



## Fighting wildfire with prescribed burning in the Southern Great Plains: Social and regulatory barriers and facilitators

Urs Kreuter<sup>1</sup> and Morgan Treadwell<sup>2</sup>

<sup>1,2</sup>Texas A&M University

### INTRODUCTION

Elevated fuel loads together with projected hotter and drier climatic conditions will likely lead to more frequent erratic wildfires in the western USA<sup>1</sup>.

Paradoxically, perceptions by land managers and policy makers that applying prescribed fire is risky business have contributed to more destructive wildfires in the western USA by encouraging fire suppression and woody plant expansion into grasslands<sup>2</sup>.

Recognition that decades of fuel accumulation are increasing the risks of wildfire has led to calls for fire management reform, including the use of prescribed fire to reduce fuel loads.

However, this shift in fire management emphasis has failed to take widespread effect “because of liability and casualty risks and little tolerance for management errors”<sup>3</sup>.

The limited use of prescribed fire is problematic on privately owned rangelands and forests in the western USA because they are frequently the source of or conduit for wildfire<sup>4</sup>.

To ensure fire management reform for reducing wildfire risk is broadly adopted on private land, it is necessary to clearly understand the perceptions of landowners, County Commissioners and District Judges about the importance and use of prescribed fire as a land management tool<sup>5</sup>.

Despite the increasing body of literature illuminating the effect of various factors on prescribed fire use, there are still significant knowledge gaps regarding social and regulatory barriers to using fire for fuel load reduction on private land.

For example, there is a high level of uncertainty about judgments that may be brought to bear against a landowner for damages resulting from an escaped fire or from smoke emissions<sup>6</sup>.



**Figure 1. Juniper and other woody plant invasions in Southern Great Plains rangelands increase the wildfire fuel load.**

Furthermore, imposition of blanket burn bans by county commissioners can present a regulatory barrier for the application of prescribed fire under conditions that maximize woody plant mortality<sup>7</sup>.

Sensationalized media coverage of wildfire disasters and inadequate differentiation between prescribed fire and wildfire lead to misunderstanding by landowners, District Judges and County Commissioners about the ecological role of fire and the relatively low risk of damage that prescribed fire poses when applied safely<sup>8</sup>.

An integrative assessment of current knowledge, knowledge gaps and the potential efficacy of alternative wildfire avoidance and mitigation strategies is needed to reduce the risk of loss of life and property damage from wildfire traversing across private land due to fuel load buildup.

Texas and Oklahoma, which are predominantly private land states, have been the focus of research conducted at Texas A&M University to address these knowledge gaps since 2004<sup>9</sup>. This research brief presents key research findings leading to the initiation of this project.

## METHODS

The research conducted to fill the knowledge gaps regarding social and regulatory barriers to the use of prescribed fire adopted a mixed methods approach, including focus group meetings, personal interviews with key informants and, predominantly, multi-phase mail surveys.

The mail surveys included: 785 landowners (with 47% response) in the Edwards Plateau, Texas in 2004<sup>9</sup>; 1187 landowners (with 49% response) in a total of 12 counties in three ecoregions across Texas in 2008<sup>10,11</sup>; 1,853 landowners (with 37% response) in a total of 12 counties in Texas and Oklahoma in 2015<sup>12</sup>; 192 District Judges (with 20% response) and 400 County Commis-

sioners (with 31% response) in 272 counties in Texas and Oklahoma in 2018; and 1,179 landowners (with 30% response) in a total of 12 counties in Texas and Oklahoma in 2018.

Details of the 2004, 2008 and 2015 study are available in the cited references and results of the 2018 studies will be available in forthcoming publications.

