. Behavioral constraints to active lekking sites
3. Populations outside of the burned area not yet saturated

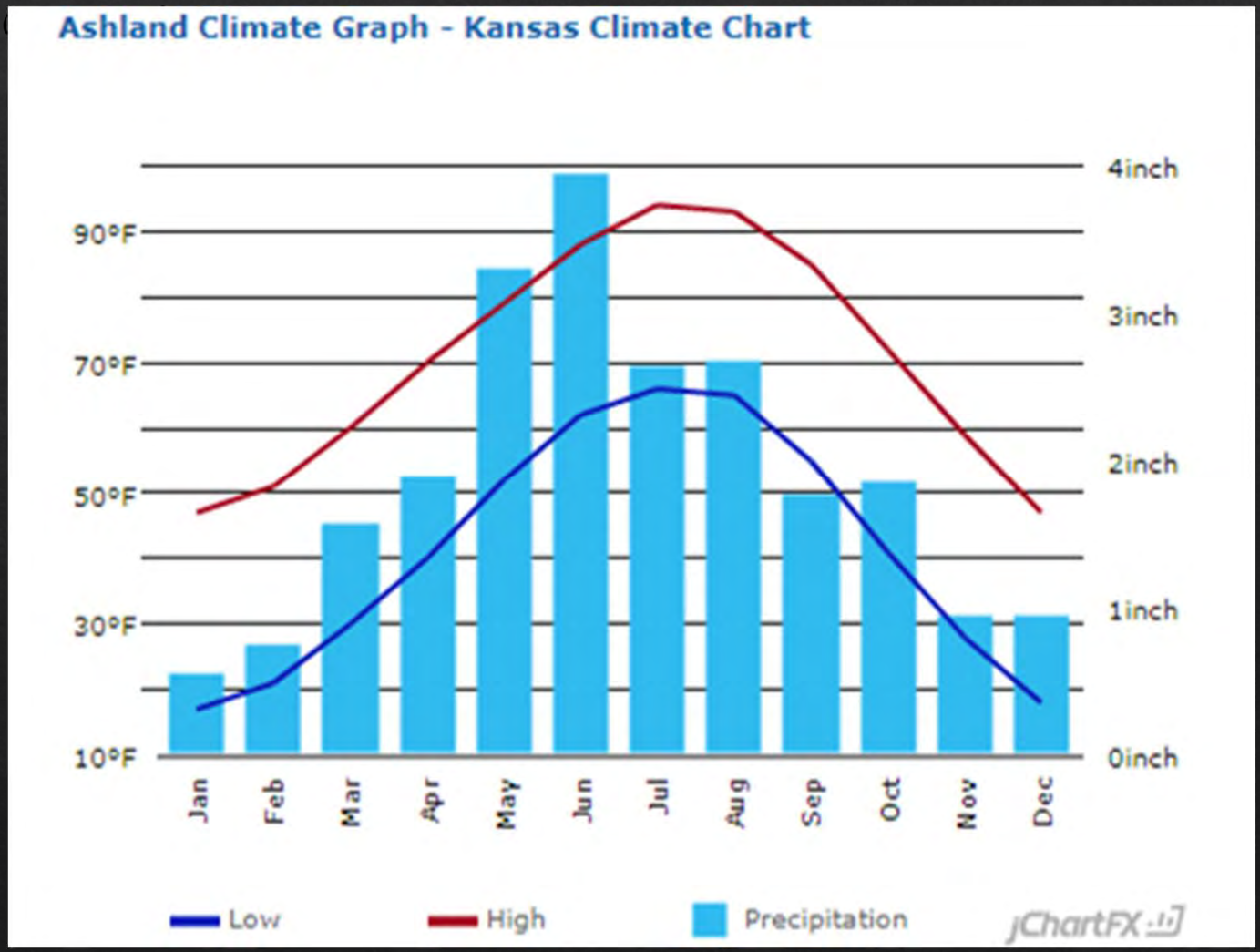
Slide 31

DS4 Consider getting rid of this slide for now or reframing the conclusions a bit.
Dan Sullins, 11/3/2019

Overall conclusion

- Intensive very large fires can have a homogenizing effect on herbaceous lesser prairie-chicken habitat
  - Decrease visual obstruction and variance of litter depth
  - Increased accessibility to brood habitat but need nest habitat
  - In PBG system LEPC typically did not nest in areas <2 yrs since burn

Study Area



Usclimatedata.com

Monitoring lesser prairie-chickens: 2019 update

- Currently tracking 18 hens (16 GPS and 2 VHF) and 1 male
  - 2 hens surviving from previous year
  - No males still alive from 2018
- Have exhibited wide ranging movements to new leks and areas
- 4 avian predation, 3 mammal, and 2 unknown

Photo by Ashley Messier

Results: adult breeding season survival

- Breeding season survival (March 15- Sept. 15)
- For 2019 assumed survived to 9/15/19
- Female survival comparable to before the fire
- Male survival is much lower, especially in 2019
  - smaller sample size (4 vs. 13)

Year	Sex	Estimate	SE
2014	Female	0.65	0.11
2015	Female	0.75	0.11
2018	Female	0.67	0.16
2018	Male	0.44	0.23
2019	Female	0.76	0.09
2019	Male	0.11	0.13

