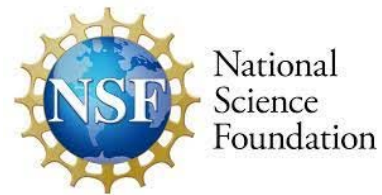


Agriculture and Wildfire: Farmer Perceptions, Preparedness and Impacts

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Outline

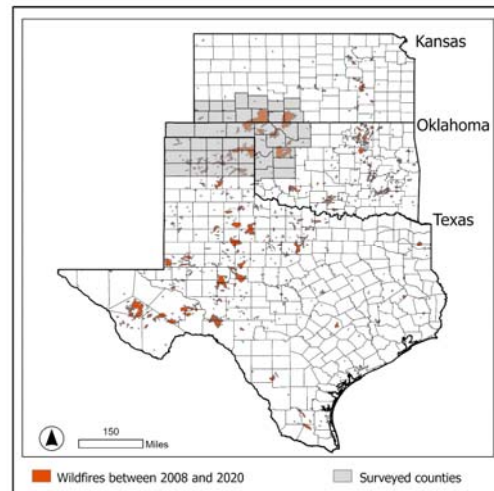
- Introduction
- Research Questions
- Methods
- Wildfire Damages in Kansas and the Southern Great Plains
- Farmer and Rancher Perceptions, Experience, and Preparedness



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The US Southern Great Plains & Wildfire

- Dramatic increase in frequency of wildfires in region, 50% in the Southern Great Plains (Donovan et al 2017, Stambaugh et al 2018, Edwards et al 2019).
- Between 1985 -2014, the total area burned by wildfires in region grew from the thousands into the millions of acres, a 400% increase (Reed 2017).
- Largest wildfires in Kansas history: 2016 & 2017, Oklahoma in 2018
- Predictions indicate a 50% to 150% increase in overall frequency and severity of wildfire in this region (Donovan et al. 2017; Edwards et al., 2019)



The US Southern Great Plains & Wildfire

- Most research on wildfire impacts is on communities, homes and in forested/mountainous areas. Not much research exists about impacts on agriculture except in the popular press.
- Over 2 million acres burned across KS, OK and TX in 2017. In KS, an estimated 8000 livestock were lost, in addition to crops, forage, and structures, resulting in millions of dollars in damages (CNN 2017, Healy 2017, Peoples 2018).
- Potential damages across the Southern Great Plains from wildfires range in estimates from \$189 to \$444 billion (Botts et al, 2013; Steelman 2016).

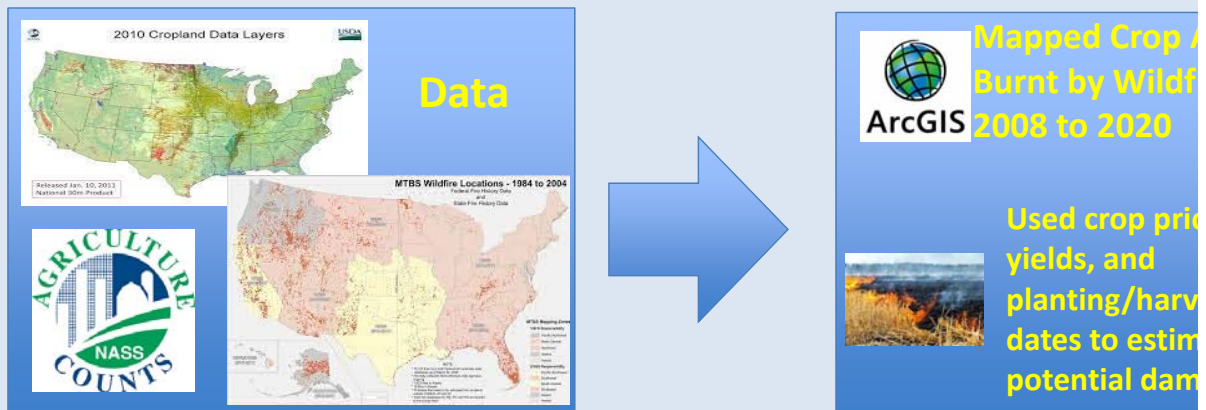


Research Questions

- ***What is the impact of wildfires on crop and forage loss? What are damage estimates for crops and forage loss due to wildfires from 2008 to 2020?***
- ***What are farmers' perceptions, preparedness and experiences related to wildfire in the Southern Great Plains?***