## KEY FINDINGS

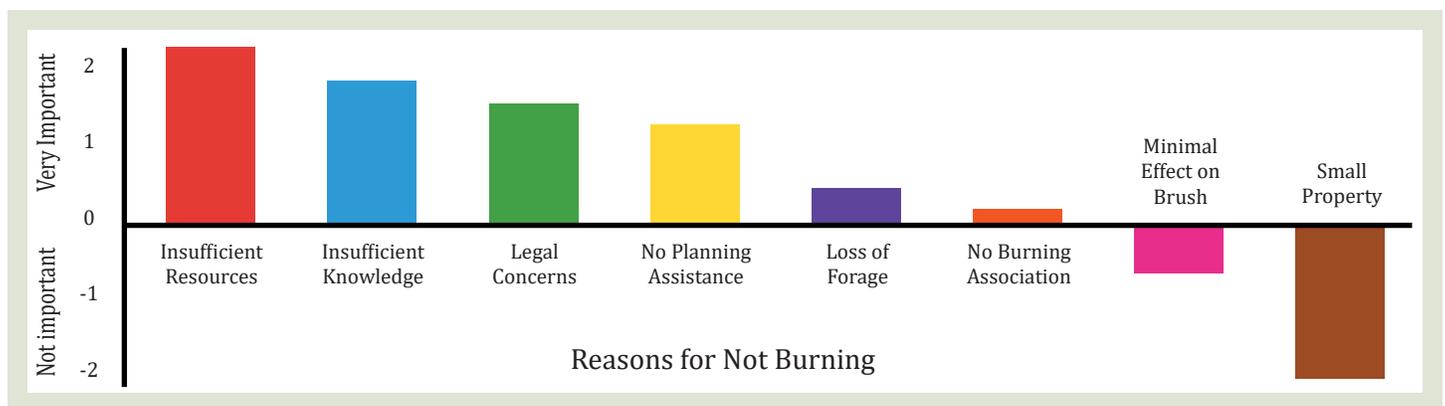
### Study 1. 2004 Edwards Plateau Landowner Survey<sup>9</sup>

A key finding from the 2004 landowner survey was that the primary reasons landowners in the Edwards Plateau ecoregion of Texas did not use prescribed fire were insufficient labor and fire management equipment to conduct fire safely, insufficient knowledge of how to apply a burn, legal concerns over liability for damages from escaped fires and a lack of assistance with burn plan development, which is a requirement for applying prescribed fire (Fig. 2). One response to address these concerns has been the establishment of prescribed-burning associations (PBAs) in Texas and Oklahoma<sup>13,14</sup>.

### Study 2. Texas Three-Ecoregion Landowner Survey<sup>10,11</sup>

Two key findings of 2008 three-ecoregion landowner survey pertained to the economic efficacy of prescribe fire compared to alternative brush management treatments (Table 1) and the predominant effect of social norms on landowners' attitude towards prescribed fire (Fig 3). Specifically, without any cost sharing, prescribed fire was found to be the only economically feasible method (positive return on cost) for managing invasive woody plants in all three ecoregions and that even with a 50% cost share most of the alternative mechanical and chemical treatments remained economically unfeasible<sup>10</sup>.

**Figure 2. Primary inhibitors of prescribed fire use in the Edwards Plateau ecoregion of Texas as indicated by mean response scores for the question "How important is each of the following reasons for you not using prescribed fire?" Range: -3 (not important) to +3 (very important)**



