



Extension Agronomy

eUpdate

04/06/2018

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy e-Update 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 Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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1. First hollow stem update: April 5, 2018

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 eUpdate article “Optimal time to remove cattle from wheat pastures: First hollow stem” in the Feb. 23, 2018 issue).

First hollow stem update

In order to screen for FHS during this important time in the growing season, the K-State Extension Wheat and Forages crew measures FHS on a weekly basis in 28 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 varieties in Table 1. **As of April 5, all varieties had reached first hollow stem.**



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 Feb. 21, Feb. 28, March 6, March 14, March 21, March 23, March 28, April 3, and April 5, 2018, of 28 wheat varieties sown mid-September 2017 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). Least significant difference (LSD) between varieties for statistical significance is also shown.

Variety	2/21	2/28	3/6	3/14	3/21	3/23	3/28	4/3	4/6
AM Eastwood	0.19	0.28	0.30	0.52	0.79	2.35	--	--	--
NE10478-1	0.15	0.25	0.24	0.44	0.71	1.11	1.66	--	--
LCH13-22	0.16	0.21	0.24	0.40	0.65	1.39	1.99	--	--
LCH14-55*	0.17	0.19	0.25	0.42	0.51	1.12	2.06	--	--
LCH14-89	0.15	0.22	0.24	0.39	0.58	1.16	1.72	--	--
LCS Chrome	0.16	0.20	0.25	0.30	0.42	0.81	1.15	1.58	--
LCS Pistol	0.17	0.22	0.27	0.41	0.63	1.55	--	--	--
Bentley	0.12	0.22	0.23	0.35	0.58	1.20	1.46	1.66	--
Doublestop CL Plus	0.15	0.21	0.26	0.32	0.48	1.17	1.39	1.82	--
Gallagher	0.18	0.26	0.30	0.50	0.69	1.64	--	--	--
Iba	0.16	0.20	0.26	0.41	0.53	1.31	1.63	--	--
Lonerider	0.15	0.21	0.26	0.41	0.74	1.78	--	--	--
OK12716	0.15	0.21	0.28	0.35	0.61	1.36	1.51	--	--
Ruby Lee	0.13	0.19	0.25	0.46	0.57	1.46	2.28	--	--
Smith's Gold	0.18	0.27	0.24	0.48	0.89	1.29	2.42	--	--
Spirit Rider	0.19	0.24	0.31	0.47	0.55	1.65	--	--	--
Stardust	0.18	0.23	0.25	0.43	0.73	1.68	--	--	--
Paradise	0.19	0.23	0.32	0.43	0.78	1.24	2.37	--	--
Bob Dole	0.19	0.25	0.28	0.35	0.75	1.35	1.78	--	--
SY Achieve CL2	0.18	0.26	0.25	0.54	1.33	2.52	--	--	--
SY Benefit	0.18	0.26	0.30	0.52	1.02	2.43	--	--	--
SY Rugged	0.13	0.23	0.23	0.39	0.73	1.05	1.75	--	--
1863	0.21	0.24	0.30	0.63	1.27	1.57	--	--	--
Joe	0.16	0.21	0.27	0.37	0.59	1.18	1.62	--	--
Larry	0.15	0.22	0.25	0.39	0.58	1.31	1.52	--	--
Oakley CL	0.14	0.21	0.28	0.37	0.43	0.57	1.34	1.48	2.53
Tatanka	0.12	0.22	0.24	0.38	0.66	1.20	1.70	--	--
Zenda	0.19	0.23	0.28	0.41	0.54	1.08	1.72	--	--
Variety differences	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
LSD	-	0.04	-	0.33	0.90	0.79	0.39	0.47	-

The last variety to reach FHS was Oakley CL, which reached first hollow stem between April 3rd and 5th. At this time, cattle should already have been removed from wheat pastures if the intent is to harvest for grain, irrespective of wheat variety.

The intention of this report is to provide producers 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 individual wheat pasture to take the decision of removing cattle from wheat pastures.

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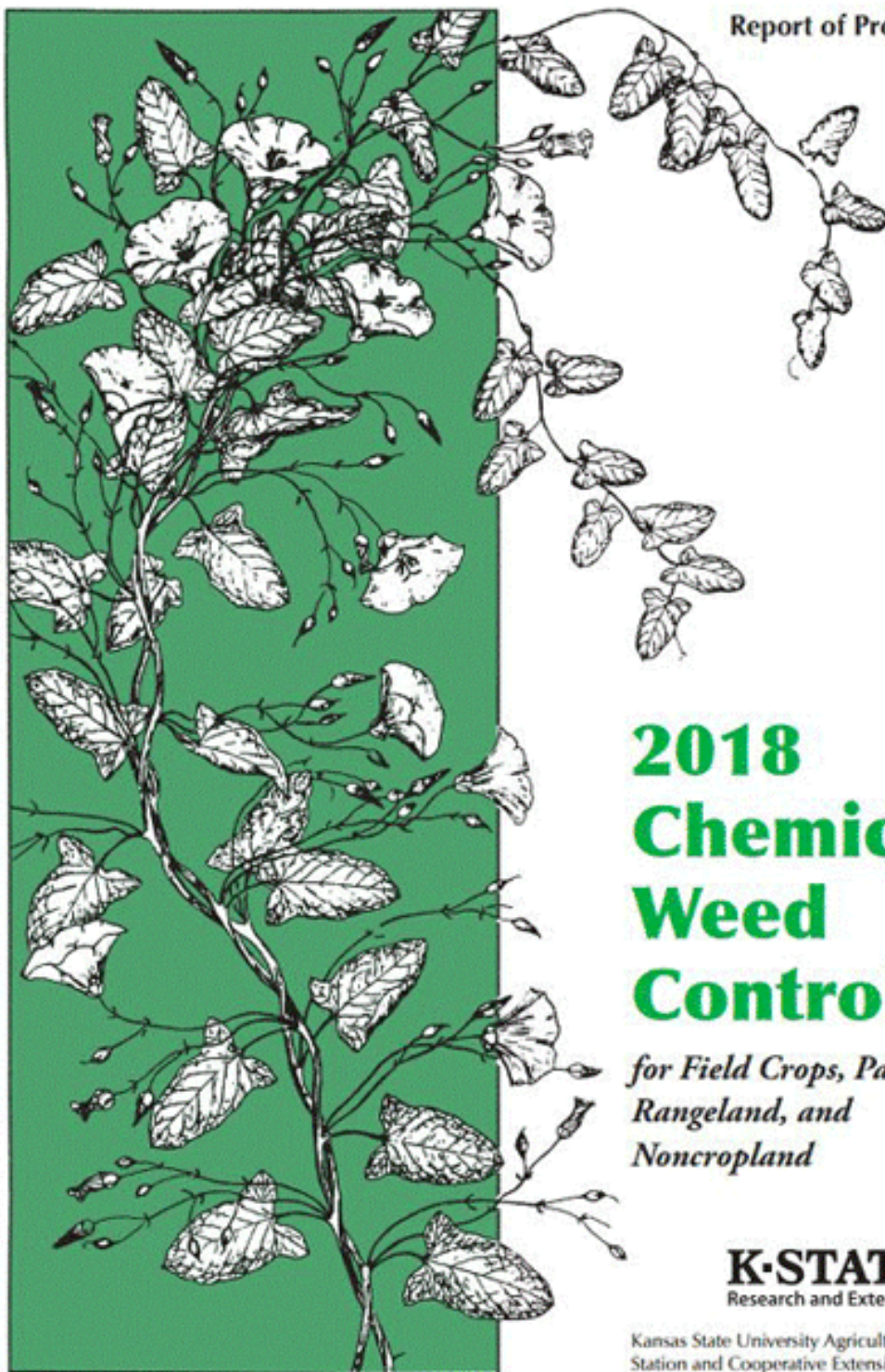
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2. Preemergence herbicide programs for corn

Difficult weeds, especially glyphosate-resistant weeds, are controlled most consistently with soil-applied herbicides which kill germinating seeds/seedlings. Much of the resistance to glyphosate has developed from over-reliance on postemergence herbicide applications for weed control. Thus it is essential to include one or more of the preplant and preemergence residual herbicides available for corn. The specific herbicide you use, although important, is usually less important than just making the decision to use a preplant or preemergence herbicide.

It is important to use multiple modes of action when selecting herbicides. To assist growers, we have included in this article a reference number in parentheses that corresponds to the herbicide's mode of action. For example, the reference number herbicide mode of action for glyphosate is No. 9, and will be referred to in this article as "glyphosate (9)." There is a key to all herbicide modes of action at the end of this article. When there are two or more numbers in parentheses, it means the active ingredients in a product have different modes of action. If a herbicide is mentioned more than once in a paragraph, we include the reference number only after the first mention of the product in that paragraph.

It is important to change herbicide programs from time to time so that you do not get hooked on any single herbicide program year after year. Weed species shift and develop resistance to herbicide programs that do not change. It's also important to know the strengths and weaknesses of each product in terms of the spectrum of weeds controlled. A table summarizing weed species response to various corn herbicides can be found on pages 24-26 of *2018 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland* (SRP 1139). See: <https://www.bookstore.ksre.ksu.edu/pubs/SRP1139.pdf>



2018 Chemical Weed Control

*for Field Crops, Pastures,
Rangeland, and
Noncropland*

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For burndown applications in a no-till system on emerged grass and broadleaf weeds, an application of glyphosate (9) and a product containing dicamba (4) or 2,4-D (4) may be critical. The choice between 2,4-D and dicamba will depend on weed species present. Dicamba products will be more effective on kochia and marehail. 2,4-D is more effective on winter annual mustards. The use of

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preemergence herbicides, applied just before or following planting, often provides control of weeds for several weeks. This can greatly improve the effectiveness of a postemergence herbicide application, and gives the producer more leeway on post application timing.

Categories of soil-applied residual herbicides for corn

Soil-applied residual herbicides for corn can be grouped into several basic categories.

Triazine (5). Atrazine (5) is a common component of many preplant and preemergence herbicide premixes for corn. Where weed pressure is light, a March application of atrazine with crop-oil concentrate and 2,4-D (4) or dicamba (4) can control winter annual weeds such as mustards and marestail and provide control of most germinating weeds up to planting. If kochia is the key target, 0.5 to 1.0 lb/acre atrazine (5) with a pint of dicamba (4) applied in late February to early March can provide excellent control of germinating kochia. It is essential to add glyphosate (9) to the mix if winter annual grasses are present. In a premix with other herbicides, atrazine adds burndown control of newly emerged grasses and broadleaf weeds present near planting time, as well as some residual control of small-seeded broadleaf weeds such as pigweeds and kochia (except for triazine-resistant populations). Unless your situation prohibits atrazine use, always apply atrazine (5) with HPPD-inhibitor (27) and acetamide (15) herbicides.

Acetamides (15) and pyrazole (15) /atrazine (5) premixes. The main acetamide (15) products used in corn include acetochlor, S-metolachlor, metolachlor, dimethamid-P, and many premix products containing one of these active ingredients. The pyrazole products include Pyroxasulfone (15). In general, these products are very effective in controlling annual grasses (except shattercane and Johnsongrass) and small-seeded broadleaf weeds such as pigweeds. They are much less effective in controlling small-seeded kochia or large-seeded broadleaf weeds such as cocklebur, devilsclaw, morningglory, sunflower, and velvetleaf. An exception are those products containing pyroxasulfone – Zidua (15), Anthem (15, 14), and Anthem ATZ (15, 14, 5). These products have activity on kochia and the large-seeded velvetleaf. There have been no cases of weed populations in Kansas developing resistance to the group 15 herbicides to date.

The acetamide and pyrazole products are most effective when applied with atrazine. Several atrazine (5) /acetamide or pyrazole (15) premixes are available and should be used instead of acetamides or pyrazole alone unless atrazine is not allowed. These premixes generally fit into two groups: products with a reduced atrazine rate (1 lb or less / acre) and products with a full atrazine rate (1 to 2 lb/acre). Soil type, soil pH, and organic matter will determine whether the reduced- or full-rate atrazine product is used. In past years, often because of cost, reduced rates of these products were applied to help manage heavy summer annual grass pressure, then followed up with a good postemergence herbicide program. With the increased occurrence of glyphosate- and other herbicide-resistant weeds, it is essential to use the full rates of these products in conjunction with a POST program.

HPPD-inhibitors (27). Examples of HPPD-inhibitors are isoxaflutole (e.g. Balance Flexx (27), Corvus (27, 2), and Prequel (27, 2)) and mesotrione (e.g. Callisto and many Generic (27), Callisto Xtra (27, 5), Resicore (27, 15, 4), Acuron (27, 15, 5), Lexar EZ (27, 15, 5), Lumax EZ (27, 15, 5), Acuron Flexi (27, 15), Zemax (27, 15). These products either contain atrazine or should be applied with atrazine, and are excellent on kochia, pigweeds, velvetleaf, and many other broadleaf weeds.

