

16 What's Next *The Future of Fire as a Tool for Managing Brush*

200 As economics of profitable ranching become more challenging, one of the hardest decisions to make is how to deal with excessive woody vegetation. Because of its relatively low cost and environmental friendliness, fire is viewed as an extremely viable tool for reducing excess brush. However, serious problems can occur, as we witnessed with the unfortunate prescribed burn that became a destructive wildfire near Los Alamos, New Mexico in 2000. But what does the future hold? In this chapter, we will review some ideas relating to the future of fire as a management tool. Because the future is as much about interacting with people as it is about managing a natural resource, we have divided the chapter into two major sections, an "ecology and management" section, and a "political" section.

Ecological and Management Aspects

Some trends that we see occurring in the future with respect to ecology and management of fire include (1) a more efficient execution of prescribed fires, (2) a greater ability to manipulate fire behavior and effects, (3) increased use of fire within integrated treatment plans, (4) increased use of summer fires, (5) a greater realization of the limitations of fire, and (6) an increased use of fire to manage seeds and seedlings.

More Efficient Execution of Prescribed Fires

As information continues to become easier to access, there will be a greater ability on the part of the resource manager to physically execute a prescribed fire. The manager will have easier access to current weather forecasts, will have better and less expensive instruments to measure weather in the field, and can access imagery of weather patterns via satellite on a laptop computer. The manager will have better access to geo-referenced aerial images when planning a burn. A manager will also have access through the internet for better communication with all people involved in the fire, including neighbors, fire departments, agencies, and weather forecasters. For the on-site crew, better and less expensive radios and perhaps even Global Positioning System (GPS) locators will increase coordination of all crew mem-

bers. This will result in increased safety for the crew and an increased ability to report spot fires that breach containment, etc.

More and more managers will have access to fire behavior models and, with laptop computers in the field, will be able to predict not only conditions which are safe to burn, but also fire effects on vegetation and soils. Interfacing a fire behavior model on a laptop with a portable weather station would allow a manager to instantaneously track the conditions required to produce a specific fire effect. It may be that such a window of opportunity would exist for only 2 or 3 hours in a day.

201

*What's Next:
Future
of Fire as a Tool*

Greater Ability to Manipulate Fire Effects

With greater access to information about fire behavior and fire effects on vegetation, the manager will have more options for customizing a fire treatment plan. This may involve planning for different intensities to achieve different management goals. For example, burning under different air temperatures and relative humidities can produce different effects on mesquite (Britton and Wright 1971, Ansley et al. 1998).

There will be an increased use of more specific fire prescriptions. Such prescriptions will go beyond the traditional definition of prescription, which has primarily been used to differentiate an intentional fire from an act of nature, and will move toward achieving more specific effects than were expected in the past. Goals may be different for different pastures within the same ranch. For example, in one pasture the goal may be to top-kill 90% of the mesquite with a summer fire and shift the plant community to 50% cool-season grasses, while in an adjacent pasture, the goal may be to use a lower intensity fire to top-kill only 30% of mesquite and maintain a dominant warm-season grass community. In another example, a low-intensity fire may be desired for mesquite savanna development (Ansley and Jacoby 1998). As we gain more biological information, we will be better able to manipulate individual components of a ranch to different end results with fire.

Increased Use of Fire Within Integrated Treatment Plans

Often, dense stands of brush require mechanical or chemical treatment before prescribed fire is effective. This is because the development of such stands almost completely eliminates herbaceous production, which provides the fine fuels necessary to carry a fire. We believe that the use of prescribed fire in combination with other treatments is an area that will receive increased activity. While this has been discussed within academia for many years (Scifres et al. 1985), there are very few active examples of the planned use of an integrated treatment approach. Thus, this is an area that will receive increased research attention, but also will be applied in a more planned manner by more and more producers. The potential of fire to extend the life of herbicides needs to be explored both from a biological and economic standpoint (Scifres and Hamilton 1993). Herbicide/fire combinations for developing savanna or other management goals are also needed.

