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USE OF PRESCRIBED FIRE IS HEATING UP: EDUCATING ABOUT CONTROLLED BURNING
PROGRAMS IN THE STATE PARKS OF UPSTATE SOUTH CAROLINA

By

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I. Introduction

While the use of prescribed fire, or controlled burning, is a land management practice that many ecologists are familiar with, many members of the general public may still be unsure of the purpose, use, and benefits of this practice. These small-scale, intentionally set fires have the capacity to greatly improve the management of habitats and ecosystems across the state of South Carolina, but without public support, the likelihood of these programs' successes diminishes considerably. Public support is imperative and in order to ensure it, organizations must start with education. This paper intends to explain prescribed fire, how it is accomplished, and why it can be so beneficial to forest ecosystems, particularly in the Upstate of South Carolina, where the state park system is beginning to use fire to manage and restore parklands.

II. Role of Fire in Ecosystems

Not all fires affect forest ecosystems in the same way. The intensity and scale of a fire greatly alters how it will affect the air, water quality, and wildlife in the area that it occurs. There is a great difference between small, intentionally set prescribed fires and the large, destructive wildfires that have recently begun to perpetuate news cycles. The South Carolina Department of Natural Resources defines prescribed fire as “the planned application of a controlled fire to forest, brush, or grassland vegetative fuels under specific environmental conditions and precautions which cause the fire to be confined to a predetermined area and allow accomplishment of planned land management objectives” (SCDNR, 2014). The most important concepts described in this definition are that controlled burns are set intentionally with extensive planning to accomplish certain management goals such as habitat restoration or clearance of underbrush.

Benefits of Prescribed Burning

Prescribed fires and wildfires are both fires but can vary greatly depending on the individual circumstances. The word ‘wildfire’ brings to mind images of high-intensity, broad, and destructive fires, but this is not always the case. Small intensity wildfires do occur, often in areas that have smaller fuel loads to burn. The number of wildfires that occur in an area and their intensity can be minimized by the use of controlled burning programs, but the presence of wildfires cannot ever be completely extinguished because fires can continue to be set by natural causes, such as lightning strikes. Catastrophic wildfires are typically driven by high fuel loads (including leaf litter and downed woody debris), drought, and high winds. They are more common today than they were before the

20th century because of increased wildfire suppression, which led to a build up of fuel loads and the presence of exotic species. Wildfires also tend to be more damaging today because of increased residential building in the wildland-urban interface. Wildfires are a threat to infrastructure, human health, and wildlife because they can burn at such high temperatures and spread very quickly (Gorte, 2010).

In the Southeastern U.S., fire historically had a huge role in the formation and health of ecosystems. Before humans, natural fires occurred due to lightning strikes, and native vegetation evolved to tolerate the frequent natural fires that occurred every couple years. The first instances of prescribed burning involved Native Americans, who arrived in the region 10,000-12,000 years ago and began to set fires intentionally to improve grassland habitats for wildlife for the benefit of hunting and to control understory growth in the dense forests, which improved foraging and accessibility (Dixon et al., 2012).

Controlled burning programs are enacted in the present day to accomplish these same land management goals. Through these planned burns, managers seek to reduce the vegetative fuel that has built up on the forest floor, and thereby reduce the risk of high intensity wildfires, and open space for new vegetation to grow. Other management goals that can be met with the use of fire, including the preparation of sites for planting, the improvement of wildlife habitat, the management of competing plant species, the control of disease spread, and the improvement of appearance and access (Dixon et al., 2012). Because the fires that result from these controlled burning programs are smaller and slower moving, wildlife is able to get out of harm's way, and larger trees and their root systems are not damaged in the flames. While the forest may appear barren and unhealthy directly after the burn occurs, a small amount of vegetative litter will typically remain and

act as protection for the soil. Over time, the natural ecosystems will regrow and recolonize the area. The timescales on which this occurs depends on the type of vegetation and type of ecosystem (SCDNR, 2014).

The use of low-intensity fires can have a great number of benefits to both forest and grassland ecosystems. In prairies and grasslands, fire can help to prevent the encroachment of larger shrub and tree species, keeping the grassland habitat intact. Fires can benefit vegetation in forests as well because they clear out the underbrush and leaf litter that covers the soil. The additional space and sunlight that results allows new seeds to germinate. Also, the fire helps to recycle nutrients back into the soil more quickly. Plant and tree species that are slow growing or are fire dependent, meaning they require intense heat to release seeds, will have a better chance at competing with other species in these circumstances. This can be important when considering the restoration of native species to an area that is historically accustomed to periodic fire (Cunningham, 2003). If a disease is infecting an area, prescribed fire can be used to help reduce the spread by eliminating the pest, fungus, or parasite that is causing the disease. In these instances, it can also help to speed up the process of breaking down the dead, affected trees and allow new seedlings to regrow in their place, thus replacing a dead, diseased forest with a new and healthy one (Cunningham, 2003).