Acuron (27, 15, 5), Lexar EZ (27, 15, 5), Lumax EZ (27, 15, 5), Resicore (27, 15, 4) and Corvus (17, 2)+atrazine (5) provide excellent control of grass weeds. Corvus will also control shattercane. Balance

Flexx has activity on shattercane but is less consistent than Corvus. Prequel has a low rate of Balance mixed with Resolve and will not provide the same level of residual weed control as Acuron, Resicore, Lexar EZ, Lumax EZ, Balance Flexx, or Corvus used at full rates. Keep in mind, products containing Balance should not be applied to coarse-textured soils when the water table is less than 25 feet below the soil surface. Balance Flexx does not provide adequate control of sunflower. Corvus will be much better than Balance Flexx on sunflower, provided the sunflower is not ALS-resistant. Herbicides containing clopyralid (4) such as Hornet (4, 2), Resicore (15, 4, 27), TripleFlex II (15, 4, 2), or Surestart II (15, 4, 2) will also provide very good control of sunflower.

A new herbicide from Syngenta called Acuron contains Lumax EZ (27, 15, 5) + bicyclopyrone (27). Bicyclopyrone is an HPPD-inhibitor herbicide that enhances large-seeded broadleaf weed control and also has grass activity. Acuron (27, 15, 5) provides enhanced control of giant ragweed, common ragweed, common cocklebur, and velvetleaf, along with improved morningglory control over Lumax EZ. A herbicide just registered in 2016 is called Acuron Flexi (27, 15) which is basically Acuron without atrazine. Acuron Flexi (27, 15) and Zemax (27, 15) which are basically Lumax without atrazine (5) were developed for areas where atrazine generally isn't used or is prohibited. Resicore will also fit in this scenario and is the most effective of the non-atrazine products in this list. Zemax and Acuron Flexi, without the atrazine (5), may provide less broadleaf weed control.

PPO-inhibitors (14). Examples of PPO-inhibitors include flumioxazin (e.g. Valor (14), Fierce (14, 15), and saflufenacil (Sharpen (14), Verdict (14, 15). Valor or Fierce must be applied 7 to 30 days before corn planting in a no-till system. These herbicides provide excellent control of pigweeds; however, they are marginal on kochia. Fierce will provide improved control of velvetleaf and kochia compared to that from Valor. The addition of atrazine (5) will enhance kochia, pigweed, velvetleaf, and morningglory control, provided the populations are not triazine-resistant. Sharpen and Verdict have excellent activity on pigweeds, kochia, and large-seeded broadleaf weeds. However, the length of residual activity can be shorter than other preemergence products when all are compared at full rates. This will depend on the rates of Sharpen and Verdict used. Approximately 7 to 10 days of residual can be expected per 1 oz of Sharpen and 5 oz of Verdict.

ALS-inhibitors (2). Examples of ALS-inhibitors for use as a soil-applied herbicide for corn include flumetsulam, Python (2); and Hornet (2, 4), a premix of flumetsulam (2) and clopyralid (4). Both herbicides have broadleaf activity only. These products are strong on large-seeded broadleaf weeds such as cocklebur, sunflower, and velvetleaf, or the small-seeded common lambsquarters. Adding Hornet to a full rate of an acetamide (15) /atrazine (5) mix as a premerge treatment will control the annual grasses and add considerably to large-seeded broadleaf weed control. These three-way premixes, acetochlor (15)+chlopyralid (4)+flumetsulam (2), include SureStart II (15, 4, 2) and TripleFlex II (15, 4, 2). Sunflower appears to be most sensitive to Hornet (2, 4), followed closely by cocklebur and velvetleaf. Morningglory is less sensitive. Resicore (15, 4, 27) is a new herbicide from Dow and is a premix of acetochlor (15)+chlopyralid (4)+ mesotrione (27). This product contains 3 modes of action as did SureStart II and TripleFlex II, only the ALS-inhibitor (2) has been replaced with an HPPD-inhibitor (27).

An additional ALS-inhibiting (2) herbicide from DuPont is called Resolve (rimsulfuron, 2). Rimsulfuron (2) is also a component in Prequel (2, 27), Instigate (2, 27), Basis (2), and Basis Blend (2), which was previously mentioned. Additional products containing rimsulfuron include Harrow (2) and Crusher (2). Resolve will provide short residual control of grass and broadleaf weeds and should be used as a setup herbicide with a good postemergence weed control program. If ALS-resistant broadleaf weeds are present, these ALS-containing herbicides often will be less effective.

Key to herbicide mode of action reference numbers

The Weed Science Society of America has developed a numbered classification system based on the herbicide site of action to assist farmers and applicators in selecting herbicides with different sites of action. Most herbicide labels now prominently display the herbicide classification number at the beginning of the label. Herbicide premixes that contain multiple active ingredients with different sites of action will have all sites of action numbers listed. The following list – from K-State's [2018 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland](#), SRP 1139 -- presents herbicides by mode of action, chemical family, and the WSSA herbicide site of action number (in parentheses).

Amino Acid Inhibitors

ALS-AHAS inhibitors (2):

Imidazolinone family - Arsenal, Plateau, Pursuit, Raptor, Scepter, Contain, Beyond

Sulfonylurea family - Accent, Affinity, Ally, Amber, Basis, Beacon, Cimarron, Classic, Crusher, Escort, Express, Finesse, Glean, Harmony SG, Harmony Extra, Harrow, Maverick, Oust, Peak, Permit, Spirit, Steadfast, Synchrony, Telar

Triazolopyrimidine family - Python, FirstRate, PowerFlex

Sulfonylaminocarbonyl-triazolinone family - Olympus, Osprey, thiencazone

EPSP inhibitors (9):

Amino acid derivative family - glyphosate, Roundup, Touchdown, and others

Auxins-synthetic (4)

Benzoic acid family - Dicamba, Banvel, Clarity, DiFlexx, Status, Vision, XtendiMax, Engenia, FeXapan, and others

Phenoxy family - 2,4-D, 2,4-DB, MCPA, MCPP, 2,4-DP

Carboxylic acid family - Tordon, Stinger, Remedy, Garlon, Starane, Milestone, Trycera, StareDown, Quelex

Quinoline carboxylic acid - Facet L, Paramount, Quinstar GT, Quinstar 4L

Auxin Transport Inhibitor (19)

Semicarbazone family - diflufenzopyr

Cell Membrane Disrupters

Bipyridilium family (22) - Gramoxone, Diquat

Diphenylether family (14) - Ultra Blazer, Cobra, Phoenix, Reflex, Flexstar, ET, Vida, Dawn, Rhythm

N-Phenylphthalimide family (14) - Encompass, Resource, Valor

Aryl-Triazinone family (14) - Cadet, Spartan, Aim

Pyrimidinedione family (14) - Sharpen, Kixor

Lipid Synthesis Inhibitors (1)

Aryloxyphenoxypropionate family - Fusilade DX, Assure II, Fusion, Targa

Cyclohexanedione family - Poast, Poast Plus, Select, Volunteer, Section, Arrow, Tapout

Phenylpyrazolin family - Axial

Nitrogen Metabolism Inhibitors (10)

Organophosphorus family - Liberty

Photosynthetic Inhibitors

Triazine family (5) - atrazine, metribuzin, Princep, Evik, Pramitol

Phenylurea family (7) - Lorox, Karmex, Spike

Uracil family (5) - Sinbar, Hyvar

Nitrile family (6) - Buctril, Moxy, Bromox, Brox

Benzothiadiazole family (6) - Basagran

Pigment Inhibitors

Isoxazolidinone family (13) - Command

Isoxazole family (27) - Balance, Huskie

Triketone family (27) - Callisto, Impact, Laudis

Seedling Growth Inhibitors

Thiocarbamate family (8) - Eradicane, Eptam

Acetamide family (15) - Dual II Magnum, Define, Outlook, Propel, Surpass, Harness, Degree, Topnotch, Warrant

Pyrazole family (15) - Zidua, Anthem

Dinitroaniline family (3) - Treflan, Trust, Prowl, Acumen, Sonalan, Balan

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3. Soil temperature update as of early April

Selection of the optimal planting date is one of the most critical factors in the farm decision-making process. In making this decision, producers should consider soil temperatures rather than just calendar dates. After a very warm start to March, air temperatures across Kansas declined this past week.

For the week of March 30-April 5, average weekly soil temperatures at 2 inches among crop reporting districts, overall ranged from 28 to 53 degrees F (Figure 1). For example, in the northeast region, soil temperatures ranged from 40 to 42 degrees F; while in the southwest region, soil temperatures varied from 58 to 48 degrees F (Figure 1). Soil temperatures were around 42-45 degrees F for the northwest region.

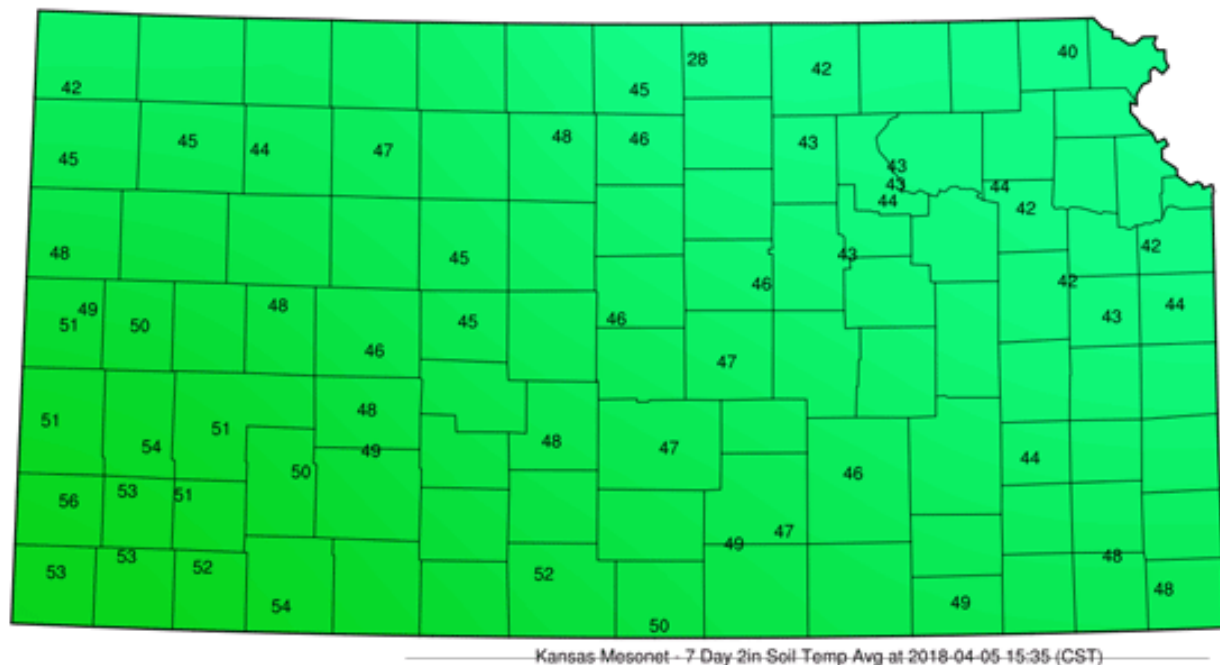


Figure 1. Average soil temperatures at 2-inch depth for the week of March 31-April 5, 2018.
(<http://mesonet.k-state.edu/>)

Differences in soil temperature were primarily related to the large variations in air temperatures experienced last week, from 33 degrees F in northern portions of the state to 50 degrees F for areas in southeast Kansas (Figure 2).