Key questions as to how such a program should be implemented remain unanswered. For example, how can fire be used in an integrated system to

optimize wildlife habitat? Do I spray first, then burn, or burn first, then spray the brush left after the fire? At what point after an herbicide treatment is it most cost-effective to burn? Often, economic reality will dictate the sequence of treatments.

Increased Use of Summer Fires

There has been a great deal of interest during recent years in the use of summer fires for reducing brush. There is no question that summer fires are more effective than cool-season fires at top-killing mesquite. Some studies in Arizona suggest that velvet mesquite (*Prosopis velutina*) are killed by summer fires (Humphrey 1949, Blydenstein 1957), but increased mortality from summer fires has not been found with honey mesquite (*Prosopis glandulosa* var. *glandulosa*) in Texas (Stanley 1997, Ansley and Jacoby 1998, D. N. Ueckert, unpublished data). Summer fires are also more effective on cactus (*Opuntia* spp.) and juniper (*Juniperus* spp.) species (C. A. Taylor, D. N. Ueckert, unpublished data). Not only are summer fires more effective at reducing brush, some managers feel that summer fires allow one to burn without having an extended preburn grazing deferral. This certainly makes sense in areas dominated by cool-season annual grasses which provide adequate fuel for fire but have no forage value during the summer.

We anticipate that use of summer fires will increase. For example, an informal survey of members of the Edwards Plateau Prescribed Burning Association revealed that summer fire was preferred over cool-season fire by a ratio of 10:1. However, those using summer fire should proceed with caution. Wright and Bailey (1982) suggest that certain warm-season species, such as sideoats grama (*Bouteloua curtipendula* var. *curtipendula*), may be harmed by summer fires. Soil erosion may be increased, while water infiltration rates and soil nutrients may be decreased with intense summer fires (Hester et al. 1997). The question remains, if most natural fires occurred during summer months by lightning strikes, etc., then how were some warm-season perennial mid-grasses, such as sideoats grama, able to persist? It may be the combined effect of fire followed by grazing that actually harms grasses. Research from the Texas Agricultural Experiment Station at Sonora indicates that summer fire enhances warm-season perennial mid-grasses, but their recovery may take longer than grasses that are burned during the cool season. Summer burned pastures should be deferred until the vegetation recovers completely (i.e., one to three growing seasons of complete rest may be required).

Greater Realization of the Limitations of Fire

Our best estimate of the cost of burning medium-sized pastures (approximately 300 to 1,200 acres) in the Texas Rolling Plains and Edwards Plateau, using all the recommended safety procedures (preburned blacklines, dozed perimeter line, etc.), is about \$2.50/acre (Ansley et al. 1999a). This compares to the cost of a root-killing herbicide treatment for mesquite of \$22–25/acre. There is a perception among many that fire is a somewhat magical tool that can do what more expensive treatments will do at a tenth of the cost. Even though fire is considerably cheaper than other brush treatments, it has very

clear limitations, both in ability to properly execute a burn and in its biological effect. These limitations and dealing with them by preplanned actions can be described in the following case study.

A Texas Rolling Plains Case Study

There are many limitations toward executing prescribed fires due to management or climatic constraints. Recent research on the Waggoner Ranch Kite Camp south of Vernon, Texas, offers a good example of such limitations in the use of fire. On the Kite Camp, a 35,000-acre area dominated by honey mesquite and a mixture of cool- and warm-season mid-grasses (no juniper species), we began a project in 1995 to determine if fire could be used within the constraints of a livestock production system. Mesquite were initially at about 10–30% cover. It was not economically feasible to spray herbicide first and use fire as a maintenance tool later. Several rotational grazing systems were established as experimental treatments to determine how many paddocks were needed within this soil type and precipitation zone to make fire work (Teague et al. 1997). There were eight separate systems and thirty-four paddocks total with each paddock about 400 to 1,200 acres. Our goal was to burn thirty-two (the two others were unburned controls) paddocks within a 5-year span (six to eight paddocks per year) and then apply a second burn on each paddock over the next 5 years. All burns were designed to be winter or early spring burns (January–March).

