Issue 949

K-STATE Research and Extension

Extension Agronomy

eUpdate

03/30/2023

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Wheat disease updates and outlook for stripe rust in 2023 Kansas wheat crop

The weather is warming, and wheat has started to green up across the state. With the onset of spring weather, it is time to look at factors that could influence the yield potential of the Kansas wheat crop. At K-State, we carefully watch regional stripe rust reports, particularly to our south. On March 6, Amir Ibrahim, Texas A&M AgriLife Research, reported stripe rust in a disease observation nursery in Castroville, TX where the disease is allowed to develop naturally. At the time of this publication, there have been no stripe rust observations in Oklahoma or Kansas.

Looking south helps predict stripe rust outbreaks in Kansas

There are several factors that contribute to the development and severity of stripe rust in our region. The stripe rust pathogen typically does not survive in Kansas over the winter but can survive in Texas through the winter months. Because of this, weather conditions in Texas in the fall and early spring can be important predictors of how bad stripe rust will be in Kansas.

A look at the moisture patterns for 2022-23 indicates there was some moisture in Texas in the fall (map on left in Figure 1) which may have been favorable for rust development. However, conditions have been dry through the early spring, which likely suppressed the early stages of disease development and spread. (map on right in Figure 2) What does that mean for us? We likely will have below-average levels of spores that arrive in Kansas during our critical growth stages, and a lower risk of severe yield losses to stripe rust this year. Remembering this is just a piece of the puzzle in determining risk is important. The severity of stripe rust in Kansas after it is first detected will largely be driven by local weather conditions and the varieties that are planted in the state. The disease situation can change rapidly, and it is important to continue to watch for signs of disease development as the season progresses.

Once stripe rust is detected in Kansas, cool evenings and extended periods of canopy moisture will be necessary for disease establishment at levels that would result in yield loss.

We will continue to provide updates on stripe rust occurrence and weather outlook as we move toward critical growth stages for fungicide applications in Kansas over the next several weeks.

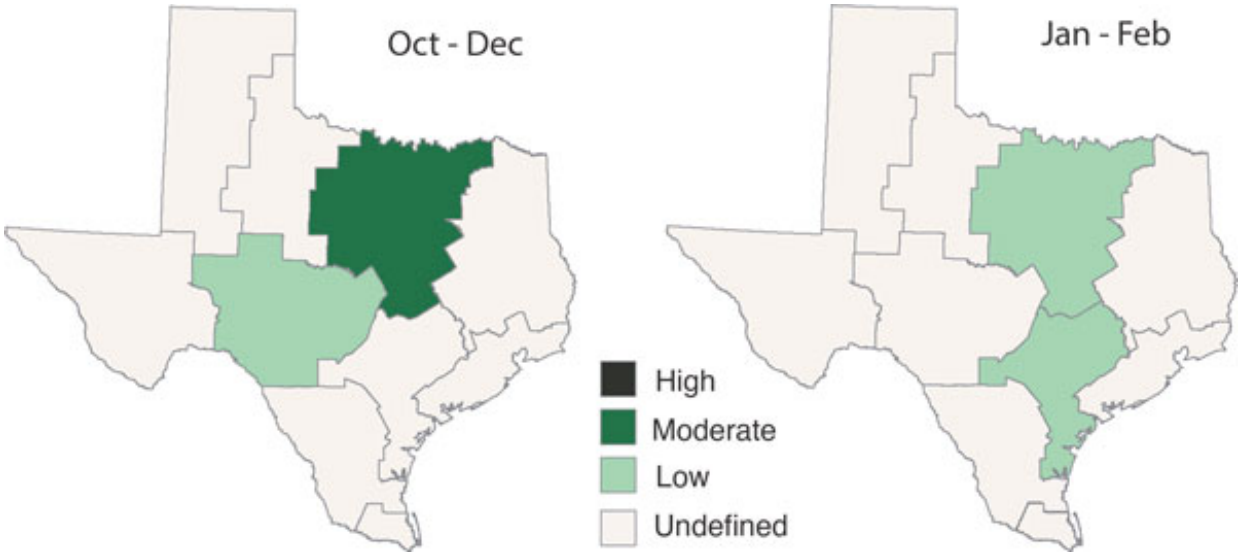

Figure 1. K-State research has shown that the annual severity of stripe rust outbreaks in Kansas can be predicted by soil moisture in key regions of Texas in both the fall and the early spring. In 2022, soil moisture in Texas was low to moderate (indicated by light/medium green colors on the map). In the spring of 2023, there was low soil moisture in some of the key regions of Texas. These maps show soil moisture levels based on the "Palmer Z-Index" provided by NOAA-National Centers for Environmental Information.