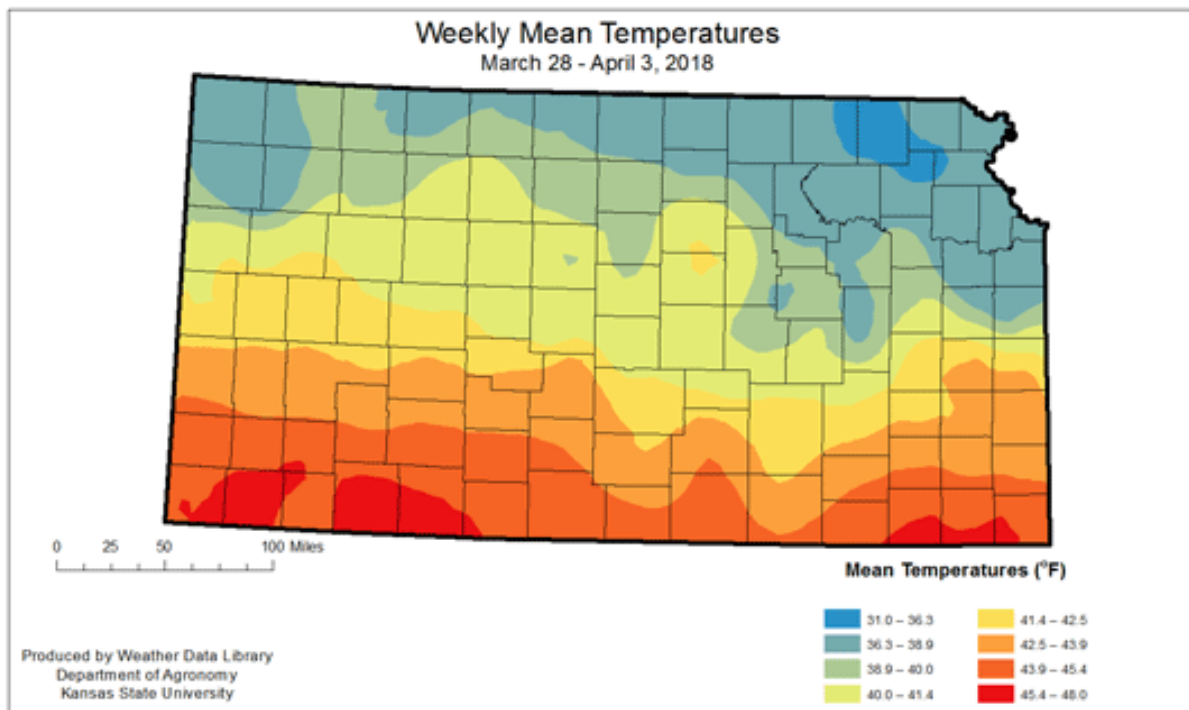


Figure 2. Weekly mean air temperatures for the week of March 28- April 3, 2018.

Projections for the coming weeks are for increasing air temperatures – warmer-than-normal for southern Kansas, which can increase soil temperatures (Figure 3). The actual change in soil temperatures in any given field will be affected by amount of residue cover, amount of soil moisture, and landscape position. Wet soils in a no-till situation will be slower to warm. Dry soils will fluctuate more rapidly, matching air temperatures, particularly if skies are clear.

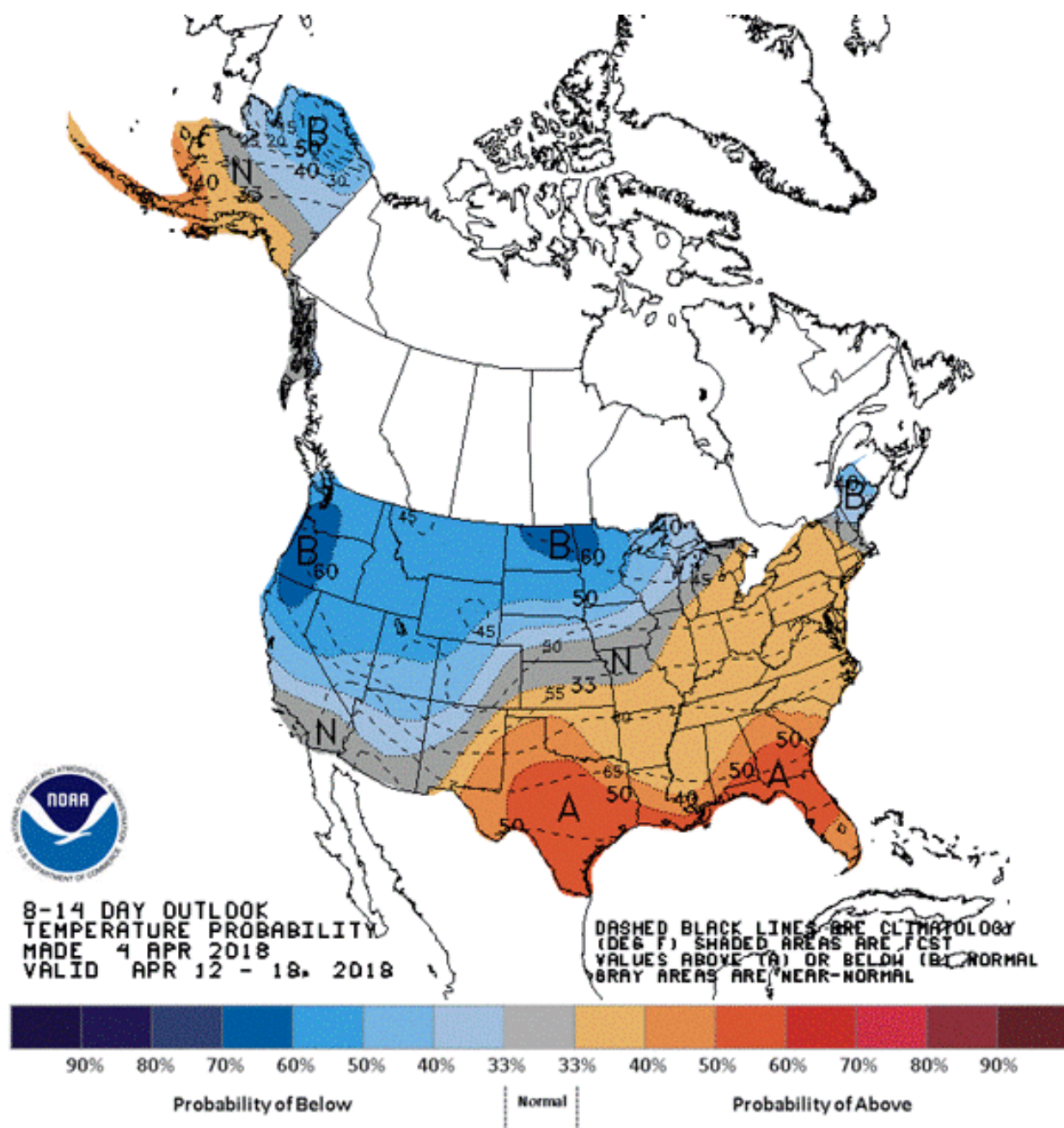


Figure 3. 8-14 day outlook temperature probability for April 1-18, 2018. (NOAA)

Current moisture status across Kansas is quite dry, with the largest weekly departure in precipitation in the northeast corner (Figure 4). Projections for coming weeks are for precipitation to be above-normal for the eastern parts of Kansas and drier for the west (Figure 5), which can also slow down soil warming conditions and potential plans for an early start to planting.

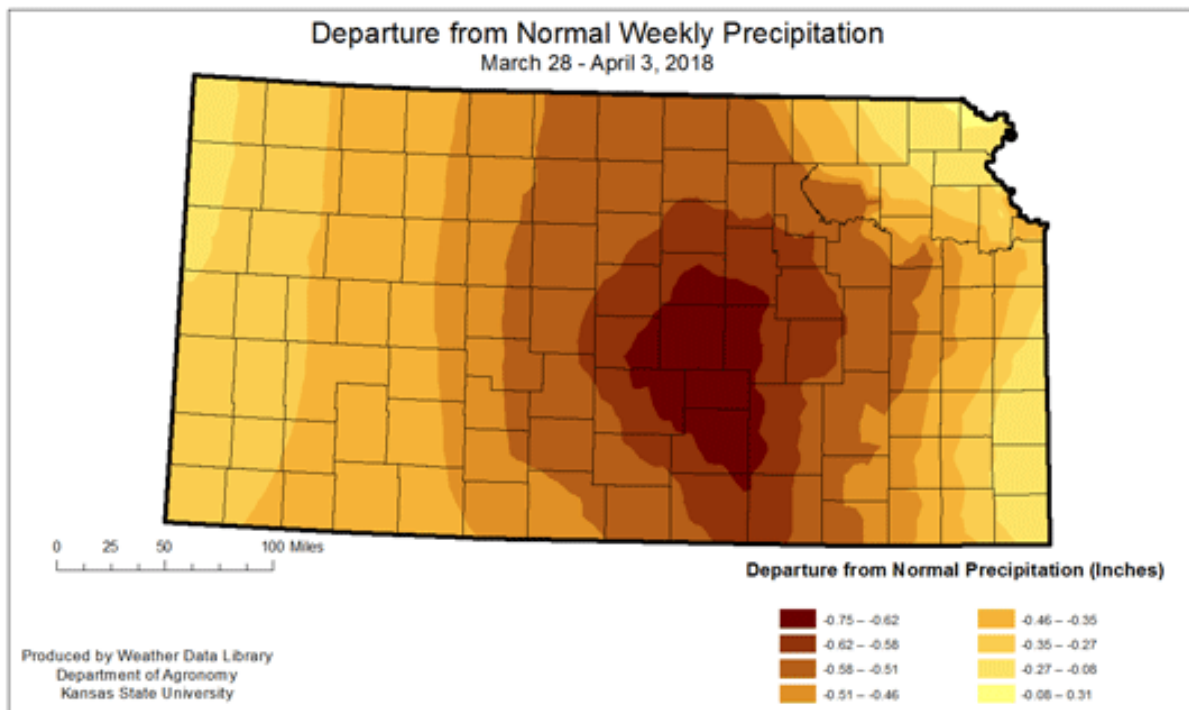


Figure 4. Departure from normal precipitation for the week of March 28-April 4, 2018.

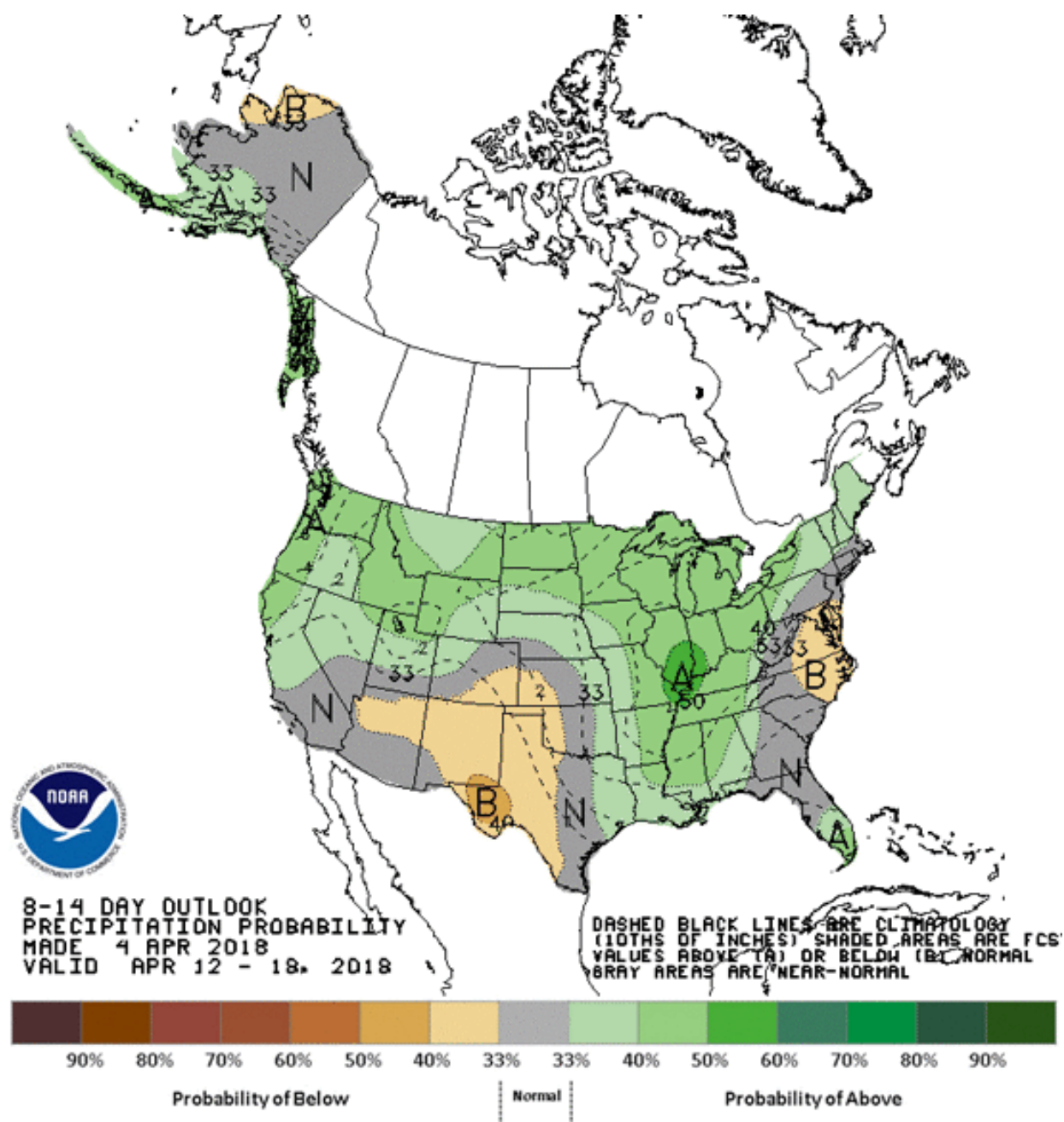


Figure 5. 8-14 Day outlook precipitation probability for April 12-18. (NOAA)

Optimal soil temperature for emergence

Every summer row crop has an optimal soil temperature for emergence. A minimum for corn is 50 degrees F for germination and early growth. However, uniformity and synchrony in emergence is primarily achieved when soil temperatures are above 55 degrees F. Uneven soil temperatures around the seed zone can produce non-uniform crop germination and emergence. Lack of uniformity in emergence can greatly impact corn potential yields. This is particularly true for corn, since it is the earliest summer row crop planted. When soil temperatures remain at or below 50 degrees F after planting, the damage to germinating seed can be particularly severe.