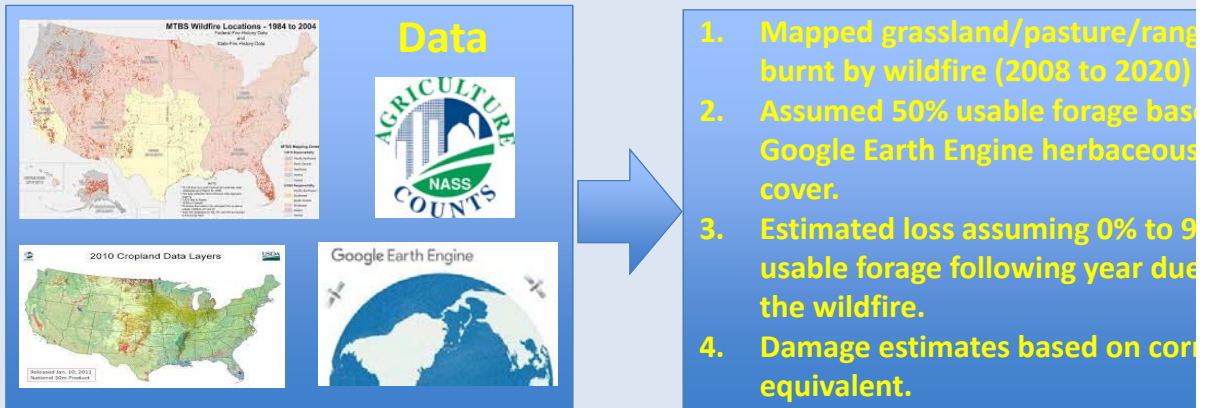
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Research Methods – Crop Damage Estimation



Barber County, Kansas (March 2020)