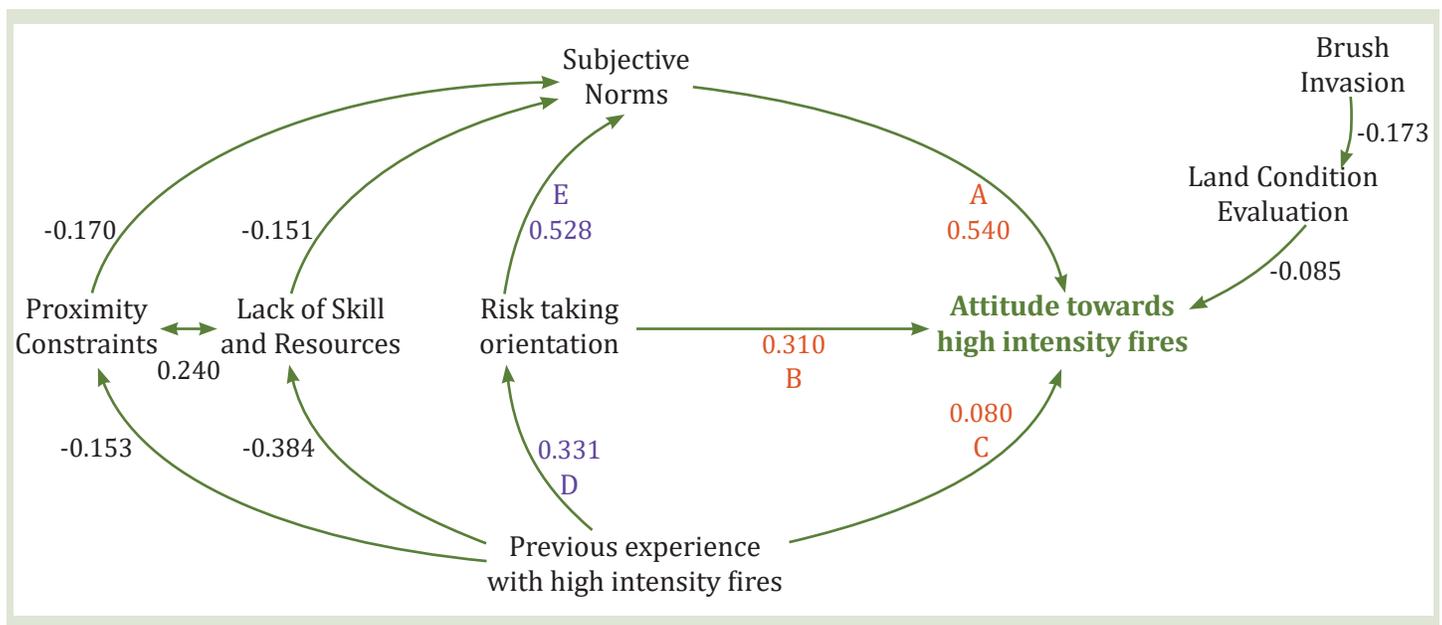
With respect to drivers affecting landowner attitudes about the application of prescribed fire in three Texas ecoregions, the dominant direct effects were subjective norms (A – “decision support” from neighbors, family and friends), pro risk-taking orientation (B), and previous fire experience (C), which were all positively associated with attitudes toward use of prescribed fire<sup>11</sup>.

Indirect effects were that people with prescribed fire experience perceive that the benefits of applying fire outweigh the associated risks (D), and that those who are less concerned about risk felt their neighbors, family and friends support their use of fire (E)<sup>11</sup>.

**Table 1. Comparative economic efficiency of prescribed fire and alternative chemical and mechanical woody plant treatments in moderately and heavily encroached areas in three ecoregions in Texas.**

Ecoregion	Treatment	Brush Type	Net Present Value (\$/acre)		Net Present Value with 50% cost share (\$/acre)	
			Moderate	Heavy	Moderate	Heavy
Rolling Plains	Extreme Fire	Prickly Pear	-0.15	5.31	7.35	12.80
		Mesquite	1.67	7.41	9.17	14.90
	Chemical/ Mechanical	Prickly Pear	-13.35	-21.80	1.14	0.06
		Mesquite	-10.59	-20.88	3.41	1.61
Edwards Plateau	Extreme Fire	Juniper	7.58	11.13	15.08	18.62
		Mesquite	2.62	1.63	10.12	9.13
	Chemical/ Mechanical	Ashe Juniper	-70.69	-107.22	-21.71	-37.00
		Redberry Juniper	-91.90	-69.5	-31.68	-19.27
		Mesquite	-56.97	-22.41	-17.98	-2.17
South Texas Plains	Extreme Fire	Huisache	2.01	-0.31	13.25	10.94
		Mesquite	4.56	6.60	15.80	17.85
	Chemical/ Mechanical	Huisache	-58.14	-39.24	-14.97	-7.31
		Mesquite	-17.48	-31.86	-13.53	-0.79

**Figure 3. Strength of direct and indirect effects of various factors on landowners’ attitudes toward the use of prescribed fire in three ecoregions in Texas.**



**Study 3. Twelve County Texas and Oklahoma Landowner Survey<sup>12</sup>**

Key findings of the 2015 Texas and Oklahoma landowner study pertained to three hypotheses.