Impact of a hard freeze on corn

Corn is also more likely than other summer crops to be affected by a hard freeze after emergence if it is planted too early. The impact of a hard freeze on emerged corn will vary depending on how low the temperature gets, the intensity and duration of the low temperatures, field variability and residue distribution, tillage systems, soil type and moisture conditions (more severe under dry conditions), and the growth stage of the plant. Injury is most likely on very young seedlings or on plants beyond the V5-6 growth stage, when the growing point is above the soil surface.

The average day for last spring freeze (32 F) is quite variable around the state (Figure 6). The largest variability is from southeast to northwest Kansas; with the earliest last spring freeze date for the southeast region (April 5-15) and latest for the northwest area (>May 3). Corn planting dates before April 15 in the southeast region would increase the likelihood of the crop suffering from a late spring freeze. Similar conditions can be projected for northwest Kansas if corn is planted before May 3.

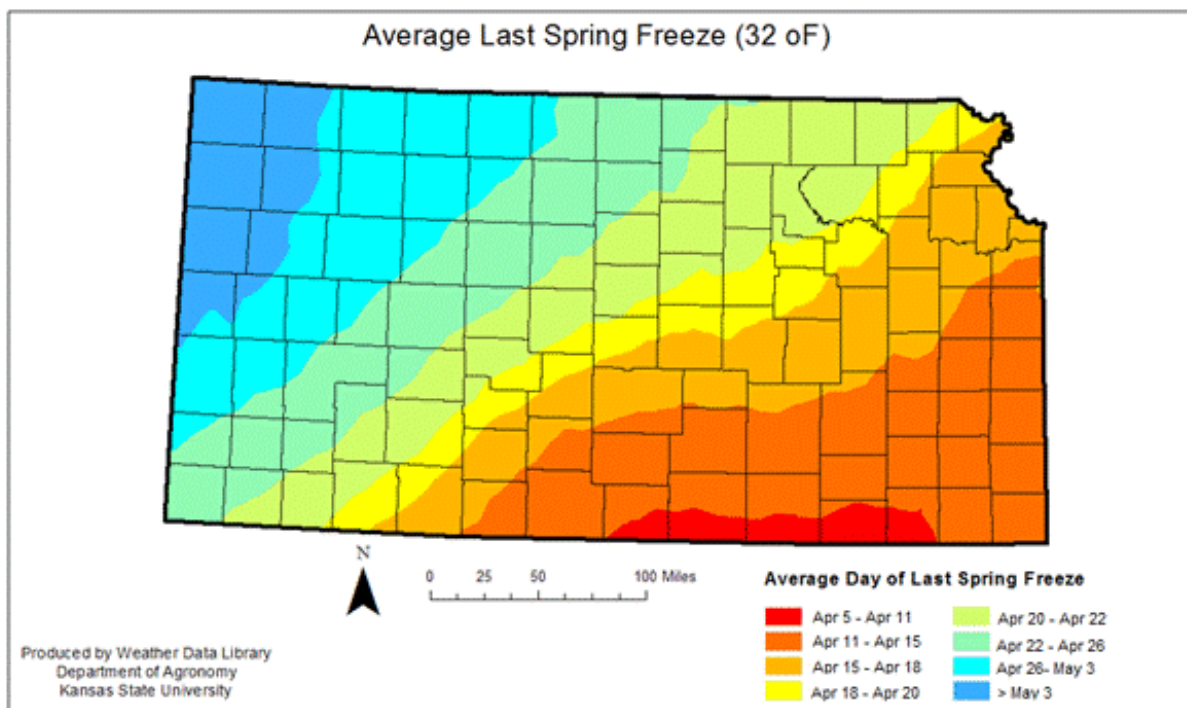


Figure 6. Average last spring freeze (32 degrees F) for Kansas.

Think about all these factors when deciding on the optimal planting time. More information about the planting status of summer row crops will be provided in upcoming issues of the Agronomy eUpdate. Stay tuned!

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4. Review of drought-tolerant corn hybrids: Yield benefits

In recent years, drought conditions have raised questions about the utilization of corn as the main crop for maximizing yield production per unit of available water in dryland environments.

Non-transgenic, conventionally bred, “drought-tolerant” (DT) corn hybrids from Pioneer and Syngenta were released to the market with the expectation of increasing corn production in water-limited regions. Monsanto also released biotech transgenic DT hybrids.

Overall, the information from seed companies indicates that DT hybrids could provide from 2 to more than 15 percent yield increase over “competitor hybrids” in non-limiting and water-limiting environments, respectively.

K-State research conducted over the 2012-2015 growing seasons across the state has recently been summarized, and this summary is available in a K-State Research and Extension publication (discussed at the end of this article). The objective of this article is to present an overview of the DT vs. non-DT responses to management practices such as plant population and irrigation.

The information below is intended to provide some guidance to farmers, consultants, and agronomists in making the right decision for selecting corn hybrids. In addition, we hope to develop a better understanding of the kinds of environments in which DT hybrids could be most likely to result in a yield benefit. These hybrids are generally targeted for water-limited environments in the Western Great Plains.

Results

Our research compared DT hybrids from diverse companies with a standard non-DT counterpart of similar maturity. The tests also evaluated the yield response to varying plant population and irrigation levels.

At the plant scale, our analysis did not reveal any change in the plant response to plant population between DT and non-DT hybrids. This indicates no need to change plant population when using DT hybrids. This conclusion was briefly introduced in an article on corn seeding rates in the eUpdate dated March 14, 2014 ([Agronomy eUpdate 445](#)).

We also analyzed yields at the plot level for DT vs. comparable non-DT hybrids with similar maturity. The information presented in the figure below (Fig. 1) depicts the association of the yields for the DT vs. non-DT corn hybrids: Yellow points = research plots (2012-2013); blue points = on-farm plots; green points = 2014; red points = 2015 growing season plots.

Overall, the analysis found a yield benefit of 3 percent for DT vs. non-DT hybrids under diverse environments and stress conditions across Kansas during the 2012-2015 seasons. In absolute terms, the yield advantage of using DT hybrids was around 5 bushels per acre compared to the non-DT material. Similar yield trends were observed in research plots and on-farm demonstration plots. A great proportion of DT and non-DT yields were similar -- within a 5% confidence interval as highlighted in Figure 1 -- except in low-yielding and high-yielding environments. In low yielding-environments, DT out-yielded non-DT corn hybrids more often compared to the situation in higher-yield environments.

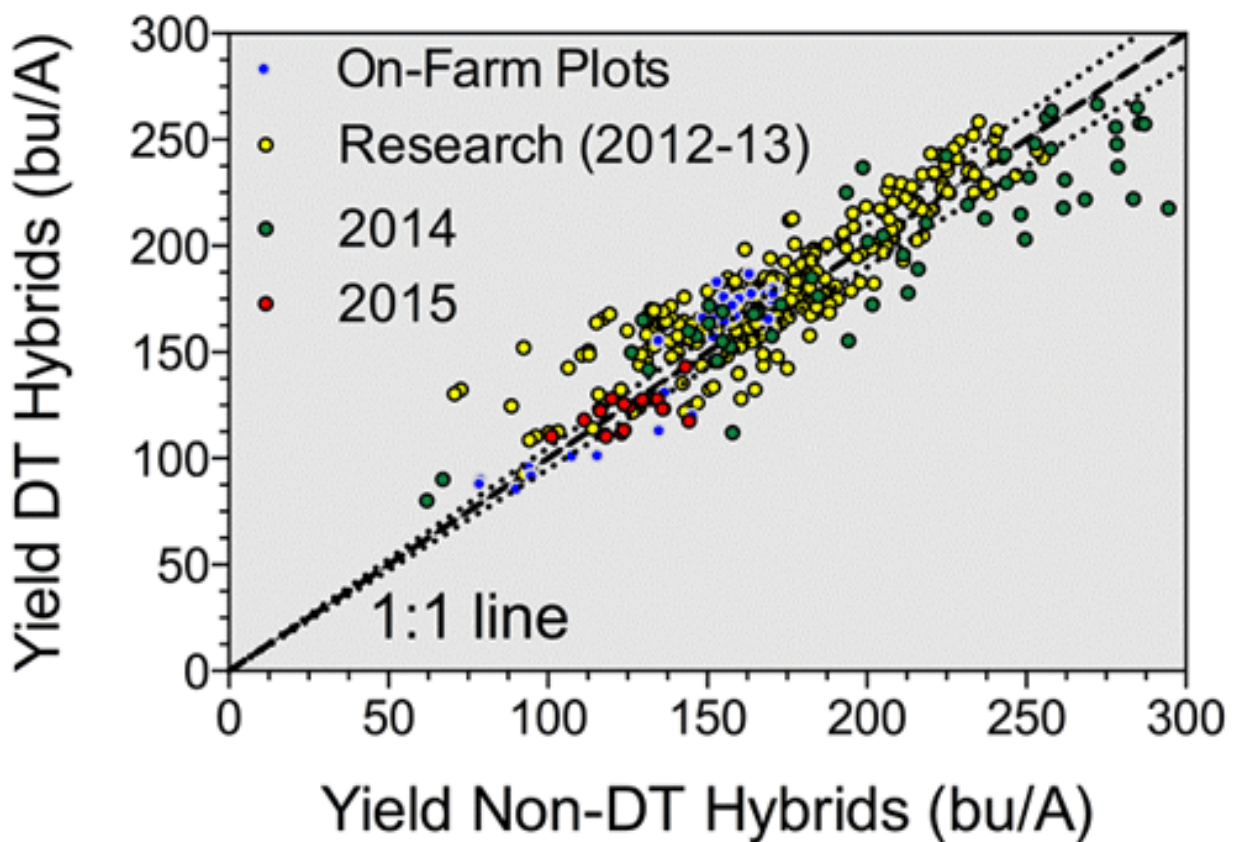


Figure 1. Yield for the DT versus non-DT corn hybrids across site-years for the 2012, 2013, 2014, and 2015 growing seasons.

DT vs. non-DT corn hybrids: Yield Environment Analysis

The analysis of information across diverse yield environments allows us to more clearly understand where there would be a yield advantage from planting DT hybrids. It is clear from Figure 2 that the yield advantage of DT corn hybrids increases as the yield potential of the crop decreases. This graph shows that there is basically no yield difference between DT and non-DT hybrids when yields are around 170 bushels per acre or greater. The yield advantage for DT hybrids gradually increases as the yield of the regular hybrids decreases from 170 bushels per acre.

It is important to note however, that these are generalized relationships, and that there are varied responses at each yield level. Some individual points show no difference between DT vs. non-DT hybrids at yields around 100 bushels per acre. Other points show a 30-bushel-per-acre yield advantage for non-DT hybrids at 160 to 170 bushels per acre, and still others show a 60-bushel-per-acre yield advantage for DT hybrids when non-DT hybrid yields were near 70 bushels per acre. On the opposite side of the yield environments, under high yield environments (>220 bushel-per-acre), individual points show a 30 to 60-bushel-per acre yield advantage for non-DT hybrids when DT hybrid yields were above 220 bushels per acre. How individual hybrids respond to a specific environment is influenced by a number of factors, including the timing and duration of the stress.

One more technical clarification is important to note. The linear response and plateau (LRP) function

model fitted in Figure 2 (adjusted to the 2012-2013 data), presented an R^2 of 0.26 units, which can be interpreted to indicate that this model is accounting for only slightly more than one-fourth of the total variation presented in the data. Even when including observations from studies conducted in the last two years (2014-2015), the trend observed in the DT yield advantage versus the non-DT yield values (Fig. 2) is not being modified. From all these years of data collection and analysis we can conclude that there are many management factors involved in the yield results, which makes it difficult to separate out the effect of hybrid alone.