Research Methods – Forage Loss Estimation

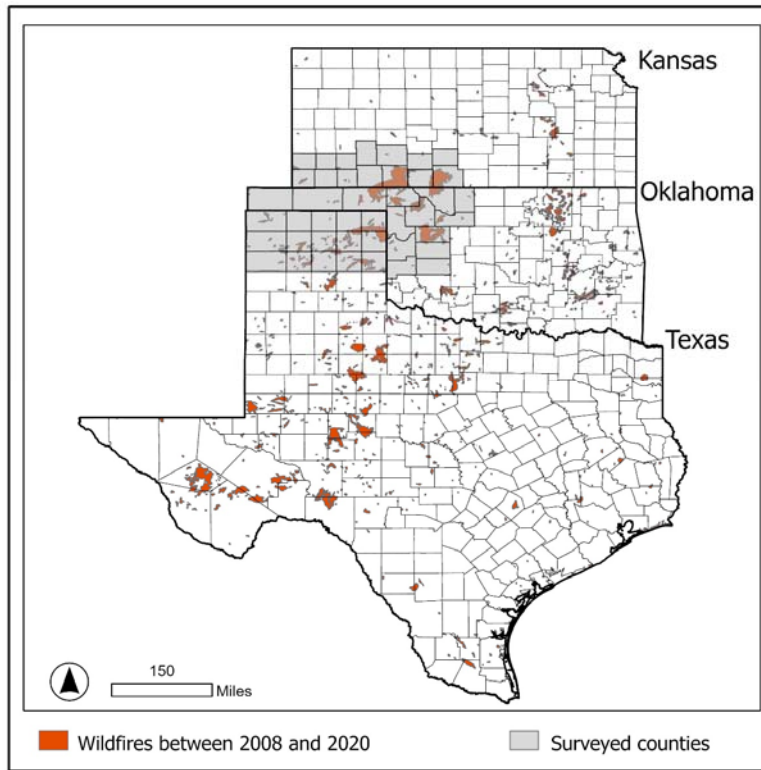


Research Methods – Interview Methods

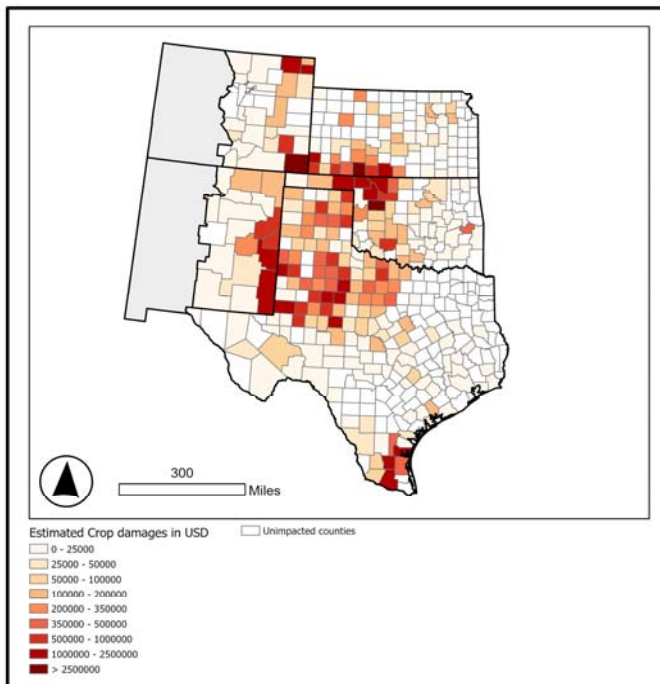
- **Farmer and Ranch Interviews ($N = 78$)**
 - Fieldwork: 5 days in March 2020
 - Semi-structured with closed and open-ended questions
 - Recorded & Transcribed w/ Participant permission
 - 34 questions: Wildfire (General), CRP (General), Farm/Ranch/Land Management, Conservation, Demographics
- **Qualitative and Quantitative Analysis ($N = 72$)**
 - Coding with NVivo to develop thematic categories & identify primary narratives
 - Descriptive Statistics
 - Statistical Regression



Research Methods – Study Region



Crop Damage Estimates from Wildfire

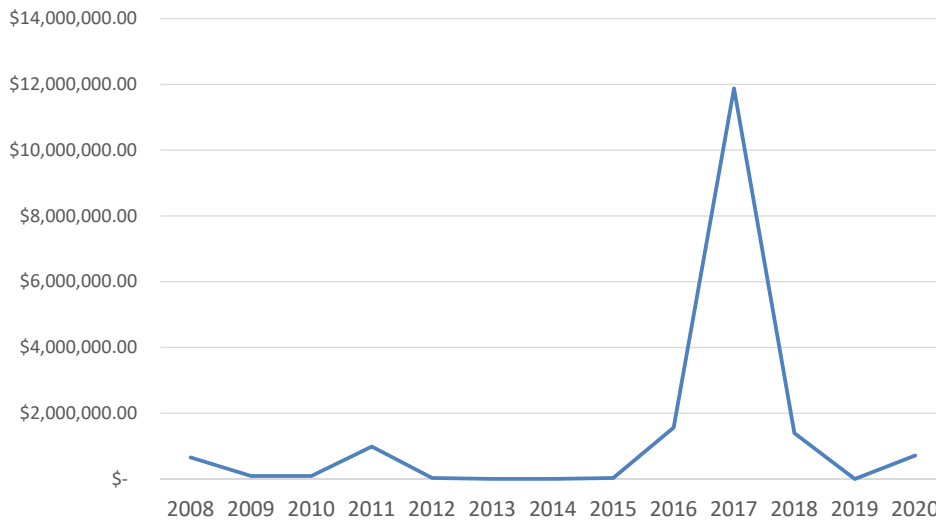


- Damage estimates by year range from \$20,000 to \$19 million.
- Total over the period is estimated at about \$82 million.