Hypothesis 1 stated, *the likelihood that a landowner will apply prescribed fire is negatively correlated with his/her perception about the legal liability for applying fire.*

This was corroborated by the research results with respondents who perceived a higher level of fire-related legal liability being less likely to apply prescribed fire, and burn bans were found to represent a significant barrier to their willingness apply fire on their property.

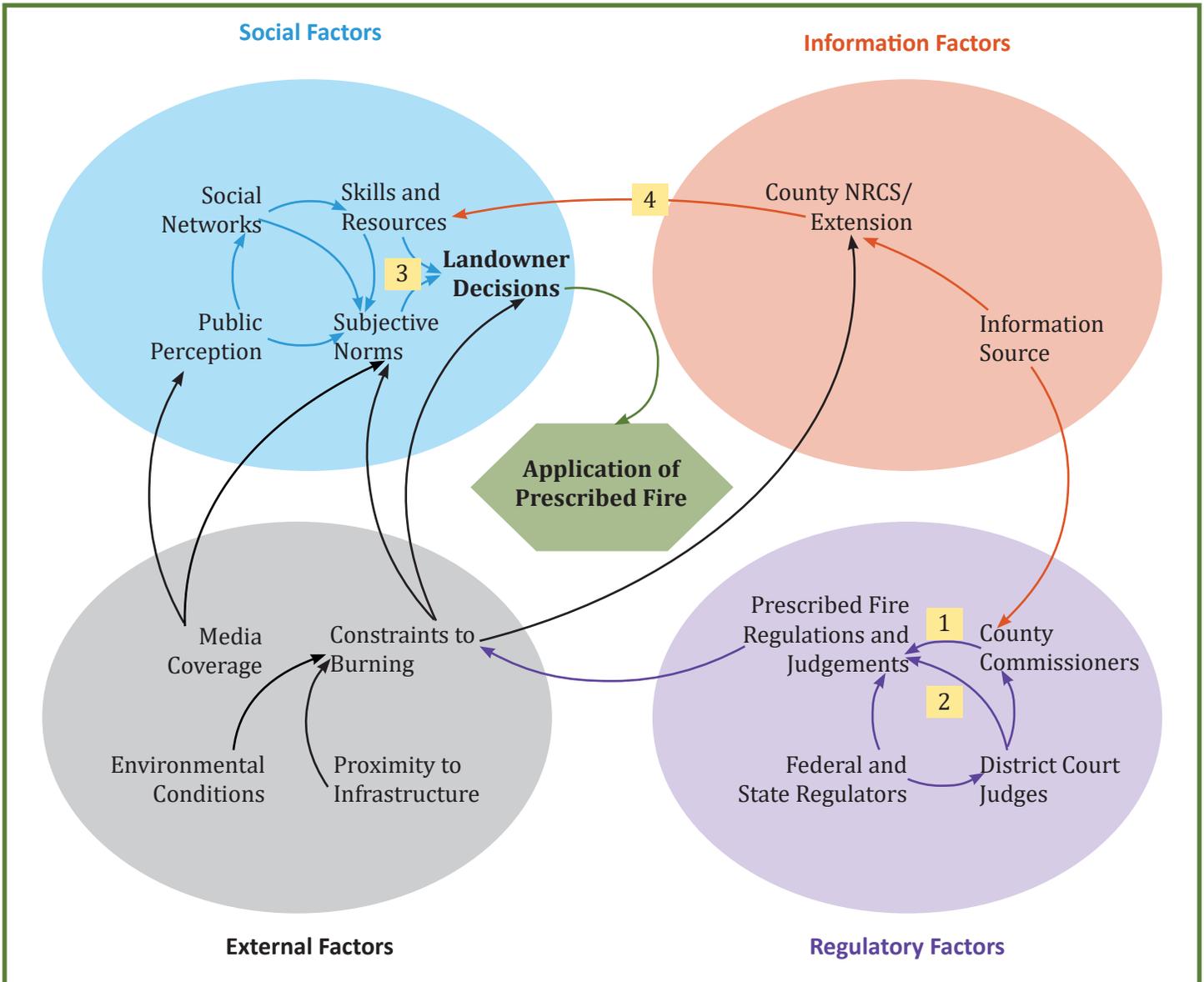
Hypothesis 2 stated, *landowner perception of legal liability for applying prescribed fire is positively mediated*