Our results give a good example of the promise and the limitations of fire. On one hand, we burned fourteen paddocks and over 11,000 acres from 1996 to 2000. We were able to burn even though 3 of the 5 years (1996, 1998, 1999) were extreme drought years. On the other hand, we fell far short of our stated goal (Ansley et al. 1999b). Moreover, half of the fourteen burns we completed produced less than 50% mesquite top-kill. On the positive side, these fires did create openings in the brush to facilitate a second burn, reduced some of the cactus, and restored some grass vigor.

Overcoming Limitations with Preplanned Actions

There were several factors involved that allowed us to burn in the midst of drought when others could not burn under such conditions. We used preburned blacklines (Wright and Bailey 1982). This enabled us to react quickly to the narrow windows of opportunity the weather gave us because, once the blacklines were burned, we could burn the main unit within about 2 or 3 hours at some later date. For example, in 1998, because of bad weather, we had less than 5 days between February 1 and April 1 which were determined to be adequate for burning. We were able to burn three separate paddocks, all more than a mile from each other, on a single day because the blacklines were preburned.

Other factors that allowed us to burn were rotational grazing and a slight reduction in stocking rate from 30 acres/cow to about 36 acres/cow. Rotational grazing enabled us to defer selected paddocks within each system for burning. Finally, our burn units were of a reasonable size (400–1,200 acres). The larger the burn unit, the greater are the limitations of how and when one can burn.

Recognizing Biological or Ecological Limitations of Fire

204
Prescribed Fire

There are many biological or ecological limitations of fire. Many still view fire as the solution to all ecological problems because it is a natural part of the ecosystem (as opposed to herbicides, for example). However, many studies have shown that for every benefit fire has on some wildlife species, it hurts others or their habitat (Greenlee 1997). Fire can also have extreme and deleterious effects on soils and herbaceous vegetation (Sharrow and Wright 1977, Hobbs et al. 1991, Hester et al. 1997).

Fire also has real limitations as to its effect on brush. Fire will not kill many sprouting species, such as honey mesquite or redberry juniper (*Juniperus pinchotii*), even after numerous repeated fires or summer fires (Ansley and Jacoby 1998). In the case of mesquite, a top-killing fire can turn a plant with a tree-like growth form into a multi-stemmed bush which is probably more competitive with grasses and impairs visibility to a greater degree. Thus, managers of the future need to seriously consider what they will be getting if their goal is a top-killing fire on mesquite. They will most certainly need to be within a management system which allows them to apply fire every 7–10 years, and perhaps more often in different areas of the state (Teague et al. 1997). The same holds true for redberry juniper with the exceptions that (1) regrowth is not as fast as mesquite, and (2) the initial growth form of a mature juniper is no better than what a regrowth juniper will become. In other words, one does not potentially lose the tree as one would in top-killing large mesquite.

In Oklahoma and areas of Texas such as the Edwards Plateau, the juniper species are susceptible to fire and fire has real potential for restoring areas invaded by junipers to grasslands (McNeill 2000). A key element will be implementing management strategies so that fire can be used before juniper gets too big and, through competition, removes all the herbaceous fuel for carrying a fire. Unfortunately, juniper invasions have reduced herbaceous fine fuel loads in much of these areas. Thus, other treatments such as mechanical chaining will be needed before fire can be used effectively.

Limitations of the effects of fire on brush are compromised even more when corners are cut to further reduce the costs of burning. Many people will refuse to use preburned blacklines or will defer grazing for a shorter time than originally planned. This usually results in a less than satisfactory fire effect. In summary, greater realization of the limitations of fire will hopefully result in more realistic goals when incorporating fire as part of an overall management plan.