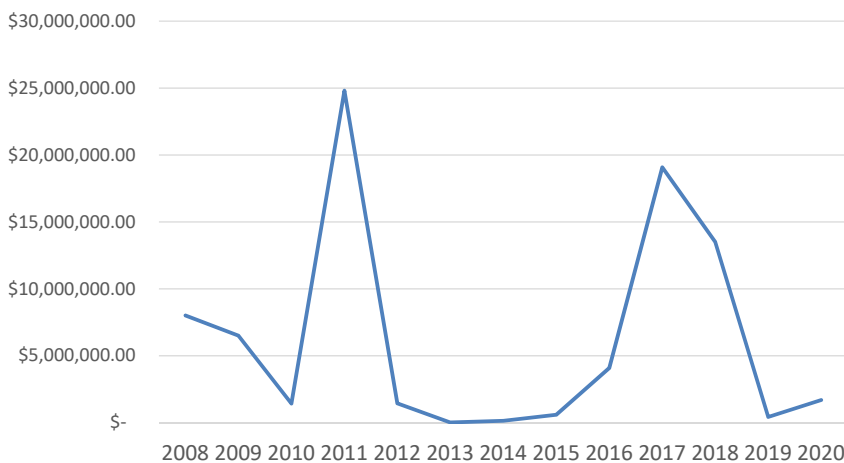
Crop Damage Estimates from Wildfire

Estiamted Wildfire Crop Damages in Kansas, 2008-2020



Crop Damage Estimates from Wildfire

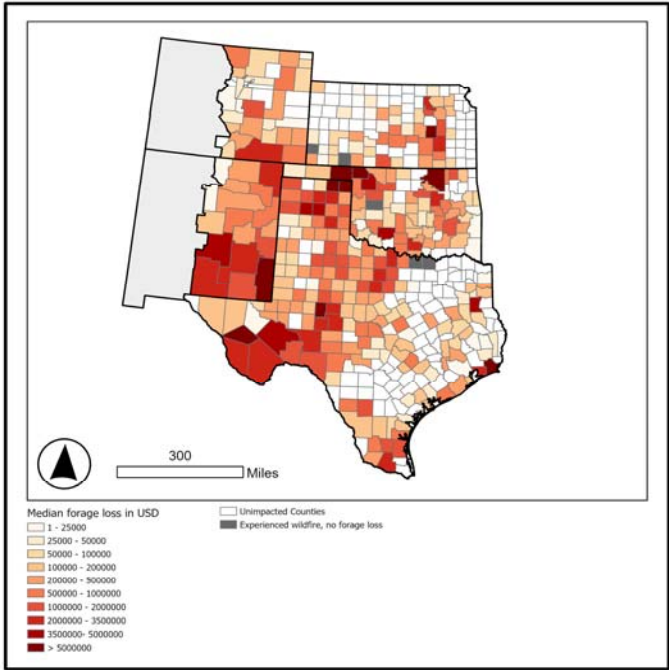
Estiamted Wildfire Crop Damanges in Southern Great Plains, 2008-2020



Damages to crops, Top 4:

- 1. Alfalfa - \$36 million**
- 2. Winter Wheat - \$24 million**
- 3. Cotton - \$16 million**
- 4. Sorghum - \$16 million**

Forage Damage Estimates from Wildfire

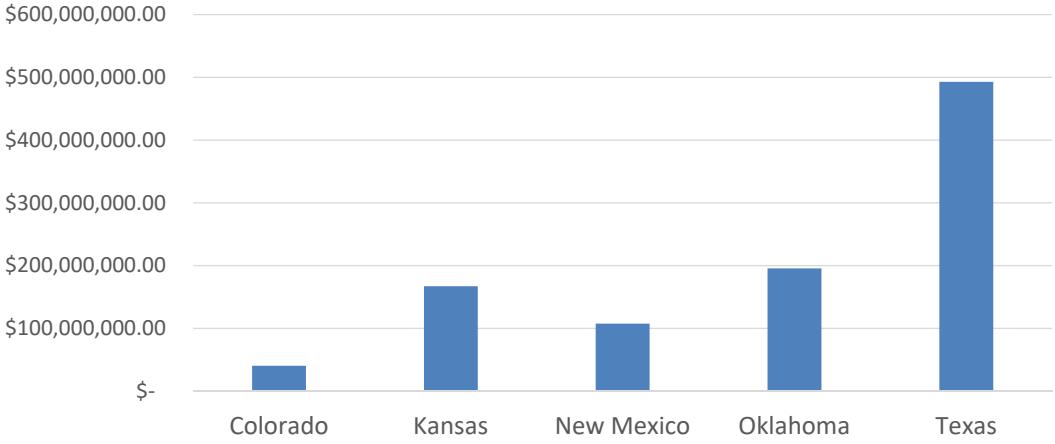


- Damage estimates by year range from \$2.4 million to \$210 million (assuming 50% usable after fire).
- Total over the period is estimated at about \$1 billion (assuming 50% usable after fire).