Please contact us (andersenk@ksu.edu) if you detect stripe rust in Kansas so we can update regional maps.

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2. Wheat viruses in Kansas: Who's who?

At this time of the year, we are starting to see wheat viruses show up across the state. Although some of these viruses can sometimes be difficult to distinguish by eye, they do behave differently in the field. Here is a review of some key facts about wheat viruses and some timely reminders for sample submission to the Plant Disease Diagnostic Lab.

Wheat Soilborne Mosaic Virus

Wheat soilborne mosaic virus is most common in the eastern two-thirds of Kansas and typically first appears as large, irregular patches of stunted, yellowing wheat in a field. From the road, these can be confused with a number of other production problems such as winter injury, or nutrient deficiencies. Upon closer inspection, leaves appear to have a yellow background with irregular green blotches (Figure 1). Optimal temperatures for symptoms of this virus are cool (around 60 F). The symptoms fade when daytime temps rise into the mid-70s. Because of this cool temperature preference, we typically see symptoms at the tillering through jointing growth stages and not later in the season.

This virus is vectored into wheat by a fungal-like organism called *Polymyxa graminis* that can survive in the soil for up to 30 years. When soil moisture is high, this organism produces spores that can swim and attach themselves to wheat roots. After they attach, they shepherd in the virus, and infection occurs. Infection may be the worst in areas of the field with higher moisture (such as low spots) and in continuous wheat fields. Equipment has the potential to move soil-infested spores to new locations.

Luckily, many of the varieties available in the eastern part of Kansas have resistance to this virus. Susceptible varieties are at risk of yield loss caused by the disease. Much of this yield loss is attributed to lower kernel weight and fewer kernels per spike. To check if your variety is resistant, please see the Kansas Wheat Variety Guide: https://bookstore.ksre.ksu.edu/pubs/mf991.pdf. For more information on this virus: https://bookstore.ksre.ksu.edu/pubs/ep166.pdf.

Figure 1. Wheat with symptoms of wheat soilborne mosaic virus. Photo by Erick DeWolf, K-State Research and Extension.

Wheat Spindle Streak Mosaic Virus

Wheat soilborne mosaic virus can be confused with a second virus known as **wheat spindle streak mosaic virus**. It is not uncommon to see plants infected with both soil-borne mosaic and spindle streak mosaic. This virus is also most common in eastern Kansas. This virus is also transmitted by *Polymyxa graminis* and the conditions for infection (cool, wet soil) are similar. This virus will also show up first as yellowing patches in the field. These two viruses have subtle symptom differences, with spindle streak symptoms appearing as thin yellow streaks or dashes on green leaves (Figure 2). Spindle streak can result in reduced tillering which may drive yield reductions. As with soilborne mosaic virus, variety resistance is really the only management tool that we have but can be highly

effective. To check if your variety is resistant, please see the Kansas Wheat Variety Guide: https://bookstore.ksre.ksu.edu/pubs/mf991.pdf.

Figure 2. Wheat with symptoms of wheat spindle streak mosaic. Notice the yellow, linear lesions that are tapered at both ends. Photo by Erick DeWolf, K-State Research and Extension.

Barley Yellow Dwarf

Unlike the two viruses mentioned above, **barley yellow dwarf virus** is transmitted by several species of aphids while they feed, including bird-cherry-oat aphids, English grain aphids, and greenbugs. Infection can occur in the fall or the spring, with fall infections resulting in the highest potential for yield losses. Avoidance of early planting, variety resistance, and systemic insecticide seed treatments are the best way to manage this virus. Symptoms usually appear as purple to yellow leaf tip discoloration and plants will appear stunted (Figure 3). The symptoms of barley yellow dwarf are most visible between jointing and early stages of grain development when warm temperatures favor disease development. Heads of infected plants may be darkened before harvest and grain can be shriveled, resulting in yield losses.