Increased Use of Fire to Manage Seeds and Seedlings

Research on control and management of woody plant seeds has been virtually ignored, yet the seed is the true source of the brush problem. Wright et al. (1976) found that honey mesquite less than 1.5 years of age were more easily killed by winter burns than were trees 3–5 years old. Seedling and young redberry juniper are also killed by fire (Wright and Bailey 1982). Future research will focus on strategic use of fire and other treatments to limit brush seed production and germination. This may involve building enough

flexibility into a management plan to burn in fall or winter after a large seed crop has been produced.

Political Aspects

205

*What's Next:
Future
of Fire as a Tool*

It is our opinion that the future of prescribed fire in Texas depends partly on politicians becoming educated on the the appropriate application of fire (i.e., it is a characteristic of civilization that the future of any technology will be influenced and directed by the political, social, and economic norms of the time—prescribed fire is no exception). Also, we believe that individuals who want to either support or use prescribed fire need to organize burning associations with clear objectives, and focus their efforts towards the safe and efficient application of fire. These organizations need to offer strong support for their membership as well as promote the benefits of prescribed fire to the general public.

The role of fire in Texas has been and still remains controversial from both an ecological and a management perspective. Negative experiences in Texas, largely with wildfires, gave rise to a collective notion that fire suppression was wise conservation (Scifres and Hamilton 1993). Furthermore, fire was purposely used as a tool of destruction within the state, which did not foster the beneficial aspects of fire. For example, in the early 1880s, grass was burned in retaliation for alleged grievances held against ranchers who were fencing the range. Under these conditions, fire was viewed as a destructive force to be prevented at all costs. Due to many negative experiences with fire, much of the ranching industry implemented fire suppression techniques rather than promoting the use of prescribed fire. For example, the use of fire guards were implemented on most large ranches. The XIT Ranch began plowing guards in 1885, the first year cattle were placed on its range (Halley 1929). Within a year over a thousand miles of guards, one hundred feet wide, had been plowed across the ranch.

Even today, the negative effects of fire receive much more press coverage than the positive effects. Examples include the catastrophic wildfires in Yellowstone National Park in 1988 and the Los Alamos fire in 2000, both of which were sensationalized by the media. These type of fires, along with the press coverage, create a negative feeling toward fire by the general public. However, there may be a shift occurring in public attitudes regarding prescribed fire, if burning is accomplished at the appropriate time and place, and in a safe manner (Scifres and Hamilton 1993).

Because of its political nature, the continued use of prescribed fire in Texas requires a core of range and forestry professionals who are proactively engaged in the development, administration, and interpretation of laws, regulations, training, etc., regarding prescribed fire. This kind of activity is absolutely necessary because there is still a general attitude among the public that range/forest fires are negative in most respects. Also, as the state's population continues to grow with more agricultural land being transferred into the rural/urban interface, fire and smoke management will certainly remain a hot-button issue.

In an attempt to become more politically active, recently, range and forestry professionals throughout the state decided to make prescribed fire a

statewide priority. As a result of their concern, an effort was initiated to solidify the status of prescribed burning in the state. This effort grew out of a concern that if the professionals did not take the lead and get something positive going, prescribed fire might be overly regulated or even lost as an effective vegetative management tool.

The Texas Case for Prescribed Burning

Since several other states had recently had experience in obtaining special legislation allowing prescribed burning, it was felt that Texas should follow in their steps and develop a strategy to insure that the practice of prescribed fire was not banned. In April, 1998, a meeting of interested parties was held in Kerrville, Texas to determine interest, gain information from other states, and generally inform attendees on the status of prescribed burning in Texas. This meeting was attended by approximately fifty individuals from approximately twenty-five organizations representing universities, state and federal agencies, private landowners, foundations, conservation organizations, and others. From this meeting, a mailing list of approximately sixty organizations and individuals was developed.

Subsequent to the Kerrville meeting, an organizational meeting was held at the Welder Wildlife Refuge in Sinton on October 13, 1998. Approximately thirty-five individuals attended this meeting, which created the loosely affiliated Texas Prescribed Burning Coalition (TPBC). The goals of the organization are to influence positive legislation concerning prescribed burning in the state, to foster and support training in the art and science of prescribed burning in Texas, and to disperse accurate information to the public on the subject of prescribed burning. Three committees were named: legislative, education and training, and public information.