Controlled burns can also be used to help the wildlife in an area. When fires clear out understory and leaf litter, they allow better accessibility for small birds and mammals to forage and travel through the area. The stimulated plant growth can also increase the amount of food for herbivorous species, such as increases in herbaceous species for grazing

wildlife. The habitat conditions of a location can be tailored with the use of prescribed fire to best be suited to wildlife that managers want to protect (Dixon et. al., 2012).

While prescribed fires provide a range of benefits, other environmental effects must be taken into account. The first is how fire affects soil. Even low-intensity fires can reduce the organic matter present in soils, which can contribute to a greater amount of erosion and run-off following a controlled burn. Southern locations tend to lose less organic matter, though, reducing these effects. Even in areas on slopes, such as in the piedmont, as long as other vegetation is present, the risk of runoff is low which also prevents the loss of nutrients to the soil structure (Dixon et. al., 2012).

A second environmental component to consider is the effects of fire on water quality. Many controlled burning sites may be near lakes, streams, or creeks. The main concern is that increased runoff following the fire could contribute to increased sediment and other particles reducing water quality. Whether this runoff occurs depends greatly on the terrain of an area and the weather conditions following a burn. If large amounts of precipitation do take place, this runoff and erosion has the potential to reduce water quality. This risk is taken into account by land managers when planning where and when to set a prescribed fire (Dixon et. al., 2012).

A last environmental effect to be considered is that of smoke. Although wildfires produce more air pollution, even small-scale fires result in smoke. As a result, both visibility and health impacts must be taken into account when planning a controlled burn. Smoke is usually only a risk at a local level. It can be dangerous because smoke is made up of small particles and combustible gasses. While the amount of the gasses produced is inconsequential on a small scale, the main concern with prescribed fire is the amount of

particulates produced, which reduce visibility and increase health risks (Dixon et. al., 2012). Particulates smaller than 2.5 microns (referred to as PM2.5) are the most dangerous because they can penetrate the lungs of those who inhale them. To minimize this threat, planners consider the surrounding urban areas, weather conditions, and seasonal aspects to minimize the smoke produced. The amount of smoke produced by controlled burns must adhere to the air standards of the Clean Air Act (US Forest Service 2013). Ultimately, choosing to implement prescribed burning can result in better air quality. Although a larger amount of emissions are produced total on a long-term scale, these emissions stay within daily and annual air standards. The burns also reduce fuel load so that if a wildfire were to occur, the emissions would be much lower than if previous burns had not taken place (Robertson, 2014).

Target Ecosystems in South Carolina

In South Carolina, there are two species whose restoration processes can be especially benefitted by the use of prescribed fire. The first is longleaf pine, which has most commonly been found on the coastal plains of the state. Longleaf pine, or *Pinus palustris*, is a species of pine that historically dominated the Southeastern United States. Today, the trees only occupy 3-5% of their former rangeland, and many land management agencies are beginning to implement practices, such as controlled burns, to facilitate their reintroduction (Addington, 2014).

In the Upstate of South Carolina, shortleaf pines (*Pinus echinata*) are in much of the same circumstances. Shortleaf pines provide a diverse habitat and food sources for birds and small mammals but due to disease, land-use changes, and changes in management

practices, there has been a 50% decrease of the species in the last 30 years. The slow growing pines are a great candidate for restoration through prescribed fire because they have a better chance of successful growth with less understory competition. The use of fire also helps to prevent and stop the Southern Pine Beetle and Littleleaf disease, both of which have plagued the species and contributed to its decline (Shortleaf, n.d.).

III. Accomplishing Controlled Burns

For forest managers to actually carry out a prescribed burn, extensive planning must be done to ensure the burn is done safely and efficiently. Many different components of a location must be taken into account to decide whether prescribed fire could be a beneficial and successful land management tool. The first is to determine what the goal of the project is and whether fire would help to accomplish that. The different uses of fire were listed in section II. Once it has been decided that fire could be an advantageous strategy, other elements of the location and planning must be considered.

Each state has different laws pertaining to how prescribed fires can be carried out legally and safely. In South Carolina, these laws are outlined in the Prescribed Fire Act and the Smoke Management Guidelines for Vegetative and Debris Burning. These two pieces of legislation explicitly state how fires must be planned and monitored (South Carolina Legislature, 2015). They first dictate that each burn be led by a prescribed fire manager. This individual has completed training with the forestry commission and is responsible for adhering to the guidelines. Duties include writing a fire plan, identifying areas sensitive to smoke, and evaluating weather conditions during the burn (South Carolina Forestry Commission, 2006).