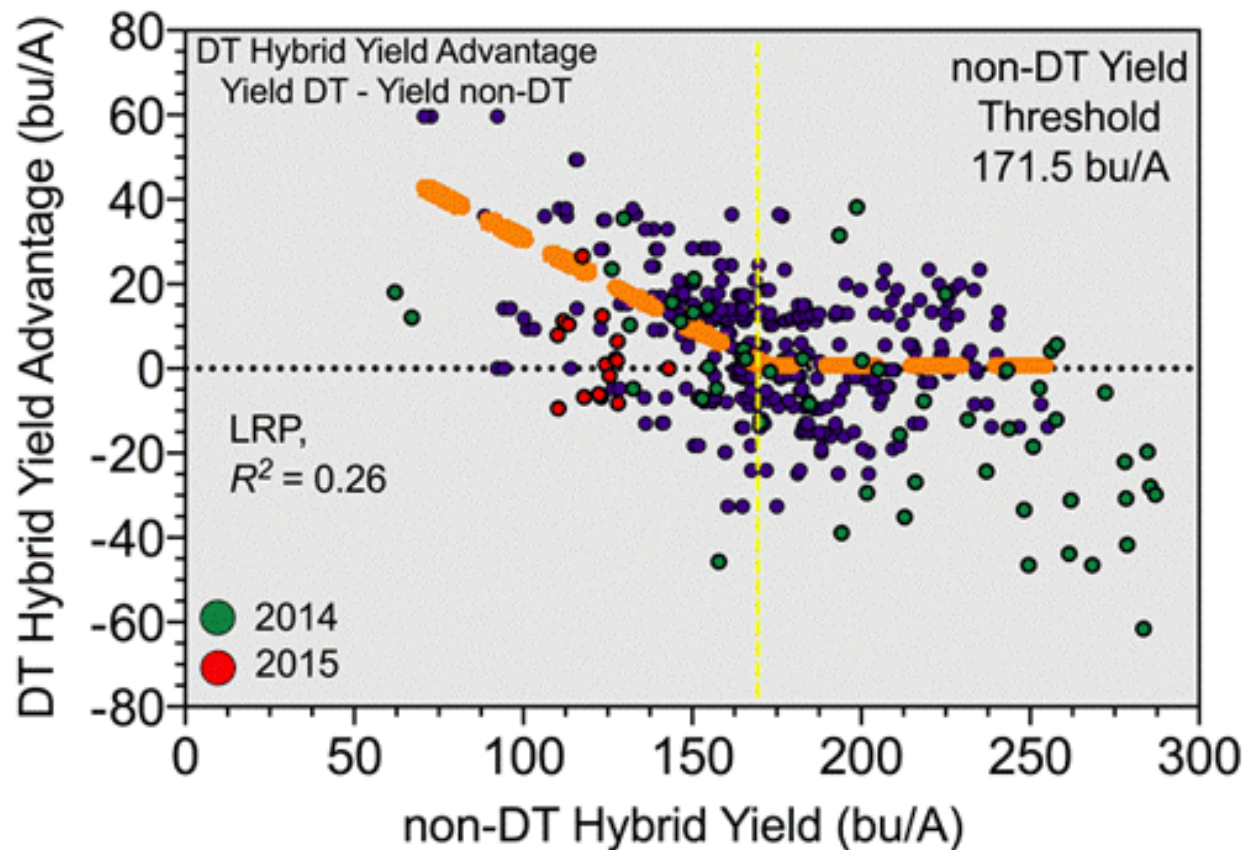


Figure 2. Yield advantage for DT compared to non-DT corn hybrids in the same environment and at the same population, ranging from low-yielding environments to high-yielding environments across site-years for the 2012, 2013, 2014, and 2015 growing seasons.

Still, we need to be cautious using and interpreting this information. More experiments and research data need to be collected, and a deeper understanding is needed to more properly analyze the main causes of the yield differences of DT vs. non-DT corn genotypes. Potential interpretations offered for the yield advantage for the DT corn hybrids in certain environments are:

- Slower vegetative growth, saving water for reproductive stages (stress avoidance)
- Greater root biomass with superior water uptake
- Differential regulation in the stomata opening, controlling water and CO₂ exchange processes
- Other potential physiological modifications

K-State Research and Extension publication

A publication titled *Drought-tolerant corn hybrids: Yield benefits* was published by K-State Research and Extension in 2017. This publication was supported by Kansas Corn Commission.

This publication presents research information conducted by K-State Research and Extension to evaluate drought-tolerant hybrids in a wide range of production environments. You can view the publication at <https://www.bookstore.ksre.ksu.edu/pubs/MF3338.pdf>

K-STATE
Research and Extension

Corn Fact Sheet Series

Drought-Tolerant Corn Hybrids: Yield Benefits

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and Soils Specialist



The authors acknowledge the support of the Kansas Corn Commission in the development and printing of this publication.

Summary

General observations:

1) Performance of individual hybrids within DT and non-DT types may vary. Some non-DT hybrids can perform nearly as well as the DT hybrids even in stressful conditions, and DT hybrids have the potential to yield with non-DT hybrids when water isn't limiting.

2) The advantage of the DT hybrids became more evident when the water stress increased to the point of leaves rolling most days.

3) From the information at hand, it is reasonable to expect a DT hybrid to serve as a type of insurance policy to sustain yield potential under water-limited environments. It also appears that there is no yield penalty associated with DT hybrids if water-limiting conditions do not occur.

Lastly, it is critical to understand that these corn genetic materials will not produce yield if the environment is subjected to terminal drought. We cannot expect them to thrive when moisture is

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severely limited, especially in dryland systems. As properly and explicitly stated by all seed companies, these DT materials have demonstrated the ability maintain yields to a certain degree in water-limited situations, and those yield differences will likely be in the order of 5 to 15 bushels per acre (depending on the environments and crop practices), when compared with a similar maturity non-DT corn hybrid.

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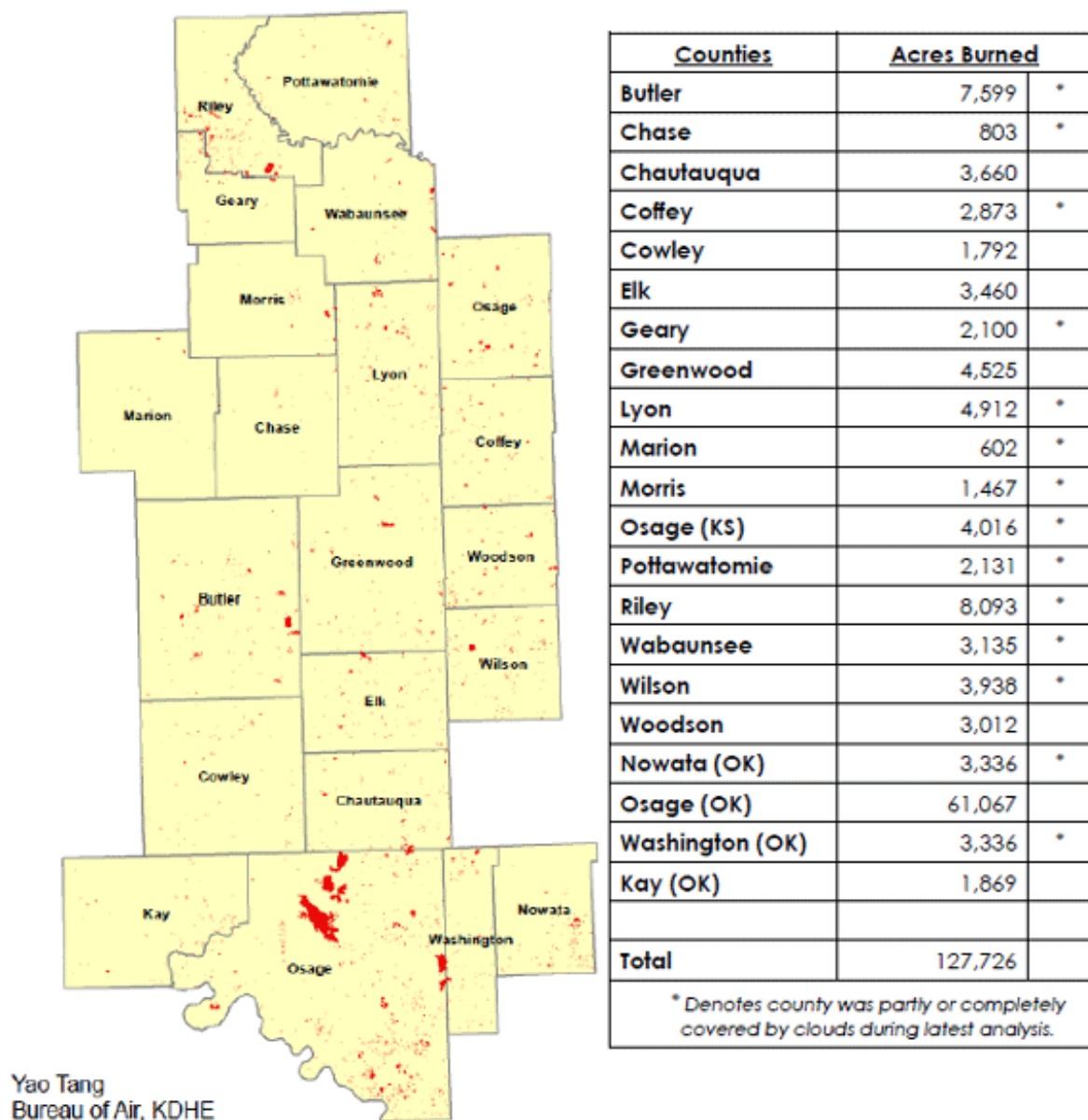
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5. Update on prescribed burning in Kansas and what online resources are available

Dry weather and wildfires have hampered the use of prescribed burns thus far in 2018. As of mid-March, less than 130,000 acres have burned in the Flint Hills region, with Osage County, Oklahoma accounting for 47% of the burned acres (Figure 1).

Flint Hills Acreage Burned (February 17 – March 16, 2018)



Friday, March 30, 2018 • 17

Figure 1. Flint Hills acreage burned between Feb. 17 - Mar. 16, 2018. Graphic from Flint Hills Prescribed Fire Update.

The question becomes, should I burn this year? Some may have already decided not to burn unless

significant moisture is received soon. Safety and concern about prescribed burns escaping have led some to the conclusion to forego burning this year.

What are the reasons for conducting a prescribed burn? Brush control and increased stocker gains often top the list when you ask that question. Decades of data have indicated that a mid- to late-spring burn enhances stocker gains with an average of an additional 32 pounds per animal grazing burned pastures. Stocker gains from burned pastures have almost always been higher, even in dry years. Brush control is more apt to occur once the woody plants are leafed out. The exception is eastern red cedar is vulnerable to prescribed burning at any time. Other reasons for burning include conservation of the native plant community, improving grazing distribution, enhancing wildlife habitat, and decreasing the severity of wildfires. Maintenance of conservation reserve program (CRP) acres is another use of prescribed burning. Normally, CRP acres are burned between February 1 and April 15 in eastern Kansas and February 1 and April 30 in the west. Summer burns after July 16 are also allowed in Kansas. Be sure to check with your local FSA office regarding burning of CRP in your county.

As landowners plan to burn there are some available websites to assist with conducting a safe burn and minimizing the impacts of smoke on populated areas.

- Use the National Weather Service for forecasts. Go to <http://www.weather.gov> and click on Kansas. Select a site on the map near the location you plan to burn. Find the hourly weather forecast. Good conditions for conducting a prescribed burn and minimizing the impacts of smoke include:
 - 45-70 F temperature
 - 40-55% relative humidity
 - 5-15 mph winds
 - >1800 feet mixing height
 - 30-50% cloud cover
- Next, check out the website <http://www.ksfire.org> and use the smoke dispersion model to determine where the smoke from your fire will go. You can access the smoke model by clicking on the small map icon titled "Click Here to Access Smoke Model". A color-coded map showing the cumulative effects of burning in the Flint Hills area will appear (Figure 2). Green indicates areas where the impact will be small, yellow is the area of medium impact, and red indicates a large impact of smoke from burning on major cities. To determine the direction the smoke from your fire is likely to move, select "Your Fire Impacts," county, fuel load, size (acres to burn), and date. The model will present the likely smoke plume from your fire over a 48-hour period. The smoke model only predicts where the smoke is likely to travel. It doesn't mean environmental conditions are safe to burn.