The legislative committee formulated a burning bill for submission to the legislature. The bill (HB-2599) passed both chambers, was signed by Governor Bush, and became law in September, 1999. TPBC's education and training committee formulated a curriculum with input from individuals in all ecological regions of the state. The curriculum is based on the same one used on several occasions by Texas Parks and Wildlife (TPWD). The public information committee is in charge of dispersal of information regarding the training curriculum.

House Bill 2599

The burning bill does several things that are positive for prescribed burning in Texas. It guarantees the right of all landowners in the state to burn on their own property. It places no additional restrictions on the landowner's right to burn. HB 2599 will be administered through the Texas Department of Agriculture (TDA). It establishes a prescribed burn manager certification system and a prescribed burning board and citizen's advisory committee.

The prescribed burning board consists of representatives of TPWD, Texas Agricultural Experiment Station (TAES), TDA, Texas Natural Resource Conservation Commission (TNRCC), Texas Forest Service (TFS), Texas Agricultural Extension Service (TAEX), Texas State Soil and Water Conservation Districts (TSSWCD), Texas Tech University-Range, Wildlife,

and Fisheries Department, Texas Christian University-Ranch Management Program, and five private landowners. The prescribed burning board is responsible for setting up the citizens advisory committee, establishing prescribed burning standards, certification, recertification, and training standards for prescribed burn managers, and establishing educational and professional requirements for burn instructors.

The Prescribed Burning Board expects to complete its charge under HB-2599 and make the certification and training process available by mid-2001. This activity is an ongoing process and will require constant vigilance from the state's prescribed fire professionals if fire is to remain a viable management option in the future.

Forming Cooperatives and Associations

Agricultural cooperatives or associations are certainly not new. The Texas Sheep and Goat Raisers' Association and Texas and Southwestern Cattle Raisers Association are examples of producer organizations that were established early in the twentieth century and have served their membership well. The founders of these organizations realized that organizing people with like-minded goals and objectives would be more effective than operating as individuals.

This same principle works for any group who is trying to succeed, especially in an environment where society is increasingly more involved with concern for activities on the state's private lands. In the future, it will take sophisticated professionals who are well organized to reconcile social demands with the realities of prescribed fire. If ranchers or other land managers want to use prescribed fire on a routine basis, they will have to organize at the local level to enhance their influence within the local community.

The Edwards Plateau Prescribed Burning Association: A Case Study

The Edwards Plateau Prescribed Burning Association, Inc., was established in the fall of 1997 on the Texas A&M University Research Station located between Sonora and Rocksprings. Local landowners attended a field tour that highlighted prescribed burning treatments on the research station. After the field tour, landowners were asked if they were interested in forming a burning association that would offer training in the use of prescribed fire, increase participation (provide a critical mass of people) on prescribed burns, pool equipment, and in general, foster a better understanding and appreciation for what prescribed fire could do.

The response to the idea of forming a burning association was very positive. A president was elected along with four board members and the association was off and running. Guidelines for the association were quickly established. Some of the important ones include (1) a \$25.00 annual membership fee, (2) officers must be landowners (no agency personnel), (3) all members that are able are encouraged to attend fire training schools, (4) each fire will have its own burn plan that is prepared by the rancher, (5) each rancher will be liable for each fire on their property and proof of liability insurance is required, (6) each landowner is responsible for prepara-

tion of their own firelines, and (7) members are encouraged to actively participate on as many burns as possible. Participation is very important because it provides each member with experience on the fireline, helps members become acquainted with other members with the same goals and objectives, and fulfills one of the main reasons for the existence of the association (an experienced and trained labor force). Member participation is recorded for each burn and the level of participation is important when members request a burn on their own property.