Figure 3. Classic red/purple leaf tips of wheat infected with barley yellow dwarf. In some cases, symptoms will appear more yellow. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Wheat Streak Mosaic Virus Complex

The viruses that cause **wheat streak mosaic** need no introduction in many parts of western Kansas. Wheat streak mosaic is one of the most economically devastating wheat diseases in Kansas. While this disease is most common in western Kansas, we have seen an uptick in affected fields in the central corridor over the last couple of years. This disease can be caused by several viruses, including wheat streak mosaic virus, triticum mosaic virus, and wheat mosaic virus (high plains). These viruses are vectored by the tiny wheat curl mite, which survives between seasons on volunteer wheat and other grassy hosts. Infections can occur in the fall or spring but can result in more severe yield loss when they occur in the fall after planting. Unlike soilborne mosaic virus or spindle streak mosaic virus which slow down at temps about 70 F, wheat streak mosaic symptoms develop most rapidly at temperatures above this threshold. We often see symptoms appear when temperatures warm in the spring. We expect to see an increase in samples in the diagnostic lab over the coming weeks as the crop moves into the jointing stages of growth. Symptoms appear as green and yellow streaks on wheat leaves (Figure 4). The best management strategy is to destroy nearby volunteer wheat within

two weeks of planting. There are also varieties that carry some resistance to these viruses. More info: https://bookstore.ksre.ksu.edu/pubs/MF3383.pdf

Photo 4. Stunted plants infected with wheat streak mosaic virus exhibit classic green and yellow mosaic symptoms. Photo by: Kelsey Andersen Onofre, K-State Research and Extension.

Important considerations for submitting wheat samples to the diagnostic lab

Testing for each of these viruses is available in the K-State Plant Disease Diagnostic Clinic. High-quality samples are critical for an accurate diagnosis. So far, in 2023 the clinic has received several positive samples for Wheat Streak Mosaic Virus, Wheat Spindle Streak Mosaic Virus, and Wheat Soilborne Mosaic Virus in Crawford, Reno, McPherson, and Rice counties in Kansas. Below are some reminders about sample submissions that are especially important when submitting wheat to the clinic.

Sample Submission

- Collect and ship samples on the **same day** using **OVERNIGHT shipping**

    - Collect healthy and symptomatic plants (labeled accordingly)
    - Collect the **ENTIRE** plant (see Figures 5 & 6)
        - **Dig** up the plant to keep the root system intact
        - Bag roots separately to avoid soil contact with leaves
        - Place bagged roots and above-ground materials in a larger plastic bag
    - Label and use plastic bags instead of paper and do NOT add water. This maintains sample integrity.
- Once collected:
    - Fill out the submission form with as much information as possible. Include variety/hybrid info (especially for wheat)
    - Ship plants ASAP **overnight** via **UPS or FedEx** when possible. USPS can take up to 14 days
- Send photos to clinic@ksu.edu with the tracking number or date shipped
    - 3 types of images
        - Symptom/problem close up and in focus
        - Entire plant from ground level to the top of plant
        - Site – capture the pattern in the field; transition areas, terraces, etc.

Figure 5. A high-quality sample where the entire plant was submitted in a large plastic bag with the roots bagged separately. This sample was shipped overnight and arrived in excellent condition. Photo by Chandler Day, K-State Research and Extension.

Photo 6. A low-quality sample where only leaf tissue was submitted in a paper bag. This sample was shipped using USPS priority mail but took over 7 days to arrive in the clinic. Photo by Chandler Day, K-State Research and Extension.

Reminders/Updates

- High-quality samples lead to a high-quality diagnoses
- New Services
    - Molecular diagnosis (increased detection capability)
        - Sudden Death Syndrome
        - Bacterial Leaf Streak of Corn
    - Triticum mosaic virus (TriMV) added to wheat virus screen (ELISA)
- Wheat Virus Screen (6 viruses – WSMV, **TriMV**, HPWMoV, WSSMV, SBWMV, BYDV-PAV)
    - Submit samples before 5 pm on Wednesdays for results on Fridays
    - $50 for extension clients
    - $70 for non-extension clients

If you have any questions, comments, or concerns, please reach out to clinic@ksu.edu or

785-532-6716.