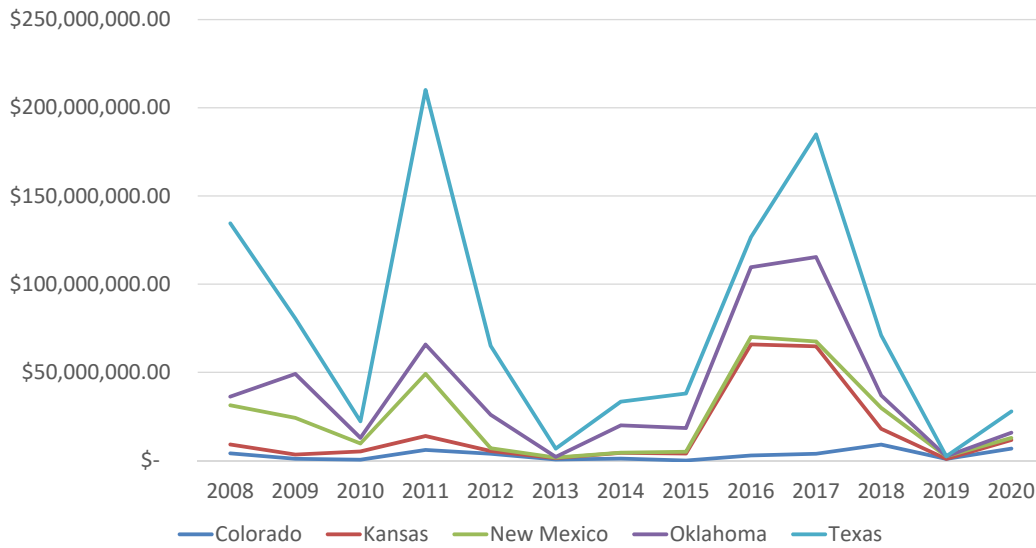
Forage Damage Estimates from Wildfire

Estimated Forage Loss Estimates (Corn Equivalent) 2008-2020 by State (50% usable after fire)



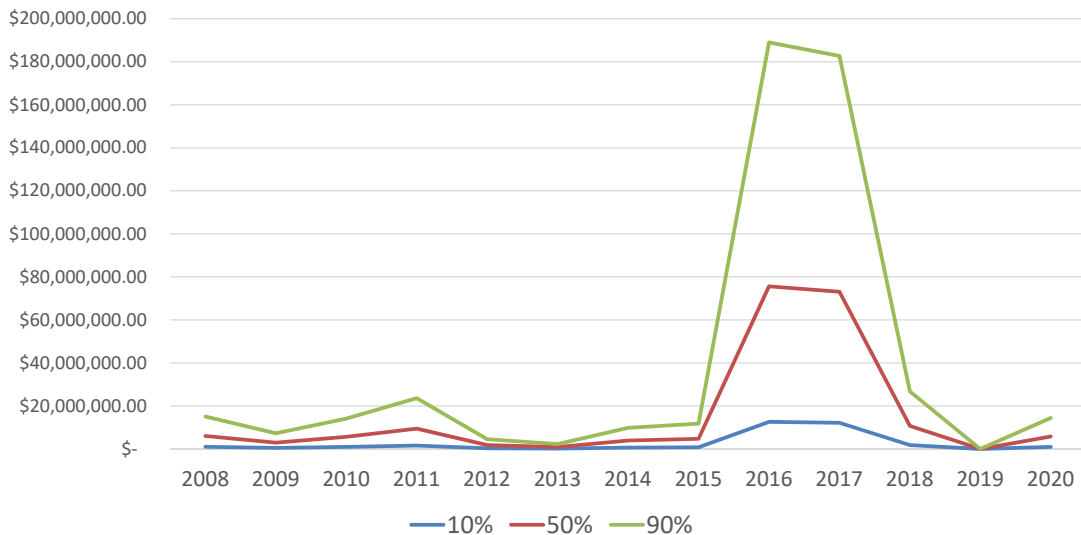
Forage Damage Estimates from Wildfire

Southern Grate Plains Forage Loss Estimates (Corn Equivalent) by State 2008 to 2020 (assuming 50% usable)



Forage Damage Estimates from Wildfire

Kansas Forage Lost Estimates (Corn Equivalent) by State 2008 to 2020 for different assumed usage rate



Farmers and Ranchers Perceptions, Experiences and Preparedness



Beaver, Beaver County OK (March 2020)

Wildfire burned ~30,000 acres

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Farmers and Ranchers Perceptions, Experiences and Preparedness

Table 1. Descriptive Statistics and Comparison with 2017 Agricultural Census Data (n = 72)

Variable	Description	Mean	Standard Deviation ^a	2017 Ag Census ^b
Experience	Years of farming experience	38.4	16.0	25.0
Crop Acreage	Total crop hectares	1188	1937	317
Head of Cattle	Total number of cattle owned	742	1959	464
Female	Binary (=1 if female and 0 otherwise)	0.07	0.06	0.35
Age	Years of age	61.5	10.8	58.7
Off-Farm Work	Binary (=1 if employed any time off the farm, 0 if none)	0.42	0.24	0.59
College	Binary (=1 if college education or higher, 0 otherwise)	0.72	0.20	0.28 ^c

^a For binary variables, the standard error is calculated as $p(1-p)$, where p is the mean of the binary variable.

