Use of Prescribed fire on rangeland and pastures.

Overview

A primary concern associated with fire is the negative impact of smoke on air quality. This is short term transitory impact. To understand the role of fire, a holistic or ecosystem view is needed, because fire can maintain healthy watersheds, and improve water quality, wildlife habitat, biodiversity and livestock use. In most cases on rangeland and pastures there are three different fire conditions a land manager is faced with; trying to exclude fire; wildfires; and prescribed fires. Excluding fire has already led to many unplanned, undesirable consequences in most of these types of communities (e.g. eastern red cedar dominance on the tall grass prairies, increased sagebrush or pinyon-juniper dominance in the west, loss of aspen communities throughout the west, and the loss of habitat diversity in the landscape). In addition, fuel loads have increased which has led to larger wildfires that can have more negative impacts. The impact of wildfires can be both positive or negative depending on the burning conditions. However, as the fuel loads have increased wildfires are often resulting in more negative impacts. Prescribed fires can be set to select the burning conditions to minimize the negative impacts and have a greater long term positive effect on the ecosystem.

Fire has been an integral disturbance in the development of our rangelands throughout North America. Most of our rangelands have distinct successional patterns that have developed because of specific fire return intervals. With the arrival of European man the fire return intervals have been altered, through the use of livestock, active fire suppression and the introduction of new plant species,. However, as seen during the past few years, this did not eliminate fire from these systems. But it did change the size and impact of fire on the rangeland ecosystem..

Fire has been considered the dominant driving force in the development of our plant communities by many. It must be understood, however, that these were not all wildfires that occurred before European man's arrival in North America. The aboriginal people of North America actively used fire to manipulate the plant communities to create a better environment for them. When European's came to North America they did not understand these systems and tried to remove fire. This was actively pursued, even leading to the creation of Smoky Bear. We have since realized that fire is important for many of these systems to be sustainable. But fire is a two edged sword. It has both positive and negative effects on the landscape, which are effected by the environmental conditions at the time of the burn.

Wildfires tend to be burn at high intensities where land managers have no control in directing the possible out come of the fire effects. Wildfires on rangelands have increased in size and intensity in North America as we have reduced the total number of fires because of active suppression and as a result have helped alter the associated plant communities. Many of our grasslands have been converted to shrublands which changes the type of fire and its impacts on the environment. These now support greater fuel loads,

which burn at higher intensities. The plant diversity is often reduced, and in the Western United States, soil erosion tends to increase with this conversion to shrubs (e.g. Pinyon-Juniper communities). These areas, because of altered fuel loads, often burn under very sever weather conditions when there is no possible control of the size, or location (1996 fire season). The important point is that we have successfully reduced the number of fires but not the acreage burned. There are now fewer but larger more intense fires. The general concerns associated with these types of fires are the degradation of watersheds and associated water quality, altered plant communities over extensive areas, soil surface can be left exposed for extend time periods increasing the loss of topsoil, no control of weather conditions to reduce smoke impacts on air quality, loss of forage for wildlife and livestock.

Prescribed fires are set to achieve specific purposes using designated fire prescriptions. Because a land manager can select the specific conditions needed to achieve the desired long term results, minimize both the long term and short term negative impacts. They can minimize the time soils are exposed to wind and water erosion, have the lease impact on the desired plant community, plan for changes in the forage available for wildlife and livestock, remove or minimize unwanted plants and weeds, improve animal distribution and use of the pastures, improve forage quality and maintain the desired type of cover needed for watershed management. Prescribed burn greatest advantage for wildlife and plant diversity is the natural mosaic pattern it creates. No other technique available is as effective in creating these patterns on the landscape. We can use mechanical (e.g. chaining)or herbicide but the mosaic pattern is not readily achieved for the same cost. Prescribed fire is the only technique many landowners have which can economically achieve these objectives simultaneously.

The effects of fire on our ecosystems are both negative and positive and both are associated with wildfires and prescribed fires. However, the negative effects can be minimized and the positive effects enhanced using prescribed fire and selecting when, where and under what conditions the fire will occur as well as being able to have specific manage plan in place after the fire.

The negative impacts of fire are often most sever under these wildfire conditions. Because there is no control of the preburn plant community a land manager must accept what will follow. Often these areas burn during the hottest, driest portion of the year which reduces the ability of the plants to recover on the site.. If there is not sufficient recovery of the vegetation cover in an adequate time period the result in an increased loss of soil from wind and water erosion. From a PM10 perspecive there are two concerns associated with these types of fires. First is the smoke problems during the wildfire and second is the dust problems associated with wind erosion on these large exposed areas following the fire. How long dust is a problem is dictated by the vegetation recover following the fire. This happens with both wildfires and prescribed fires, but in the case of the prescribed fire there is the ability to minimize the longer term impacts.