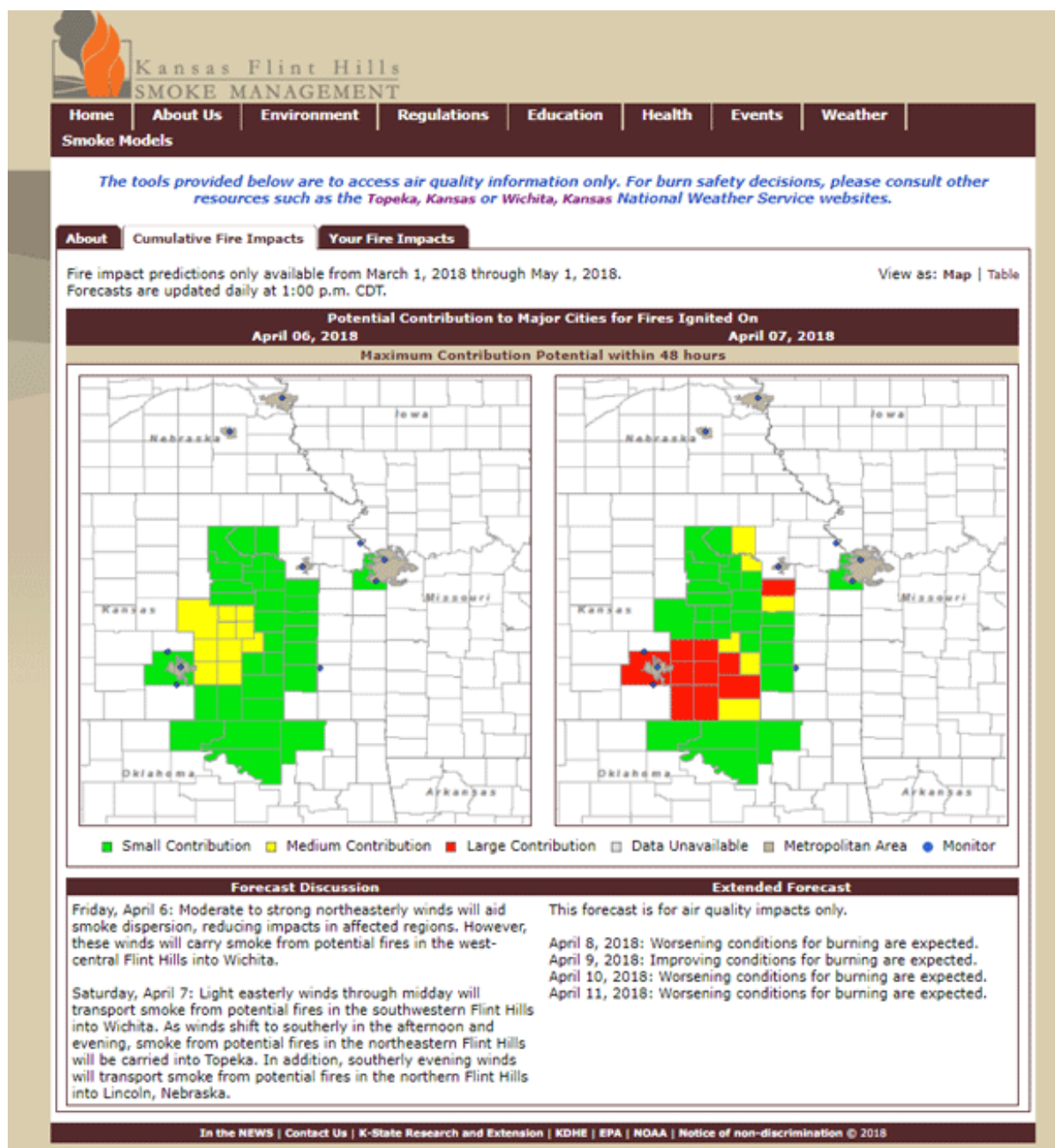


Figure 2. Screenshot of the Smoke Model. Source: ksfire.org

- Another consideration is to determine if the regional air quality is good or bad. To do that, go to the website: <https://www.airnow.gov>. "Current AQI" gives the combined effects of ozone and PM (particulate matter) on the air quality index (AQI) (Figure 3). By selecting the "More Maps" tab, current ozone and current PM can be seen.

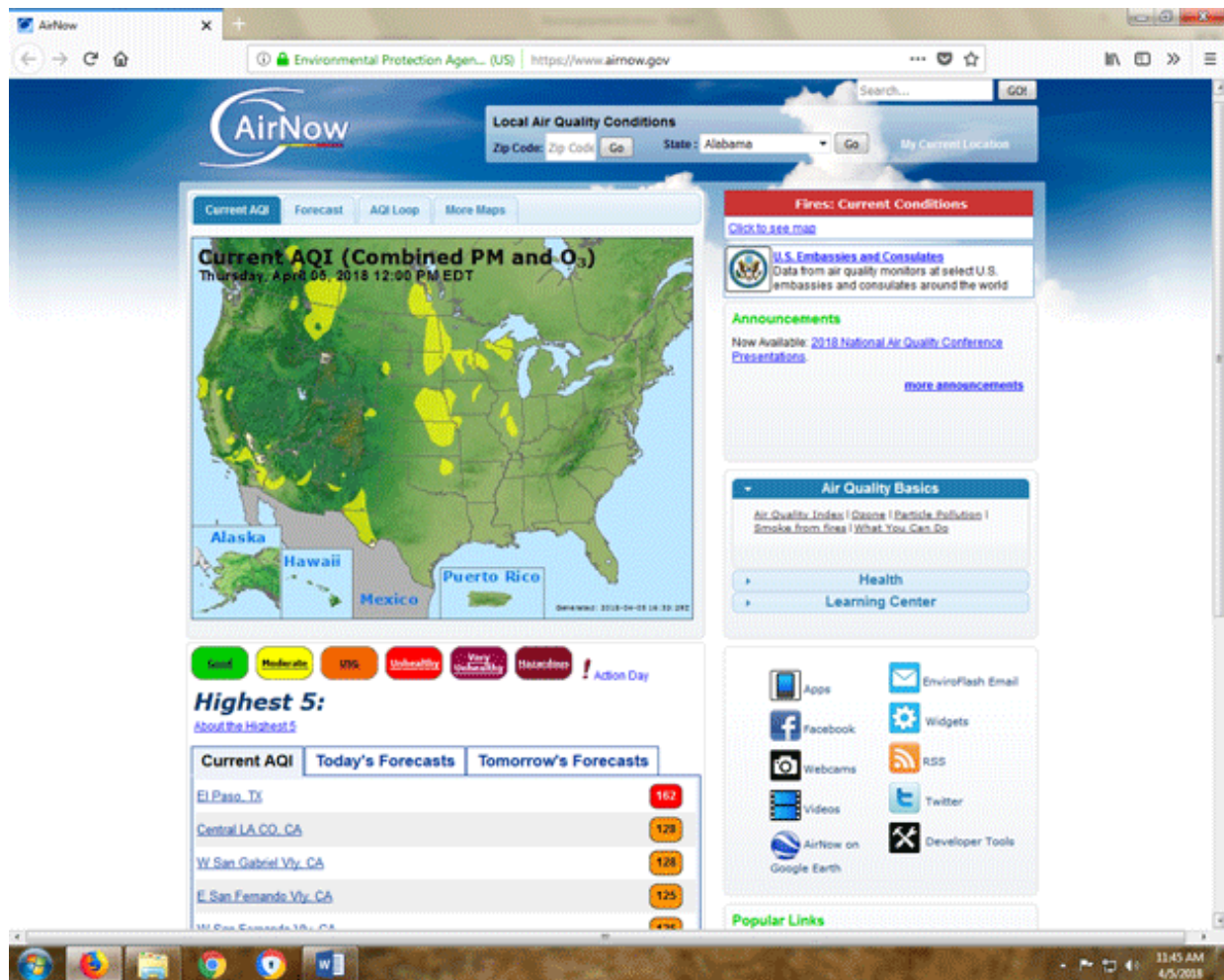


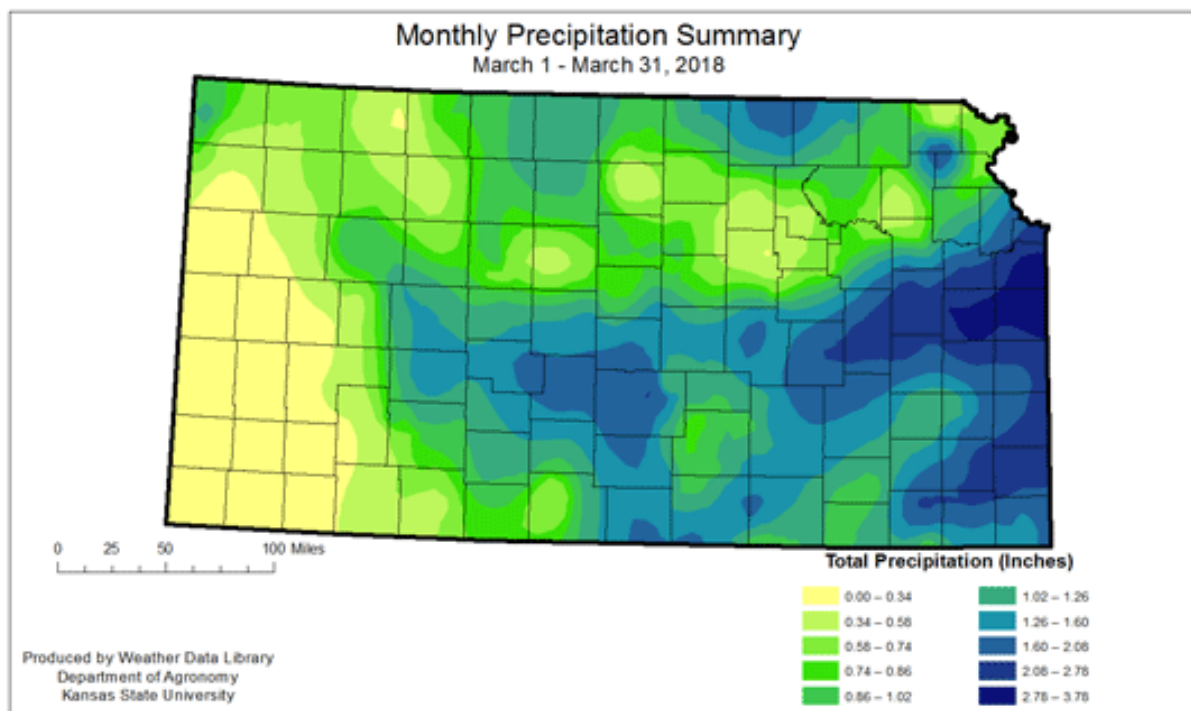
Figure 3. Screenshot of the Current Air Quality Index (AQI). Source: www.airnow.gov

Prescribed burning is an essential tool for maintaining the integrity of our prairies in Kansas. Plan well, burn safely, and remember that smoke from your fire can have negative impacts downwind.

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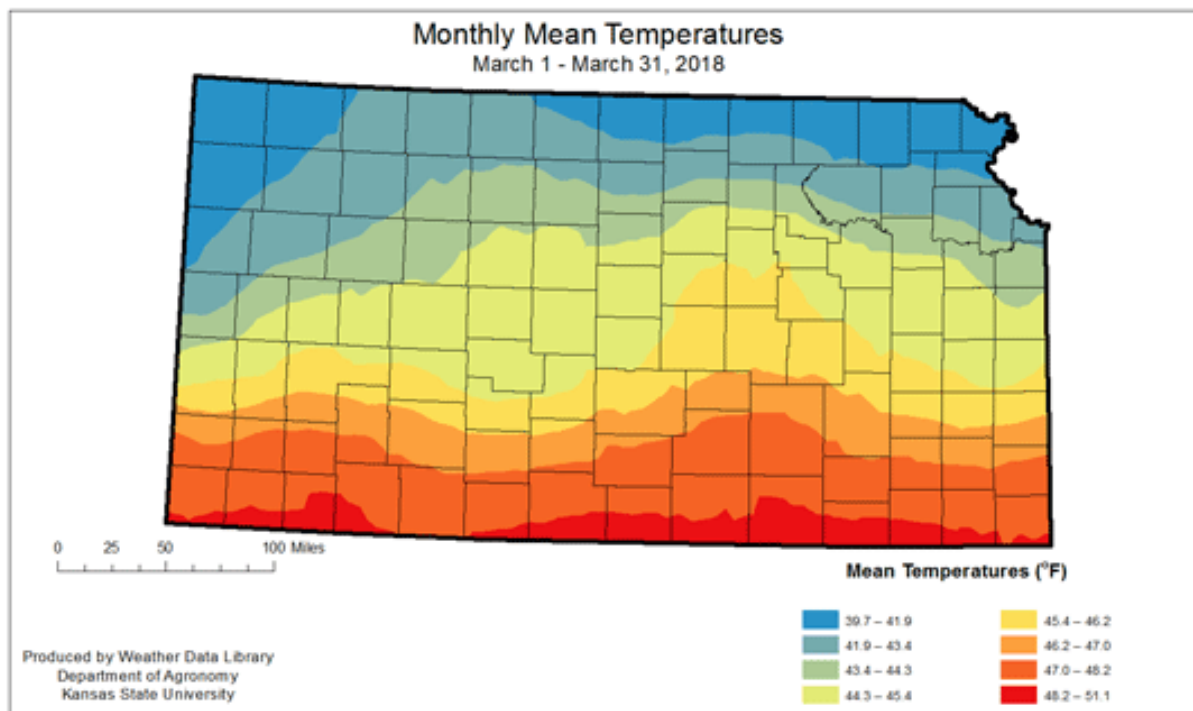
6. Kansas weather summary for March 2018 - Another dry month

The Southwest Division again missed out on most of the precipitation during March. State-wide the average precipitation was 0.97 inches or 41 percent of normal. No division reached normal for precipitation for March. The Southwest Division, with an average of just 0.33 inches, had the lowest percent of normal at only 22 percent. The East Central Division had the closest to normal precipitation with an average of 1.50 inches or 55 percent of normal. The greatest monthly precipitation totals were 3.78 inches at Stillwell 1N, Johnson County (NWS) and 4.10 inches at Plevna 3.1 NNW, Reno County (CoCoRaHS). There was some snow during the month, with two locations matching or setting daily records for snowfall. The greatest daily snowfall report was 4.5 inches at Tribune 1W, Greeley County, on the 6th. The greatest snowfall totals for the month were 3.0 inches at both Ransom 2NE, Ness County and Wakeeney, Trego County (NWS); and 2.7 inches at St. Francis 12.1 NW, Cheyenne County (CoCoRaHS).