^b Source: USDA-NASS, 2020.

^c Source: USDA-ERS, 2019.

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Farmer and Rancher Experiences

- 79% of those interviewed had experience a wildfire event
- 77% of these experienced one every 1 to 5 years.
- Largest losses from fencing and forage/hay.



Farmer and Rancher Experiences

- Respondents indicated it costs \$4700 to \$7500 to replace a mile of fence and often not insured. Losses ranged from 10 to 136 miles of fencing.
- Loss of forage and livestock. One producer lost over 1200 head in 2017.



USDA Disaster Programs

- Emergency Relief Program
- Livestock Indemnity Program
- Livestock Forage Disaster Program
- Emergency Livestock Relief Program
- Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program
- Noninsured Crop Disaster Assistance Program
- Tree Assistance Program
- Emergency Conservation Program
- Wildfire and Hurricane Indemnity Program



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Farmer and Rancher Perceptions

- 63% of producers indicated they perceived that the frequency of wildfire in the region has increased. More recent wildfire exposure and having CRP land increased likelihood.
- 62% of producers felt that another megafire (over 100,000 acres in size) was likely to occur in their area in the next 10 years. More recent wildfire exposure increased likelihood.



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Farmer and Rancher Perceptions

What do rural land managers perceive as the major factors of increased wildfire risk?



- Weather Patterns
- Land Management Practices
- Landscape Composition



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Farmer and Rancher Perceptions

Weather Patterns

Drought & Dry Conditions (31)%

Wetter Summers and Drier Winters (20%)

“Really it kind of works in the opposite to the way you would think because the more rain you have, actually the more fuel you’ve got the next year because the grass then, it just ... I mean it will just grow. Then winter hits, and one mistakes and it all goes up in flames”

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Farmer and Rancher Perceptions

Land Management Practices

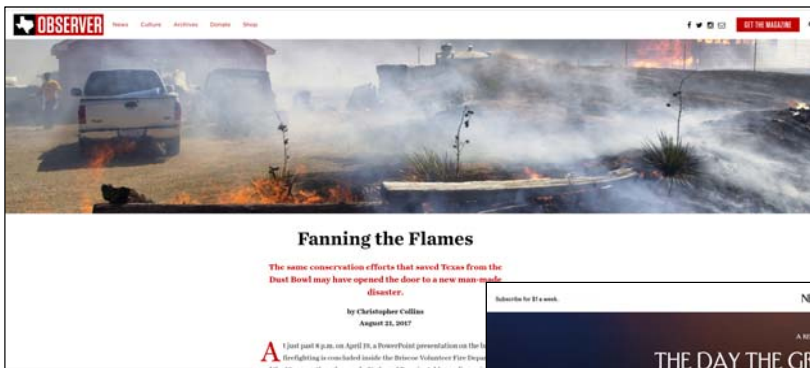
- Shifts to no-till farming practices (20%)
- Low stocking (18%)
- CRP → 'Depends' (only 10% identified CRP as main risk factor)

"...I've got 4,000 acres of wheat in the ground right now and, what? 75, 80% of it has got wheat stubble from last year and right now, even though I've got green wheat growing, if the CRP next to it caught fire it would actually burn across my field. I've got a lot of cover out there. Like I say, you can't put it all on CRP but this conservation farming, no-till, has added a bunch too."

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Farmer and Rancher Perceptions

Wildfire and the CRP?



75% of respondents indicated CRP may contribute to wildfires.



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Farmer and Rancher Perceptions

Landscape Compilation

- Nuisance species encroachment → more fuel (ex. Red Cedars; Old World Bluestem) (12%)
- Generally more grass or expanded grassland area → more fuel (ex. Land abandonment, private recreation or conservation areas, CRP) (36%)

"We used to, every quarter section was a different crop, so there was usually a way to stop the fires once you hit a wheat field or something. But now there're big blocks, sometimes five, six, 800 acres of CRP in a big block, well, there's nothing to stop that in a wildfire, on those windy days, until it hits the highway, wheat fields. I mean, there's really nothing a person can do."

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Farmer and Rancher Preparation

- 57% heavily rely on local fire departments
- 29% rely on neighbors
- 51% had tanks, sprayers and firetrucks to help combat wildfires.
- 29% use prescribed burns to help mitigate.
- Other practices – fire breaks, disking, tree removal, etc.



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Concluding Remarks

- Wildfires do have a significant impact across the agricultural landscape, with potentially significant economic damages.
- More research and education is needed about wildfires and agricultural land management.



Questions?

