Kansas Flint Hills Smoke Management Plan: How weather patterns affect smoke

The following is a slightly edited transcript of the second in a series of K-State's Agriculture Today radio broadcasts on the Kansas Flint Hills Smoke Management Plan. This is an interview with Kris Craven, meteorologist and fire/weather program leader with the National Weather Service in Topeka, conducted by Eric Atkinson of the K-State Radio Network. Podcasts of all Agriculture Today interviews can be found at: http://www.ksre.ksu.edu/news/DesktopDefault.aspx?tabid=66

Q: Grassland managers have to pay attention to the weather when they conduct their spring burning, correct?

A: As rangeland owners prepare to burn off their land, they look for fairly specific parameters to get the best burn conditions. Two big factors that are good to look at are wind and relative humidity. You don't want it to be too windy so that the fire gets away from you. And you don't want it to be not windy enough so that you don't have enough wind to push the fire. So a lot of times landowners are looking for a range of wind speeds between 5 and 15 miles per hour. Sometimes individual counties will set a maximum limit on wind speed for burning. A lot of counties won't let people burn when the wind speed gets over 20 miles per hour.

Wind speed works in combination with relative humidity. Grasses are very thin, and respond rapidly to changes in relative humidity, especially when conditions dry out in the afternoon during the spring and summer. Most people recommend that landowners burn in the range of 40 to 70 percent relative humidity. Anything below 30 percent and it gets a little dangerous because those fields start to get dry and they will burn fairly quickly. It gets a little difficult to burn at the higher range of relative humidities – 60 to 70 percent. It will take longer to burn under those conditions.

You want to look not only at conditions for the day you burn, but at conditions for the overnight hours and for the next day. Let's say you go out in the morning and you have the right conditions to burn. You get it burned off and you think you're done. But maybe you've left some stumps or paddies smoldering and the next day you get 40 mile-per-hour winds. Then you run the risk of reigniting that fire and having it move onto someone else's property.

Q: There are often limited opportunities to meet all of the ideal conditions for conducting a prescribed burn. That's why in many cases you'll see prescribed burning concentrated in a short time span.

A: Absolutely. It difficult in some instances to get those ideal conditions where it is both a little breezy and dry. But also, you want to burn at different times of the year for different purposes. For example, you might burn in February if you're trying to kill cedar trees. But the prime time of the year for pastureland burning to increase forage production for cattle or to decrease weed and invasive species populations, is in April. So there's a rush to get Flint Hills grasslands burned in the April timeframe.

Q: When it comes to how the smoke from pasture burning behaves, the weather and wind clearly have an effect. Are there other factors, too?

A: Surface winds are what we normally encounter since that's where we live. But as the smoke rises into the atmosphere, we calculate a parameter called mixing time. This is a fancy word for stating how high the atmosphere mixes in the middle of an afternoon. Let's say you mix to 3,000 feet. So you light your fire and get the burn going, and the smoke wafts up into the atmosphere and gets to 3,000 feet. Maybe there's a 15 mph wind to carry that smoke downstream. That's just what's happening today. That's a snapshot in time. The next day, let's say a front comes through and the wind direction changes. So now that smoke concentration which was moving toward Kansas City may now get shoved back toward Wichita. The problem is that the atmosphere is not a static condition; it is very dynamic. It is always changing, and predicting exactly how those smoke plumes will move is one of the challenges of smoke management.

Q: When there is a cloud ceiling overhead, that can clearly make a difference in how the smoke behaves, correct?

A: Absolutely. A lot of people recommend a minimum cloud ceiling of about 2,000 feet for pasture burning. And most will recommend you don't burn when there is complete cloud cover. About 70 percent or less cloud cover is what you're looking for. Clouds will act like a lid and keep the smoke down low. That may impact not only places that seem far away like Kansas City and Wichita, but that can also impact your local area as well.

Q: When you look at the smoke management plan from a meteorological standpoint, how do you view it in dealing with these smoke issues?

A: Everybody wants the plan to work. Burning is so beneficial in so many ways, there needs to be a burning plan in place so that we can get the burning done. At the same time, burning can have a pretty tremendous impact on human populations. So finding that balance without changing things too dramatically is really important.

Q: For those who conduct prescribed pasture burning, it is worth bringing up that the National Weather Service offers myriad information sources on its web site that can help in making these decisions on wind speed, direction, humidity, and so forth.

A: Yes. On our web site, which is www.weather.gov/topeka, we have a fire/weather tab. On that tab is a map you can click on and get a fire/weather forecast. We've trained our group to write a forecast specifically aimed at people who are burning. And we have our forecasters write a short discussion about how weather patterns will impact burning and fire behavior over the next couple of days. We've got tools that allow you to see hourly graphs on how the temperatures and winds will behave, and how the mixing zone will change throughout the day and the night. In terms of the smoke management plan, the main idea is that if we can just get people to spread out their burning a little more and get the concentrations down, then if our weather patterns in April aren't quite so great for

burning, we won’t find ourselves in a situation where everyone is trying to burn all at the same time.

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