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3. First hollow stem update - March 30, 2023

Cattle should be removed from wheat pastures when the crop reaches first hollow stem (FHS). Grazing past this stage can severely affect wheat yields (for a full explanation, please refer to the eUpdate article "Optimal time to remove cattle from wheat pastures: First hollow stem").

First hollow stem update

In order to screen for FHS during this important time in the growing season, the K-State Extension Wheat and Forage's crew measures FHS every week in 21 different commonly grown wheat varieties in Kansas. The varieties are in a September-sown replicated trial at the South Central Experiment Field near Hutchinson.

Ten stems are split open per variety per replication (Figure 1), for a total of 40 stems monitored per variety. The average length of hollow stem is reported for each variety in Table 1. As of March 27, two varieties had already reached first hollow stem (KS Hatchett and LCS Atomic AX), and all varieties had started to elongate their stems. Other advanced varieties that were above 1 cm of first hollow stem (but still below the threshold) were AP EverRock, Armor EXP6 AX, CP7050 AX, CP7909, and LCS Galloway AX. All varieties had reached at least 0.46 cm of first hollow stem so they should attain the 1.5 cm threshold fairly quickly from now on.

Figure 1. Ten main wheat stems were split open per replication per variety to estimate first hollow stem for this report, for a total of 40 stems split per variety. Photo by Romulo Lollato, K-State Research and Extension.

Table 1. Length of hollow stem measured on February 22, 27, March 6, 13, 20, and 27, 2023 for 21 wheat varieties sown mid-September 2022 at the South Central Experiment Field near Hutchinson. The critical FHS length is 1.5 cm (about a half-inch or the diameter of a dime). Value(s) in bold indicate the highest FHS group.

	First hollow stem (cm)					
Variety	**2/20**	**2/27**	**3/6**	**3/13**	**3/20**	**3/27**
AM Cartwright	0	0	0.08	0.19	0.26	0.86
AP EverRock	0	0	0.08	0.29	0.35	1.18
AP Prolific	0	0	0.04	0.16	0.2	0.61
AP18 AX	0	0	0.06	0.3	0.31	0.64
ARMOR EXP55	0	0	0.05	0.24	0.31	0.97
ARMOR EXP6 AX	0	0	0.05	0.29	0.36	1.05
CP7017 AX	0	0	0.06	0.29	0.31	0.91
CP7050 AX	0	0	0.06	0.27	0.42	1.13
CP7266 AX	0	0	0.07	0.2	0.27	0.7
CP7869	0	0	0.08	0.26	0.35	0.93
CP7909	0	0	0.11	0.23	0.31	1.33
Guardian	0	0	0.05	0.22	0.21	0.91
Kivari AX	0	0	0.08	0.21	0.35	0.91
KS Ahearn	0	0	0.09	0.21	0.28	0.46
KS Hatchett	0	0	0.06	0.18	0.38	**2.03**
KS Providence	0	0	0.07	0.2	0.31	0.65
LCS Atomic AX	0	0	0.06	0.32	0.58	**2.68**
LCS Galloway AX	0	0	0.06	0.22	0.33	1.21
LCS Steel AX	0	0	0.05	0.25	0.3	0.95
LCS19DH-152-6	0	0	0.02	0.17	0.32	0.78
Whistler	0	0	0.05	0.25	0.28	0.62
Average	0	0	0.06	0.24	0.33	1.02

We will report first hollow stem during the next few weeks again until all varieties are past this stage. Additionally, first hollow stem is generally achieved within a few days from when the stem starts to elongate, so we advise producers to closely monitor their wheat pastures at this time.

This report intends to provide producers with an update on the progress of first hollow stem development in different wheat varieties. Producers should use this information as a guide, but it is extremely important to monitor FHS from an ungrazed portion of each wheat pasture to decide on removing cattle from wheat pastures.

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4. Entry to the National Wheat Yield Contest is open

Every year, the National Wheat Foundation promotes a National Wheat Yield Contest, with winners coming from many states and, in many cases, from Kansas (Figure 1).