There are also short term and long term impacts on water quality following fire. In the

short term water quality is adversely affected following wildfires until the vegetation recovers to protect the site. The long term effect is that water quality and quanity can be improved or maintained depending on the plant community. These impacts can be found with both wildfires and prescribed fires. With prescribed fires a land manager can choose the type of burn conditions to minimize these negative impacts.

The greatest short term impact would be from smoke during the fire. With wildfires, managers have no control over the weather conditions, size or location of the burn. With prescribed fires the weather conditions can be selected to ensure adequate smoke dispersal. This is often referred to a clearing index. In addition, prescribed fire is now being used to alter the rangeland fuel beds to reduce the size, intensity and chance of the wildfires. A current EPA memo dated May1996 supports the use of these ideas for wildland fires. One concern, however, is that prescribed fires would not be allowed during specific periods. Because of the past exclusion of fire in many rangeland communities, fire can only be reintroduced and used during very specific weather conditions. Often these only occur one or two days a year. This could occur during periods of existing air quality problems. If they are not allowed then we will have to accept the effects of wildfires with there air quality problems as well as the long term problems associated with altered watershed values, wildlife habitat, livestock use and different plant communities.

Use of fire can lead to numerous positive environmental impacts simultaneously. A few examples include increased plant diversity, increased forage production from soil fertilization and altered plant competition (changed plant communities), increase forage palatability (both herbaceous and browse), improved animal distribution, management of unwanted plants, increased water yield and maintenance of plant communities that can reduce soil erosion. It is also important to realize that many of these benefits are realized only when subsequent management understands the positive and negative effects of fire and adjusts management to reduce the negative effects while maximizing the positive effects. Prescribed fire does no fit all situations but without fire many of our rangelands will not be sustainable because the alternatives (herbicides, mechanical, or biological) are too expensive, will not achieve all of the desired results, or have other unacceptable environmental impacts.

Specific effects

General Use - Other techniques are available that can achieve many of the same objectives as fire but they require multiple applications and have other environmental side effects. Examples include the use of herbicides to remove the shrubs and weeds from the plant community but these also remove most of the desired forbs needed to maintain and perpetuate the plant and wildlife diversity. Because of the increased nutrient content of the vegetation following fire wildlife and livestock use these areas more readily. It one of the few techniques that allows the private landowner to manipulate the distribution of wildlife as well as livestock.

Plant diversity

Wildfires generally set the successional plant community back to an earlier seral state. However, perennial grasslands and other resprouting plants can be maintained depending on the season and intensity of the fire. Cool season grasses are maintained by summer fires because they are dormant, while warm season grasses are maintained by early spring, fall or winter burns. Forbs can be enhanced for wildlife and aesthetic purposes by using summer or fall burns. Resprouting plants are not removed following fires but their stature is altered. Plants such as aspen in the west need some type of top removal to perpetuate the existing stand because establishment from seed is so rare. For nonsprouting shrubs and forbs fire acts as a top removal disturbance that can remove these plants from the community. These plants can then only return to the community through the germination and establishment of its seed. Some plants (e.g. many legumes) use the heat generated by fire to scarify their seed. This is the most important mechanism for many of these plants to regenerate. Without fire we could lose many of these species from our communities.

Wildfires do allow an increase in plant diversity because of the many annuals that can be released following the removal of the dominant vegetation. This generally leads to improved wildlife habitat because of the increased forbs that area associated with these burns. However, in the west with the introduction of cheatgrass, an introduced annual, wildfires are replacing the native shrub steppe communities with this annual and decreasing plant diversity as well as causing more frequent fires.

Wildlife.

Fires can alter the habitat structure to favor different species depending on how long it has been since the most recent fire. But the best use of fire is to create a diversity of habitats. Creating a mosaic of different habitat associated within the same landscape to be used by wildlife. Fire generally creates a natural mosaic most desired by many wildlife species. It also creates the greatest range of seral states, which results in the variety of habitats needed for many wildlife. The effect of fire on an individual is related to what that species needs. Some species require age specific plants (e.g Kirkland's Warbler) while others prefer the improved nutritional status of the vegetation regrowth following the burn. While still other animals are most benefited by the change in the vegetation structure. Fire can achieve all of these simultaneously. Another advantage fire offers is the benefits of scarifying seeds which provide mast. In the southeast this is an important factor in helping provide legume seeds for turkey quail and other bird species. Other techniques can be used but then only one of the objectives is generally obtained. Problems associated with the large wildfires that currently occur today are reduced mosaic patterns because of fuel loads and required burn conditions and the loss or reduction of safe islands for many species.