*by their social connectedness, such as membership in a prescribed burning association.*

The survey results also corroborated this hypothesis, showing that landowners who were PBA members were much more willing than non-members to participate in fire application, and also that Oklahoma landowners were more likely than Texas landowners to apply burns likely due to a greater pro-fire culture that is correlated with more PBAs in Oklahoma than in Texas.

Hypothesis 3 stated, *landowners who perceive fire to be an effective, affordable, and easy to use tool for woody plant management will be more willing to burn than those who do not have this positive perspective of prescribed fire.*

**Figure 4. Categories of factors affecting the use of prescribed fire by landowners and knowledge gaps in the current research project.**



The research results corroborated this hypothesis in only one instance; landowners who believed prescribed fire to be an affordable woody plant management tool were about a third more willing than those who felt otherwise to apply prescribed fire.

#### Study 4. District Judges, County Commissioners and Landowner Surveys

The current project funded by the Joint Fire Science Program is helping to fill the remaining knowledge gaps about social and regulatory barriers and facilitators (Fig. 4). These include: **1** Legal liability – perspectives of District Judges about prescribed fire and applicable statutes; **2** Regulatory drivers – perspectives of County Commissioners about prescribed fire and burn bans; **3** Landowner decisions making – effect of analytical versus heuristic decision processes; and **4** information dissemination – landowner perceptions about trustworthiness of information media.

#### IMPLICATIONS

The primary implications of the prescribed fire adoption research results summarized in this brief include:

To enhance the application of prescribed fire across the Southern Great Plains, assistance should be provided to landowners with respect to labor, fire management equipment and fire safety training. Prescribed burning associations have proven to be very successful in this regard and should be developed more widely across the region<sup>13,14</sup>.

The overwhelming economic advantage of prescribed fire as a woody plant management treatment, versus mechanical and chemical treatments, has been understated and needs to be more widely demonstrated and promote by entities tasked with the expanded use of prescribed fire as a fuel load reduction tool<sup>10</sup>.

Given that social norms about prescribed fire, especially attitudes of neighbors, family and friends, and previous fire experience affect landowner attitudes about prescribed fire, mechanisms that provide experience with this land management tool and that facilitate the inclusion of neighbors, family and friends should be promoted. Collaboration between county, state and federal agencies with local prescribed fire associations to arrange prescribed fire demonstrations could be an important strategy for providing such opportunities in order to promote a pro-fire culture among landowners and their people<sup>11</sup>.

The preponderance of evidence that a primary inhibitor of prescribed fire use is uncertainty about and concern over the liability for damages created by escaped fire and smoke hazards calls for clarification of the legal risks faced by landowners when applying this land management tool. This implies that the language of legal statutes be carefully reviewed and revised in such a way that clarifies liability and damage assessments and that reduces fire applicators' legal exposure if they diligently follow clearly codified procedures when applying fire. This would also enhance a pro-fire culture in the Southern Great Plains<sup>6</sup>.