The fire plan is a written document that must be submitted to the Commission of Forestry. It includes all of the components of the future planned burn. These involve the location of the burn, the purpose, and a description of the materials and techniques used to carry out the burn. The plan also details information about the best weather conditions in which to conduct the burn, how smoke will be managed, the preparation required, and a list of what members of the public need to be contacted about the fire. One of the most

important components of this plan is that it includes details about procedures in case the fire escapes and how it would be patrolled and extinguished in this situation (South Carolina Forestry Commission, 2006).

The guidelines followed by the state of South Carolina were designed so that prescribed fires could be carried out safely and with the proper amount of safety and planning. When these guidelines and rules are followed, they result in safe and efficient prescribed fires.

IV. Informing the Public About Controlled Burns

For prescribed fire programs to be successful, governmental organizations and private owners must have the support of their surrounding community. An understanding of controlled burning, its benefits to the adjacent area, and how it can improve forest ecology in an area is essential to gaining the support of the general public. Without this partnership between private individuals and agencies, the likelihood of successful management programs based on fires decreases substantially.

Many members of the general public have reservations about the safety and possible negative effects that can result from prescribed fire. It is important to note that for a controlled burn to be considered legal, it must adhere to strict legal guidelines. Preventative measures, such as extensive planning, the use of firebreaks, and proper training, are used. If done correctly, they should not be harmful to any humans, wildlife, or ecosystems (Cunningham, 2003).

Part of the apprehension the public may feel towards fire may stem from the United State's Forest Service's historical relationship with fire. In the 20th century, a policy of fire suppression was enacted to prevent large-scale wildfires. A large education campaign featuring Smoky the Bear was used to inform people about the dangers of fire in the wilderness. During this time, prescribed fire was not used or advocated, and there were efforts to put out all natural fires that occurred. By the 1960's though, research revealed that fire suppression had the negative consequence of increasing fuel loads in forests, which leads to greater and more dangerous wildfires when they did occur. Managers began to recognize the benefits of using controlled burning to try to prevent this build up of fuel and the other impacts that periodic, low-intensity fires could have on a variety of

ecosystems. As a result, use of controlled burning is becoming much more common to land managers, but the stigma of fire suppression still lingers (Cunningham, 2003).

To combat this apprehension and way of thinking, the use and benefits of prescribed burning must be spread to local communities. This can be done through the formation of prescribed burning networks and associations, creation of community trust and involvement, use of signs to indicate the use of beneficial fire in an area, and development of specific and appropriate messaging. Social media campaigns, partnering with local educational programs, and collecting feedback from the community about the effectiveness of these efforts can also be very beneficial (Kunkle et al., 2015).

The South Carolina State Parks Service is already in contact with multiple other agencies and organizations to accomplish their planned controlled burning program. The Southern Blue Ridge Fire Learning Network is one example of interagency collaboration. These types of groups are very helpful when coordinating burns that could involve multiple states or organizations. Often, the lands that could be benefitted by controlled burning programs do not exist within the confines of manmade map boundaries and require their prospective agencies to work together. The other benefit of these types of collaborations is that they can aid in the exchange of information between scientists and land managers. Ultimately, this has the potential to lead to more research into how prescribed burning can be improved (Conservation Gateway, 2015).

V. Upstate South Carolina

In the South Carolina Piedmont, the State Parks System is beginning to implement controlled burning programs. While they have used prescribed fire in parks in other areas of the state, this will be one of the first times fire will be used for land management in the upstate parks. Some residents and park visitors in this area may be familiar with fire and its uses, but there is a concern that many are not. For fire to be used successfully, support and understanding from not only park goers but also local residents is imperative.

The materials formulated for this project are intended to help inform the public of the benefits of fire. The hope is that by exposing people to information about fire, it becomes a more accepted way to manage upstate forests and is not immediately associated with damaging wildfires. The materials included are a brochure, presentation, and wayside displays to be placed in specific parks where fire is used. All of the materials are somewhat general so that they can be altered and used in different locations. With increased exposure to materials dealing with fire, people can learn how fire can be a help, and not a hindrance, to the natural environment around them.

VI. Conclusion

Prescribed fires have the capacity to be extremely beneficial to the forests of Upstate South Carolina. While their use as a land management tool does come with risks, the amount of regulation and precaution required to implement them, as well as the benefits to ecosystems, make burning a legitimate tool for forest managers. Educating the public about these fires and their affects on the natural environment is a very important step to take in ensuring the success of these programs. With this education and through continued regulation and oversight, prescribed fire can be used to continue to improve the forests of South Carolina so that they be enjoyed by both humans and wildlife alike.

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