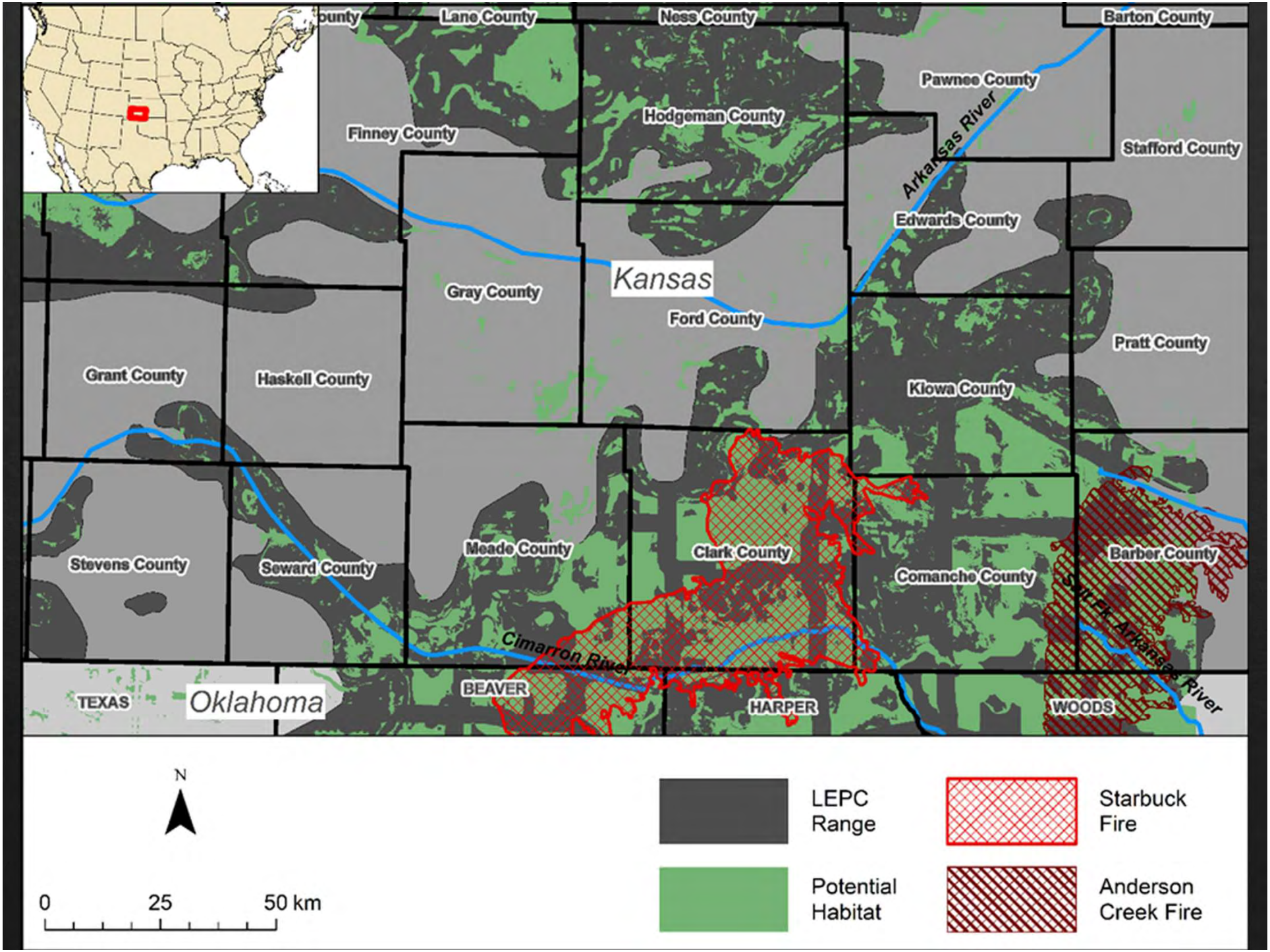
Results: 2019 nest survival

- 22 nests and 4 renests (26 total)
- 5 successful nests
  - Out of these, 3 were in areas newly trapped this year
- 1 nest still active
- All but 1 hen attempted a nest
- 2 out of 3 VHF nests were successful
- 11 predations by snakes, 4 by mammals, 3 hens killed on nest and 2 unknown

Changes in species composition before and after the Starbuck fire

Changes in species composition before and after the Starbuck fire

Changes in species composition before and after the Starbuck fire


Lane County
Ness County
Barton County
Pawnee County
Hodgeman County
Finney County
Arkansas River
Stafford County
Edwards County
Kansas
Gray County
Ford County
Pratt County
Grant County
Haskell County
Kiowa County
Meade County
Clark County
Barber County
Stevens County
Seward County
Comanche County
Salt Fk. Arkansas River
Cimarron River
TEXAS
Oklahoma
BEAVER
HARPER
WOODS
N
0
25
50 km
LEPC Range
Potential Habitat
Starbuck Fire
Anderson Creek Fire

Results: brood survival

- Attempted weekly flushes
- As of 7/8/19: 11 chicks from 5 original broods

Photos by Elli Teige

2016 Anderson Creek Fire

- Burned 1,488 km^2 (368,000)
- 22 March–30 March 2016
- Wind 20–30 mph, gusts up to 40 mph

2017 Starbuck Fire

- Burned 2,521 km^2 (623,000 acres)
- 6 March–12 March 2017
- Wind 30–40 mph, gusts up to 56 mph

2018 Fire 5 miles west of Ashland

- Burned 8 km^2 (2,500 acres)
- 5 March 2018–5 March 2018
- Wind 30–40 mph, gusts up to 61 mph

2019 Wet winter and early spring

Results: brood survival

	Number of Chicks					
Brood	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Total Surviving**
178044				3	3	**3**
178052			3		3	**3**
178051			4	4		**4**
1082	2	2	1			**1**
1130	3	1	0			**0**

- Downside to SAT transmitters, difficult to achieve brood flushes
- Good nesting habitat, but poor brood habitat?