Success of the Association Approach as a Future Vehicle

Even though the association is a new organization, it has been a great success. Currently, there are eighty-four members who represent approximately 500,000 acres of rangeland across six counties (Fig. 16.1). During the summer of 1999, fourteen summer burns were safely conducted by members of the association, most of which were conducted under burn bans. If a landowner was a member of the burning association and wanted to conduct a burn during the burn ban, County Commissioners would approve of an exemption due to the landowner's participation in the association.

The burning association has received much support from other organizations. For example, the Sonora Fire Department sold the Soil and Water Conservation District a pumper truck for \$1.00 for use by the burning association. The Texas Forest Service lends the use of a large 6-wheel-drive tanker. Both pieces of equipment have been very useful. Both the Texas Co-

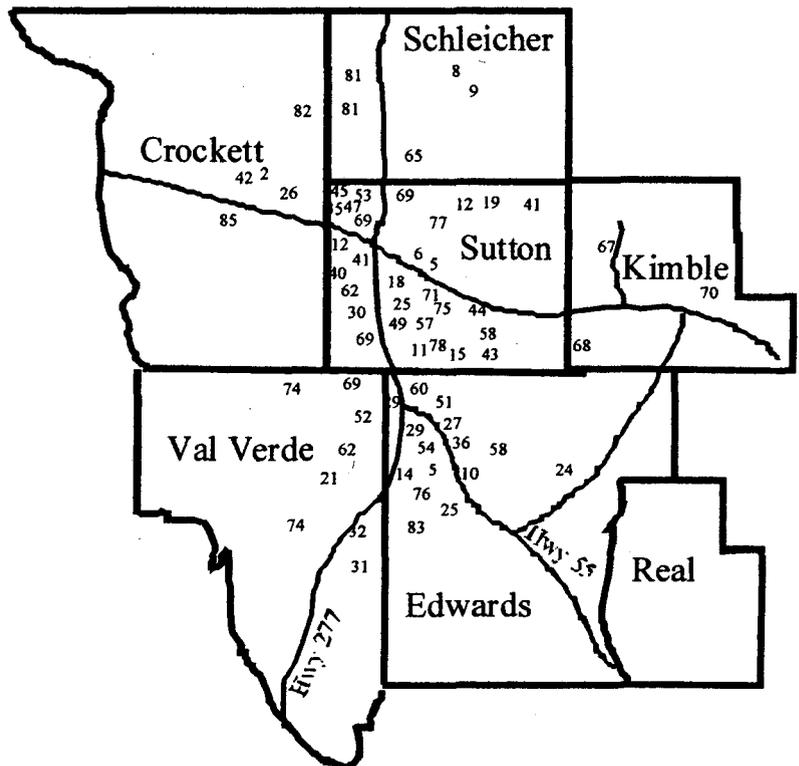


Figure 16.1.
Edwards Plateau Prescribed
Burning Association, Inc. Location
of Membership.

operative Extension and Natural Resource Conservation Service have been instrumental in the success of the association. Recently, the association gained nonprofit status and became incorporated. This has advantages in terms of receiving gifts, grants, and contributions of money.

The Edwards Plateau Prescribed Burning Association continues to grow in size and concept. It is providing landowners with a tool (fire) that is very cost effective. The association has empowered landowners at the local level and its organizational framework is being implemented across the state. It is having a positive, statewide effect on the application of prescribed fire.

209

*What's Next:
Future
of Fire as a Tool*

Summary

We have attempted to present a vision of the future regarding prescribed fire. Based on our view, prescribed fire has a bright future, but only if we continue to develop and adapt new technology to improve the safety of fire as well as its effectiveness. Also, educators and researchers must become an active part of the political agenda. A brief overview of two approaches to securing a future for prescribed fire in Texas has been presented. In both instances it involves forming organizations of like-minded people with similar goals and objectives. To be effective and remain relevant, these organizations must also educate and inform the public of the vital role that prescribed fire can play in ensuring a sustainable source of natural food and fiber, wildlife habitat, and open space; conserving water, soil, and air; and maintaining a viable cultural heritage.

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