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"Weather Components to Consider During Burning Season"

I have always believed that we all have a new outlook once spring rolls around. Especially after the winter we have sustained this year. Spring brings new life, from the baby calves bouncing around our pasture sides, to the new blades of green grass shooting up. It reminds us of the cycle of life, that we see so fully here in the Kansas Flint Hills. One of the most natural processes that is essential to the health of our prairies, is fire. When used properly, fire can be a valuable tool!

Although many of us see the benefits of burning here in the Flint Hills, some of our neighboring states may not. Much of our smoke eventually finds its way to larger metropolitan areas causing air quality issues. There are a few steps we can take, here at home, to help combat this issue. To ensure that we can continue burning in the Flint Hills for years to come without regulations.

Weather conditions have a tremendous influence on the dispersal and transport of smoke. Weather forecasts and models can be used to select burn times that minimize the risk of smoke causing air quality issues. The following are weather components that affect smoke dispersion. **Air Pressure:** Pressure is the force per unit area exerted by the weight of the atmosphere. Avoid burning during periods of high pressure, which cause stagnant air conditions that keep smoke from rising. **Atmospheric Stability:** Atmospheric stability is the resistance of the atmosphere to vertical motion. Moderately unstable conditions improve smoke dispersal and are preferred for prescribed burning, but highly unstable conditions such as fronts increase the chance of a prescribed burn escaping and becoming a wildfire. **Lapse Rate:** Lapse rate is the rate of decrease in air temperature as elevation increases. It is an inverse measure of atmospheric stability. A plume of smoke will continue to rise and expand until it cools to the temperature of the surrounding air, at which point the smoke may sink back toward the ground and negatively affect air quality. The location where the plume sinks may be many miles from the fire location. **Temperature Inversions:** When a layer of warm air lies above a cooler layer of ground air, a temperature inversion exists. When rising smoke encounters this layer of warm air, it cannot disperse upward and remains near the ground. This can cause visibility and health problems in the area near the fire. **Mixing Height:** Mixing height refers to the height above ground level at which vertical air mixing air occurs. A low mixing height indicates that the air is stagnant, and smoke is held close to the ground. The lowest mixing heights often occur at night and early morning, with the highest mixing heights occurring in mid- to late afternoon. Since the mixing height generally decreases rapidly from late afternoon to nightfall, plan to burn during the middle of the day, when mixing heights are typically highest. **Wind:** While other factors control the vertical movement of smoke, wind is responsible for controlling its horizontal movement. Winds are typically light and variable when the atmosphere is stable. Wind speeds near the ground are often lower than transport wind speeds located higher in the atmosphere. As air cools at night, it becomes heavier and can drift down valleys and drainages. This type of wind is often responsible for overnight smoke intrusions into populated areas. **Humidity:** Water vapor combined with smoke can decrease visibility to near zero. Smoke particles act as condensation nuclei, promoting the fog formation. Temperatures near the dew point and low wind speeds promote fog formation. The combination of smoke and fog results in extremely low visibility, which increases traffic fatalities. Fog and smoke, alone and in combination, can move down drainage areas for miles, causing dispersion problems at locations distant from the actual fire. As smoke moves down the drainage basin, the air temperature becomes lower, the relative humidity becomes higher, and fog formation is more likely. Other locations where fog is likely to form are near streams, lakes, marshes, and wetlands. Humidity affects fuel moisture. As fuel humidity increases, combustion is slowed and more fuel is consumed during the smoldering phase. Smoldering combustion produces twice the amount of particulates as flaming combustion. High humidity conditions result in a decrease of emissions carried into the smoke plume, and lower lofting of the smoke plume into the atmosphere, both of which decrease smoke dispersion. Combustion of high-humidity fuels also releases water vapor that decreases visibility. Rain removes small smoke particles from the air, reducing smoke concentrations and improving visibility.

When planning a prescribed burn, consider not only the effects of the burn on or near the area burned, but also the effects of smoke on areas downwind. Individual producers using practices that mitigate the effects of the smoke from their fire can reduce air quality effects from the combined smoke from many fires.

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