March continued the pattern of wide temperatures swings, as might be expected with the dry air in place. The statewide average temperature was 44.7 degrees F, or 1.2 degrees warmer-than-normal. The cold days weren't persistent enough to outweigh the warmer start to the month. Only the Northeast Divisions averaged below-normal for the month. The average temperature for the Northeast was 42.1 degrees F, or 0.4 degrees cooler-than-normal. The Southwest Division had the greatest departure, with an average of 47.6 degrees F or 3.3 degrees warmer-than-normal. The warmest temperature reported for the month was 93 degrees F at Ashland, Clark County, on the

24th. The coldest reading was 7 degrees F at Alton 2SW, Osborne County, on the 8th. Records were set on both the cold and warm end of the spectrum, with most of those records on the warm side of the spectrum. On the cold side, there was one new record low maximum temperature and no new record low minimum temperatures. On the warm side, there were 27 new record high maximum temperatures and 10 new record high minimums.



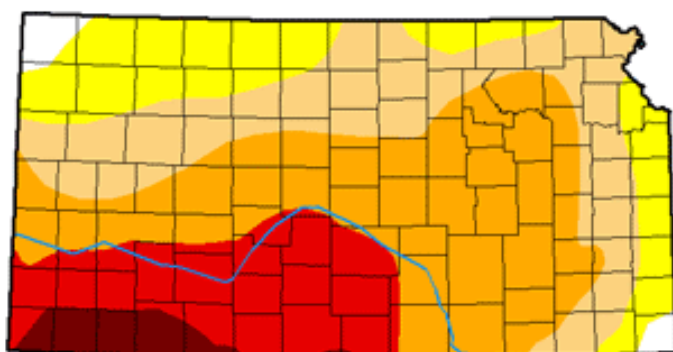
Reports of severe weather during March were limited. There were 17 hail reports and 3 damaging wind reports. In addition, there were several winter weather advisories and several days with extreme fire danger.

The northwest and southeast corners of the state remain drought-free. The rest of Kansas saw deterioration. Exceptional drought conditions now cover just over 3 percent of the state, with extreme drought covering an additional 17 percent of the state. Severe drought has expanded to a quarter of the state while moderate drought covers an additional 36 percent of the state.

Weather outlook for April

The April outlook has a slight chance for wetter-than-normal conditions across the eastern portions of the state, with drier-than-normal conditions in the southwest corner of Kansas. The temperature outlook is for cooler-than-normal temperatures statewide. Unless April moisture is significant, even that combination is unlikely to result in significant improvement of the drought conditions. With the wet summer last year and current dryness, increased fire danger continues.

U.S. Drought Monitor Kansas



Author:
Chris Fenimore
NCEI/NESDIS/NOAA



<http://droughtmonitor.unl.edu/>

March 27, 2018

(Released Thursday, Mar. 29, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	1.78	16.77	25.27	35.28	17.21	3.70
Last Week 03-20-2018	1.22	17.01	25.58	36.85	19.03	0.30
3 Months Ago 12-26-2017	0.00	67.30	24.08	8.63	0.00	0.00
Start of Calendar Year 01-02-2018	0.00	67.30	23.95	8.75	0.00	0.00
Start of Water Year 09-26-2017	59.89	30.03	8.73	1.35	0.00	0.00
One Year Ago 03-28-2017	9.58	47.60	33.81	8.44	0.57	0.00

Intensity:

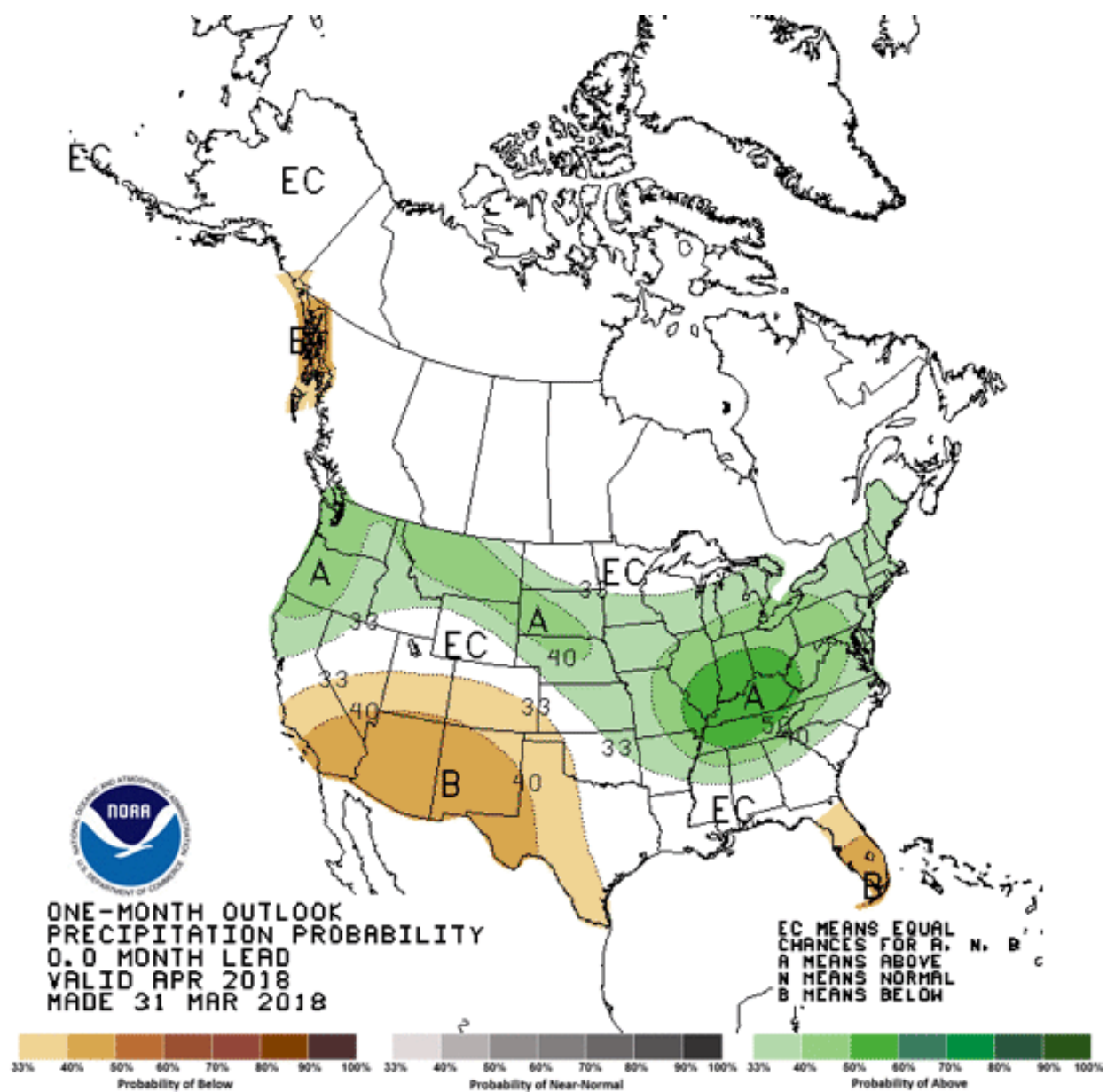
■ D0 Abnormally Dry ■ D3 Extreme Drought
■ D1 Moderate Drought ■ D4 Exceptional Drought
■ D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

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March 2018										
Kansas Climate Division Summary										
	Precipitation (inches)						Temperature (°F)			
	Mar 2018			2018 through March			Ave	Dep. 1	Monthly Extremes	
Division	Total	Dep. 1	% Normal	Total	Dep. 1	% Normal			Max	Min
Northwest	0.38	-0.93	27	0.84	-1.46	35	42.1	1.9	89	11
West Central	0.83	-1.20	41	1.54	-1.94	44	43.8	2.3	91	10
Southwest	1.15	-1.13	50	1.99	-2.22	47	47.4	3.3	93	11
North Central	0.57	-0.83	38	1.00	-1.50	39	42.9	0.7	81	7
Central	0.90	-1.35	40	1.63	-2.32	42	45.2	1.5	83	10
South Central	1.47	-1.18	54	2.72	-2.20	53	47.1	1.7	81	13
Northeast	0.32	-1.04	21	0.53	-1.85	21	42.1	-0.4	80	12
East Central	1.40	-1.23	53	2.03	-2.59	42	44.5	0.8	79	15
Southeast	1.60	-1.42	53	4.19	-1.81	68	46.7	0.9	79	17
STATE	0.97	-1.15	41	1.85	-2.00	43	44.6	1.4	93	7
1. Departure from 1981-2010 normal value										
2. State Highest temperature: 93 °F at Ashland, Clark County, on the 24th.										
3. State Lowest temperature: 7 °F Alton 2SW, Osborne County, on the 7th.										
4. Greatest 24hr: 2.45 inches at Osawatimie, Miami County, on the 19th (NWS); 2.40 inches at Pomona 4.6 NNE, Miami County, on the 26th (CoCoRaHS).										
Source: KSU Weather Data Library										

Mary Knapp, Weather Data Library
mknapp@ksu.edu

7. Kansas drought update - April 5, 2018

Current status

Moisture was limited this week. State-wide, the precipitation averaged 0.13 inches or 19 percent of normal. Unfortunately, this was concentrated in the eastern third of the state, and even in those areas, divisional averages were below normal. The Northeast Division fared the best with an average of 0.42 inches, or 69 percent of normal. The Southwest Division had the lowest average at zero inches or zero percent of normal. The deficit for that division was -0.36 inches. The greatest weekly total for the National Weather Service Cooperative Stations was 2.03 inches at Horton in Brown County. The highest weekly total at a Community Collaborative Rain Hail and Snow network station was 2.46 inches at Pomona 4.6 NNE, Franklin County. For the Kansas Mesonet, the greatest total was 2.80 inches at the Miami County station in Paola. Only trace amounts of snow were reported during the week, although hail was part of the mix. That included reports of baseball size hail in north central Kansas on March 23rd and hail up to 1.5 inches in east central Kansas on the 25th.

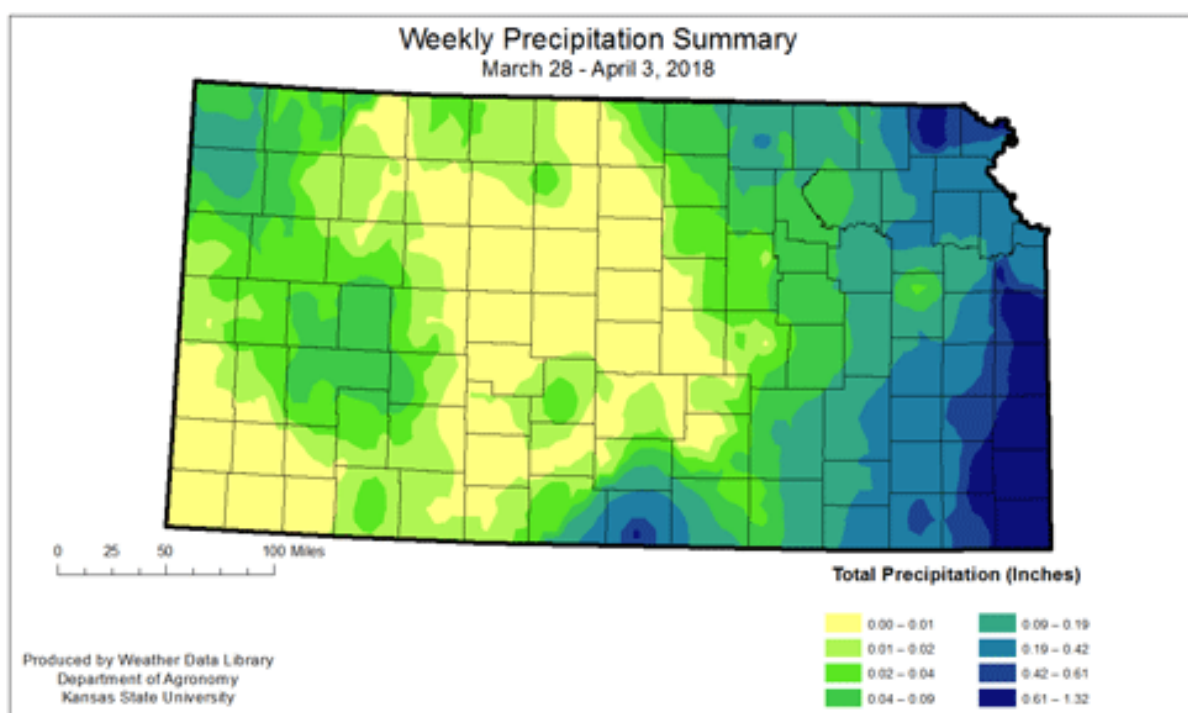


Figure 1. Weekly total precipitation for Kansas during the week of March 21 -27 via Cooperative Observer (COOP) and Kansas Mesonet.