Central Plains growers are enduring very tough conditions during the season. While at first, this may make you think that with these drought conditions, your wheat will never compete in a yield contest. In fact, these conditions may increase the chances of a given field winning within some categories of the contest. This is because the contest is designed to recognize not only yield but also yield over county averages. Thus, some lucky fields that received some rain when the majority of the county did not may be good candidates to win this category – should the management be appropriate.

Figure 1. Field of the white winter wheat variety Joe near Leoti, KS, that won state and national wheat yield contest in 2016. Growers include Alec, Ken, Matt, and Rick Horton. Photo by Romulo Lollato, K-State Research and Extension.

Last year, Brett Oelke from Hoxie, Kansas, was a national winner in the "percent over county" category (Figure 2). Brett had a later-maturing variety and was able to take advantage of late May

rains. Just like all contest winners, Brett received a trip to the Commodity Classic and was recognized at the Winner's Reception. His wheat was also recognized for top quality ensuring that he received a $250 gift card. Moreover, Brett also was selected out of a drawing of the hard wheat winners to receive a hand-held GrainSense analyzer.

Figure 2. Brett Oelke, from Hoxie, Kansas received the recognition as a National Wheat Yield Contest winner in the percent over county category. Photo by Anne Osborne.

Entering is easy and must be done by May 15 for winter wheat, although you are encouraged to enter by April 15 to get into an early entry drawing for a Bushel Farm Business subscription. You only need a 5-acre plot to enter. Each entry costs $100, but we have several partners with vouchers you can use to enter at no cost to you. You must be a current member of the Kansas Wheat Commission or your state's wheat grower organization.

Even if you are not sure how your winter wheat will finish, please enter by May 15. No late entries will be accepted. Go to www.yieldcontest.wheatfoundation.org to enter and read the complete rules.

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5. Learn the difference between fire weather watches and red flag warnings

This year has had a slow start to fire season across the state. This has been in part to dry conditions not aligning with environmental conditions. As a result, fire weather concerns have been marginal and there have been fewer than normal large fires across the state. Unfortunately, conditions are changing as several wind events are forecasted for the coming days combined with very dry air. Therefore, it's important to understand the different types of fire weather products issued by the National Weather Service as they are issued in the coming days: Red Flag Warnings and Fire Weather Watches.

A **Red Flag Warning** is issued for critical fire danger and signifies that those weather conditions are occurring, or will occur shortly. These critical weather conditions consist of a combination of strong winds, low relative humidity, and warm temperatures – all of which make fire suppression very challenging. Thresholds for these warnings vary by your local associated NWS forecast office (see Table 1).

A **Fire Weather Watch** is issued in advance of critical fire danger. These Watches signify the forecasted possibility of critical fire weather occurring in the next 24-48 hours. Some offices issue these more than others. These Watches are meant to provide you advance notice so that you can take proper precautions and/or make better decisions based upon these forecasts.

Table 1. Red Flag thresholds by National Weather Service Forecast Office

Red Flag Warning Thresholds		
Forecast Office	**Relative Humidity**	**Wind Speeds/Gusts**
Goodland	15%	Gusts 25 mph or greater
Dodge City	15%	Gusts 25 mph or greater
Hastings, NE	20%	Sustained winds 20mph/gusts 25 mph
Wichita	Extreme Grassland Fire Danger Index	
Topeka	20%	Sustained winds 20mph/gusts 25 mph
Pleasant Hill, MO	25%	Gusts 25 mph or greater
Springfield, MO	25%	Gusts 25 mph or greater

Generally, these weather conditions create an atmosphere with explosive fire growth potential. Any spark has the potential to create a large fire that will resist typical suppression efforts. Use appropriate caution, such as avoiding outdoor burning, watching for hot exhaust systems over grass, and extra care with welding or anything that might create sparks.

Note that these Warnings/Watches only occur when fuels (material that burns such as grass, leaves, cedars, etc.) are able to efficiently carry fire. During the winter, our grasses are dormant and dead. This provides ample fuel for the fire to easily carry. Therefore, these alerts most often occur between October and May (Figure 1), until the spring rains arrive to drive grass growth again. This doesn't

mean that the fire weather potential isn't there for the remaining months. During periods of drought, grasses can become dormant and carry fire. These particular situations are more difficult to forecast in advance. Reports of fire carrying exceptionally well and being difficult to suppress are critical to the forecast process. If you feel these conditions are occurring, don't hesitate to contact your local office and spread that information.