Soils

High intensity fires do result in alterations in the soils but on most rangelands the fuel load are not sufficient to cause long term problems with the exception of erosion if cover is not reestablished. Positive impacts often relate to increased soil nutrients but this is generally

only a one or two growing season effect. On rangelands most of the increased nutrient availability is related to the increased soil temperature which increase soil microbial activity. This activity increases OM decomposition and reduced OM. It took 5 years for the OM to come back to preburn levels in West Texas.

On shrub dominated areas with the high fuel loads and longer residual burning times an additional concern is the development of hydrophobic soils. This can occur when the heat volatilizes many of the organic materials which coat the soil particles. This can lead to increased soil erosion and reduced establishment of new seedling to help rehabilitate the site. The most common example of this is seen in California chaparral communities where these hydrophobic soils contribute to the major land slides following fires.

In the short term, soil erosion is often increased because of the loss of cover. This does not change until cover is reestablished. Depending on the growing conditions following the fire this can take weeks to years. With prescribed burns the fire can be set when managers have a better chance of predicting when vegetative cover can be reestablished. In the west, wildfires often occur in July-August. Little growth occurs until the next spring if there is sufficient winter precipitation. Low intensity burns can leave sufficient ground cover to minimize this effect. Burns occurring when there is adequate soil moisture and growing conditions can have sufficient cover within a few weeks. However, with wildfires intensities are higher resulting in less cover with little control for helping maintain some ground cover.

Soil moisture is often reduced because evaporation form the exposed soil surface and increased plant growth during the first growing season. However, these changes are short term and can be ameliorated by using appropriate burning conditions. On shrublands long term soil moisture can increase after the shrubs have been killed by fire. However, this depends on total precipitation and density of the shrubs.

SUMMARY OF COMMENTS FROM THE AGRICULTURE USDA AIR QUALITY TASK FORCE, TECHNICAL SUBCOMMITTEE TELECONFERENCE HELD OCTOBER 3, 1997 FROM 10:00 AM TO 11:15 AM

The following is a summary of issues and items that we agreed to address in preparing a briefing paper for Commissioner Bob Odom concerning EPA establishing Air Quality policy as it pertains to the use of fire in agriculture and forestry production and in the management of related natural resources. These issues should result in recommendations or considerations for any national policy addressing agriculture and wild land prescribed burning. Mr. Odom's testimony should include these recommendations:

1. There is not enough data currently available that demonstrates a need for EPA or states to formulate air quality standards for the agriculture and forestry industries.

2. Without adequate data there is considerable risk that unnecessary restrictive policies will be placed on use of fire by the agriculture and forestry industries resulting in adverse economic and human safety impacts.

3. The need seems apparent that EPA must delay formulating any new air quality policy that causes states to implement air quality plans that would inhibit agriculture and forestry burning until adequate monitoring is completed. This will allow researchers to determine actual air quality (PM 2.5) impacts from agriculture and forestry burning as well as natural occurring fire.

4. Monitoring programs should be structured to assess the trade-offs for the use of fire in resource management. That is an evaluation of the wide range of long term social, economic and environmental benefits from fire use versus its potential short term (seasonal) adverse impacts on air quality. Examples of beneficial impacts to be evaluated include but not limited to (a) human safety, (b) economic benefits to watersheds, individuals and society, (c) protection and management of natural resources (forest land, water quality, crops, soil, plants, range land and wildlife), (d) enhanced wildlife habitat, (e) increase plant and animal species diversity within specific ecological systems and (f) pest management.

5. Standards should be established for structuring, implementing and conducting a monitoring program with input from the USDA and USDI and state and local entities in all phases of the monitoring program including participating in the evaluation of data and how it was used in establishing federal and state air quality policies.

6. A list of documented cases showing that current EPA or state air quality policies have had an adverse impact on agriculture and forestry production.

7. Ms. Carol Browner's statement that Agriculture doesn't need to worry about the proposed PM 2.5 rule may be misleading. If agriculture activities through prescribed burning is minuscule, then agriculture should be exempt from the rule. If agriculture, however, is not to be exempt, then it is fair to assume that EPA will

shut agriculture down in any area exceeding the PM 2.5 standard. If this is true, then more scientific data is needed to validate agriculture's contribution to air quality degradation.