The northern Great Plains, historically ran on a frequent, low-intensity regime 1, but currently run on an infrequent, high-intensity regime 2,3. Prior to Euro-American settlement, indigenous peoples used fire to promote new growth of grasses, remove old grasses, manage game, and other cultural reasons4–6. Fire introduces disturbance to a landscape that helps promote heterogeneity, as well as remove invasive plant species, woody plant species, as well as increase forage quality7,8. Although fire is a positive to the land, many landowners see fire as a negative, often suppressing fire in the upper great plains, leaving it largely unburned9. Reintroducing prescribed fire has proven to be difficult but can limit and reduce wildland fuel that can lead to uncontrollable wildfires, controlling woody invasion, and non-native species, enriching habitat and forage quality for both wildlife and livestock. Greatly enhancing native species diversity and heterogeneity in grasslands10.

Social barriers include societal norms and attitudes, liability, and education, knowledge and training. Whereas physical barriers include labor, equipment, money or government restrictions10,11. Societal or social norms tend to highlight the attitude many community members display12, as they often have “feelings or moral obligation to perform or refrain from specific action”13. Social science can help managers identify and evaluate management plans based off social and ecological tradeoffs 14, make decisions that are better for humans and the environment alike. Zube (1987) explains how human perception about landscapes are often formulated in our cognitive mind. Introducing the idea that humans value different aspects of the land in their mind more so than of reason. Combing these social and ecological components could help shift management decisions15. In the northern Great Plains, these societal or social norms often play a larger role, as they change the decision making process in these smaller ranching communities16,17. These social pressures often weigh on government and private agencies as well, often limiting how often they choose fire as a management tool, on federal, state, and private lands18–21. Ranching communities in the southern Great Plains, recognized a problem in the lack of disturbance causing a decline in biodiversity and livestock production, and formed a prescribed burning association to address the problem and bring disturbance back to the landscape22. This realization has not been brought to the northern Great Plains. The northern Great Plains consists of mostly small-town ranching and farming communities, opening attitudes and barriers that other areas do not face. Bendel et al. 2020 introduced us to the transtheoretical model of behavior change, this model includes 5 stages of change, ND landowners seem to be in the first two stages (Pre-contemplation and Contemplation), as they were found to have a split between results of if fire was beneficial or not. One of the largest drivers of decision making for landowners and ranchers is being a good steward, People develop stewardship for landscapes, as these are a basic component of our natural and cultural heritage; they contribute to the formation of local cultures and provide ecosystem services both for the benefit of individual and societal wellbeing23. In North America, working landscapes partnerships foster effective stewardship and conservation of land through active human presence and management24. Landscape stewardship comprises all ‘efforts to create, nurture and enable responsibility in landowners and resource users to manage and protect land and its natural and cultural heritage’25. ‘Stewardship’ is not only a management approach but perhaps even more, an ethic that emphasizes responsibility, collaboration, participation and communication in the planning and management of land resoruces26. Stewards often manage environmental features, especially those important for wildlife and sustain these for future generations27.

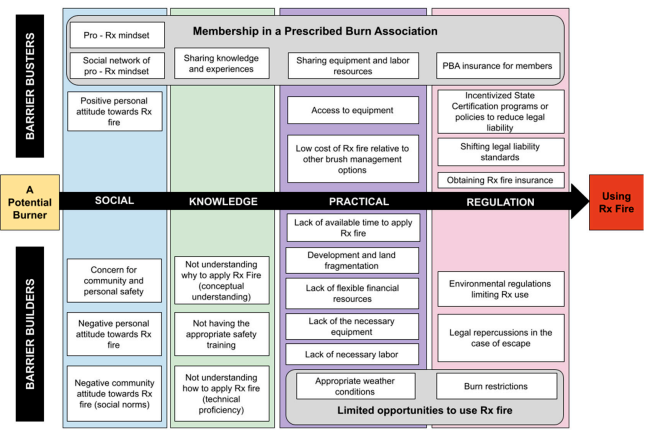
Clark et al. 2022a introduced us to the idea of barrier builders, outlining the potential barriers that might limit or prevent the use of prescribed fire, as well as introducing barrier busters that provides tools and resources that encourage the use of prescribed fire. 

Figure 1.

Perceptions oftentimes can add to a negative attitude towards fire, without properly knowing the facts, adding to these barriers that limit the use of fire. Members of the community believed that fire posed risk to nearby property, human safety, loss of forage, soil erosion and negative impacts on wildlife. Ranchers as well as community members agreed that there was potential for negative effects when a prescribed fire was on their neighbor's property (53% agree, 32% disagree; 47% agree, 26% disagree)28. Although Weir at al. 2020 conducted a study on a total of 23,050 prescribed burns with only having 1% or 199 fires result in an escape, ranging from 1 – 2,000 acres. Although there is a risk of an escaped fire, the likelihood is not enough to call for concern. Human safety is another perception that is often misconstrued. Prescribed burns have significantly less accidents than crop and animal production, between 1963 and 2013 only 6 deaths were reported to be from prescribed burns29. As well as Weir et al. 2020 having 1 minor injury in the 23,050 prescribed burns studied. Potential practioners do not just worry about the safety of those conducting the burn, but also community members around the area that may have to deal with harmful smoke, especially to the more vulnerable population, leading to another barrier30. Ranching communities also look at fire as the potential to destroy food for their cattle19, increased soil erosion allowing for more surface runoff until vegetation grows and covers the site31.

The biggest barrier that potential fire practioners have found though is liability. Numerous studies have found that liability is the largest barrier stated by landowners, including risk of an escaped fire, legal trouble, harm to neighbors, community and personal safety18,19,28,30,32. Weir et al. infers that people often fear the perception of liability “Inaccurate perception of the danger and severity of liability is a greater barrier to prescribed fire than that of the actual danger and liability”, insinuating that the actual risks of fire are not the same as the perceived risks. We have found that states vary from having strict liability to having more precautions in place, North Dakota itself has a strict burn liability, indication that the burner is always responsible for damages33.

Perceptions can also turn into personal beliefs about fire. Clark et al. 2022a found that respondents did not find prescribed fire to be beneficial and a legitimate land management practice, 2/44 studies noted that over 50% of their respondents found it beneficial, equaling to only 5% of the studies. Others found that burning should only be used in limited circumstances, only be used by professionals, and should have adequate training. North Dakota does not have any prescribed fire associations but does hold a prescribed fire cooperative that helps conduct training, education, and training burns, the North Dakota Prescribed Fire Cooperative.

This study aims to outline why landowners are hesitant to burn on their land and their overall feelings of fire, to begin working with landowners and community members to introduce prescribed fire as a management tool back on to the grasslands. Clark et al. 2022a introduces us to how most research and papers have been from the southern Great Plains, as the northern Great Plains do not have a pro-fire culture, with roughly 79% of papers and information coming from the southern Great Plains. Learning more about the northern Great Plains will help us understand landowners' hesitancy to burn their property as well as federal grasslands used for grazing.

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