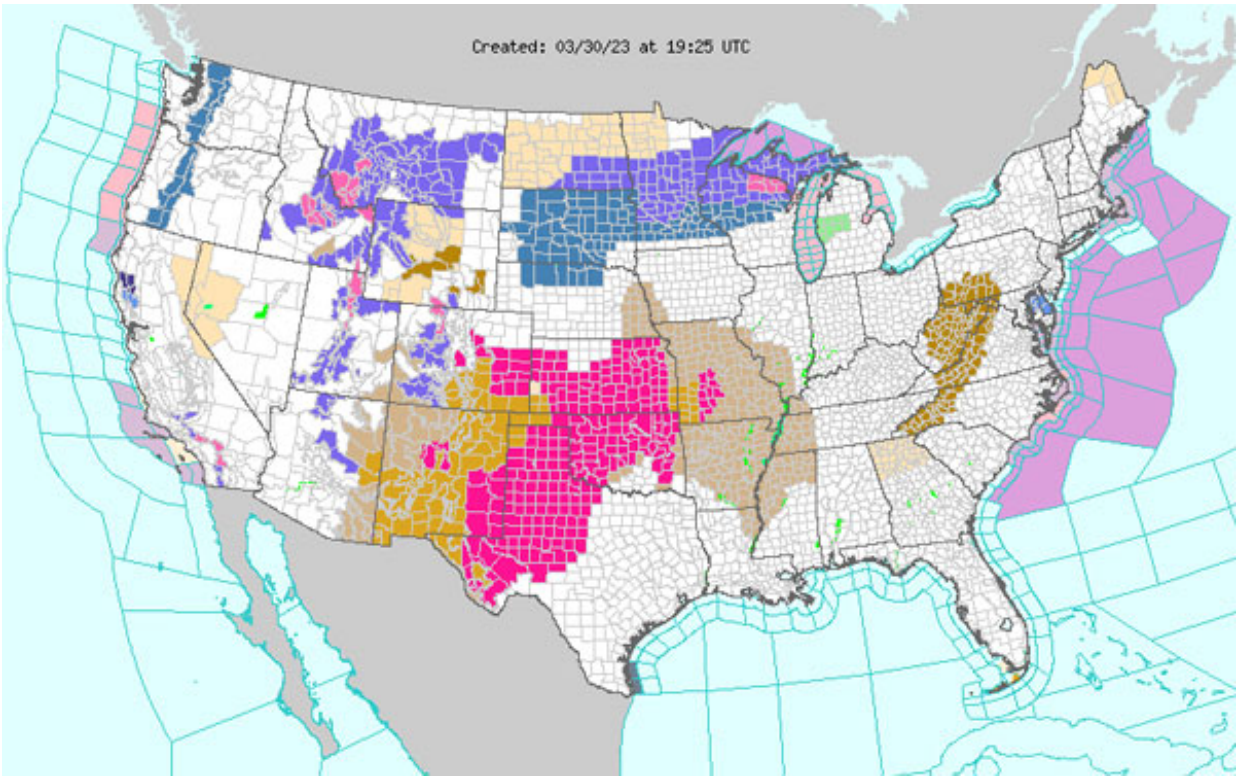

Figure 1. Red flag warnings (bright pink) on March 30, 2023. Source: National Weather Service

While 2023 Red Flag Warnings have numbered less than the last few years so far (Figure 2), it is important to note that our fire season stretches for several more months. With the increase in fire conducive conditions, these numbers will increase as well in the coming days. Similar to last year when fire season peaked in April, the recent cold spell in March has slowed down spring green up. This allows for vegetation across the state to be continually conducive to fire spread. It will remain this way until multiple significant moisture events occur and warmer temperatures remain consistent, allowing for cool season grasses to green.