---

## Bibliography

- <sup>1</sup>Luo, L. Tang, Y., Zhong, S. Bian, X., Heilman W.E. 2013. Will future climate favor more erratic wildfires in the Western United States? *Journal of Applied Meteorology and Climatology* 52:2410-2417
- <sup>2</sup>Briggs J.M., Knapp, A.K., Blair, J.M., Heisler, J.L., Hoch, G.A., Lett, M.S., McCarron, J.K. 2005. An ecosystem in transition: Causes and consequences of the conversion of mesic grassland to shrubland. *BioScience* 55:243-254
- <sup>3</sup>North, M.P., Stephens, S.L., Collins, B.M., Agee, J.K., Aplet, G., Franklin, J.F., Fulé, P.Z. 2015. Reform forest fire management: Agency incentives undermine policy effectiveness. *Science* 349:1280-1281
- <sup>4</sup>Fischer A.P., Charnley, S. 2012. Risk and cooperation: Managing hazardous fuel in mixed ownership landscapes. *Environmental Management* 49(6):1192-1207
- <sup>5</sup>Toledo, D., Kreuter, U.P., Sorice, M.G., Taylor Jr., C.A. 2012. To burn or not to burn: Ecological restoration, liability concerns and the role of prescribed burning associations. *Rangelands* 34:18-23
- <sup>6</sup>Wonkka, C.L., Rogers, W.E., Kreuter, U.P. 2015. Legal barriers to effective ecosystem management: Exploring linkages between liability, regulations, and prescribed fire. *Ecological Applications* 25(8):2382-2393
- <sup>7</sup>Twidwell, D., Rogers, W.E., Wonkka, C., Taylor Jr., C.A., Kreuter, U.P. 2016. Novel intervention to grassland-shrubland regime shifts: Potential of extreme prescribed fire and herbicide during drought. *Journal of Applied Ecology* 53:1585-1596
- <sup>8</sup>Weir, J.R., Kreuter, U.P., Wonkka, C.L., Twidwell, D., Stroman, D.A., Russell, M., Taylor, Jr., C.A. 2019. Liability and Prescribed Fire: Perception and Reality. *Rangeland Ecology and Management*, 72 (3), 533-538.
- <sup>9</sup>Kreuter, U.P., Woodard, J.B., Taylor, C.A., Teague, W.R. 2008. Perceptions of Texas landowners regarding fire and its use. *Rangeland Ecology & Management* 61(4):456-464
- <sup>10</sup>Van Liew, D., Conner, J.R., Kreuter, U.P., Teague, W.R. 2012. An economic assessment of prescribed extreme fire and alternative methods for managing invasive brush species in Texas: A modeling approach. *The Open Agriculture Journal* 6:17-26
- <sup>11</sup>Toledo, D., Sorice, M.G., Kreuter, U.P. 2013. Social and ecological factors influencing attitudes towards the application of high intensity prescribed burns to restore fire adapted grassland ecosystems. *Ecology & Society* 18(4):9 <http://www.ecologyandsociety.org/vol18/iss4/art9/>
- <sup>12</sup>Kreuter, U.P., Stroman, D.A., Wonkka, C., Weir, J., Abney, A.A., Hoffman, J.K. 2019. Landowner perceptions of legal liability for using prescribed fire in the Southern Plains, USA. *Rangeland Ecology & Management*. 72:959-967
- <sup>13</sup>Taylor, C.A., 2005. Prescribed burning cooperatives: empowering and equipping ranchers to manage rangelands. *Rangelands* 27:18-23.
- <sup>14</sup>Twidwell, D., Rogers, W.E., Fuhlendorf, S.D., Wonkka, C.L., Engle, D. M., Weir, J.R., Kreuter, U.P., Taylor Jr, C.A. 2013. The rising Great Plains fire campaign: citizens' response to woody plant encroachment. *Frontiers in Ecology and the Environment* 11(s1), e64-e71 doi:10.1890/130015

---

This research was funded by the Bureau of Land Management Joint Fire Science Program (Contract #L16AC00206) led by project PI Dr. Urs Kreuter.

For more information, visit [www.gpfirescience.org](http://www.gpfirescience.org).