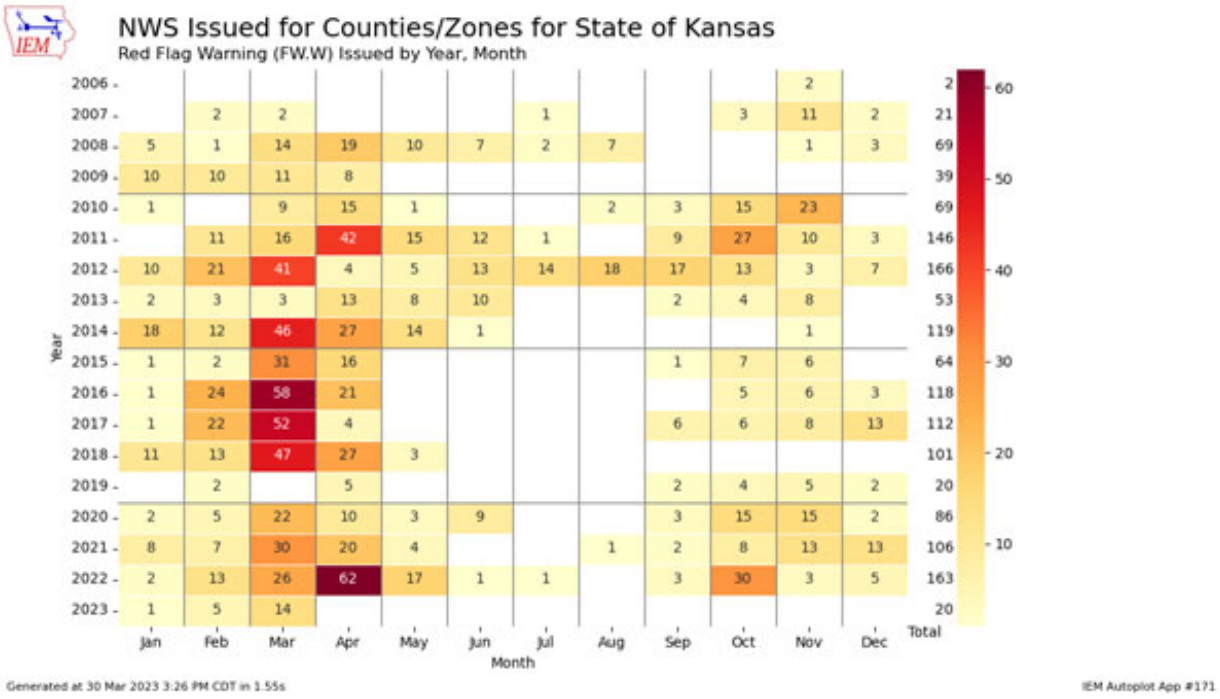

Figure 2. Red Flag Warnings issued in Kansas by month since 2006. Image from the Iowa Environmental Mesonet.

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6. New episodes of the War Against Weeds podcast address timely issues for farmers

Season five of the popular War Against Weeds podcast is well underway. In response to recent questions from farmers, the two newest episodes take a closer look at the emphasis the Environmental Protection Agency (EPA) is putting on the Endangered Species Act (ESA) with respect to pesticide use. This 2-part series on the ESA offers good information and discussions on the potential changes and impacts the new ESA emphasis will have on pesticide users. In Part 1, the Indiana pesticide administrator, Dave Scott, discusses how the ESA's new emphasis will affect state regulators and farmers. Part 2 is led by recently retired EPA weed scientist and biologist Bill Chism. He discusses some of the history of the ESA and what impacts the new emphasis may present.

Another new episode for 2023 features information on different weed identification mobile apps that can be useful for agricultural agents and others.

This podcast began in January 2021 and is a collaborative outreach effort from Sarah Lancaster, K-State Extension Weed Science Specialist, Mandy Bish, Extension Weed Scientist at the University of Missouri, and Joe Ikely, Extension Weed Scientist at North Dakota State.

There are currently about 90 full-length episodes available. Season five officially started in January 2023. Topics covered so far in 2023 include herbicide-resistant ryegrass, new challenges with kochia control, metribuzin use in soybeans, cover crops for weed control, weed mapping and imaging, and more!

Episodes are approximately 30 minutes long and free to access. They are posted at https://waragainstweeds.libsyn.com/ in addition to being available on Spotify, iTunes, and Google Podcasts.

If you have any suggestions for future episodes, please let us know!

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