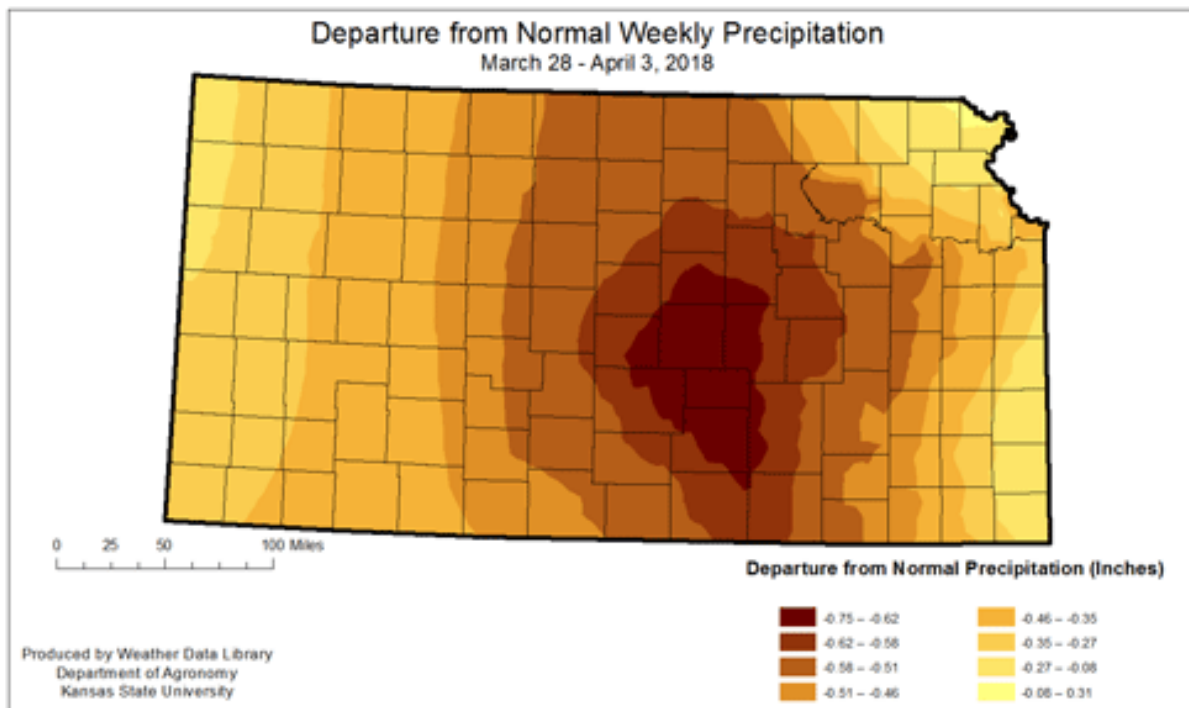


Figure 2. Departures of weekly precipitation from normal for Kansas during the week of March 21 -27 via Cooperative Observer (COOP) and Kansas Mesonet.

Temperatures were on the milder side, although lows did drop into the mid-twenties to mid-teens in all divisions. The statewide average temperature was 48.2 degrees F, or 2.4 degrees warmer-than-normal. The Northeast Division came closest to normal with an average of 44.6 degrees F, or 0.6 degrees cooler-than-normal. The Southwest Division had the largest departure, with an average of 52.0 degrees F or 5.7 degrees warmer-than-normal. Both the warmest and the coldest readings were recorded in the Southwest Division: highest maximum temperature was 93 degrees F at Ashland in Clark County on the 24th; lowest minimum temperature was 17 degrees F at Ulysses in Grant County on the 21st.

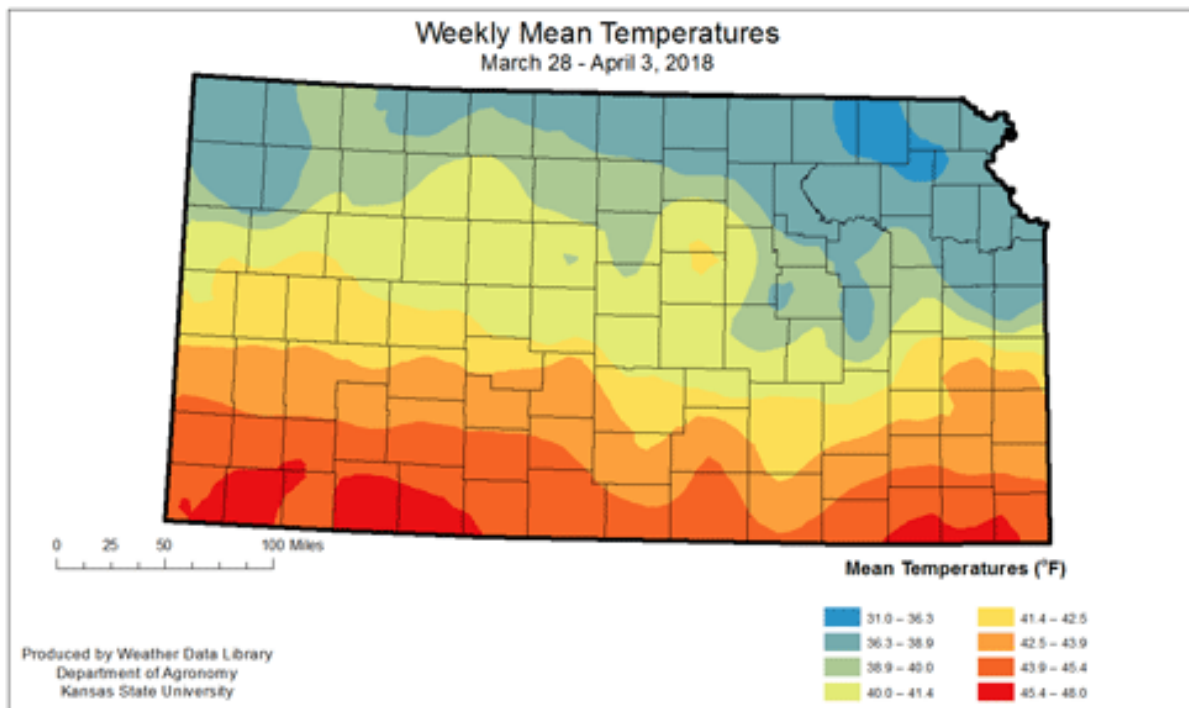


Figure 3. Weekly mean temperatures for Kansas during the week of March 21 -27 via Cooperative Observer (COOP) and Kansas Mesonet.

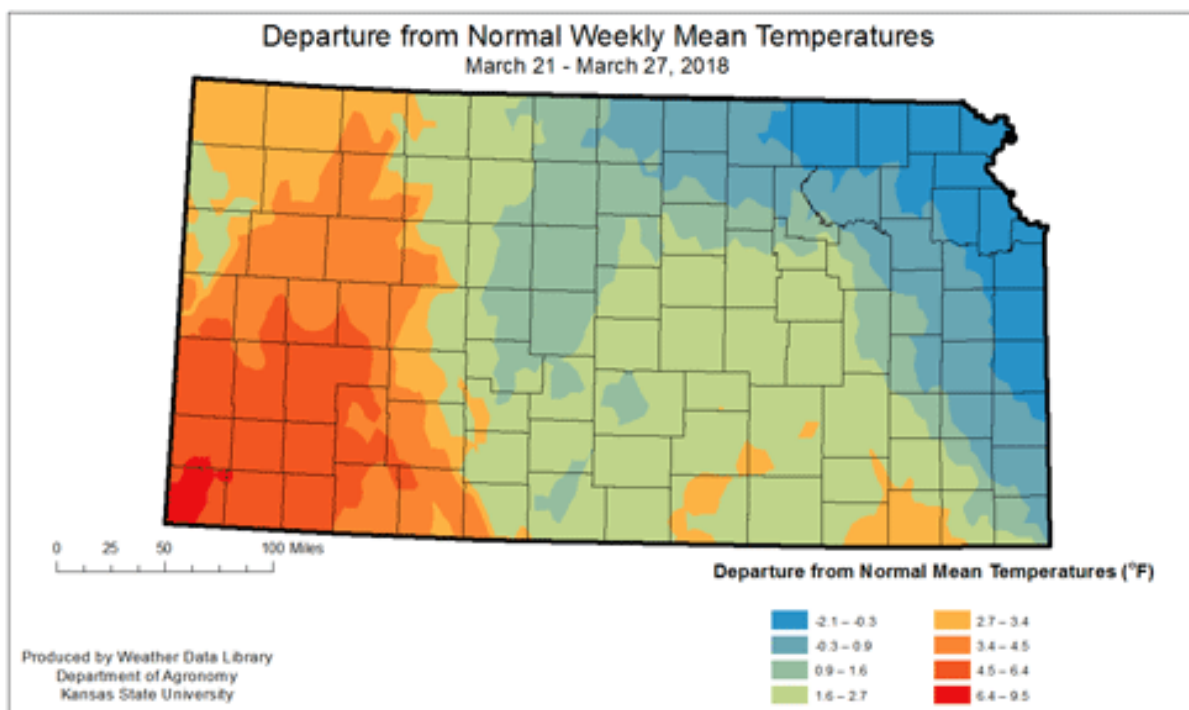


Figure 4. Departures of weekly mean temperatures for Kansas during the week of March 21 -27 via Cooperative Observer (COOP) and Kansas Mesonet.

Another drier-than-normal week resulted in expansion of the exceptional drought in Southwest Kansas (Figure 5). The minimal change in drought categories (Figure 6) shows how little the moisture received changed the overall short fall. Only very slight improvements can be seen where the heaviest rains fell.

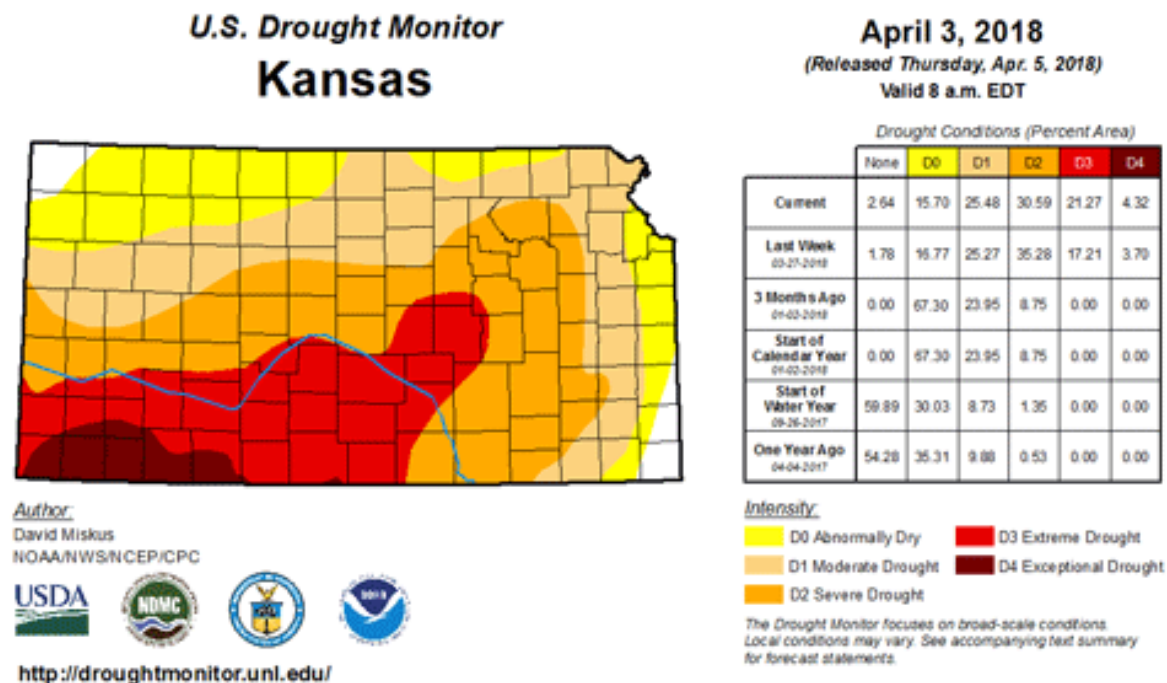
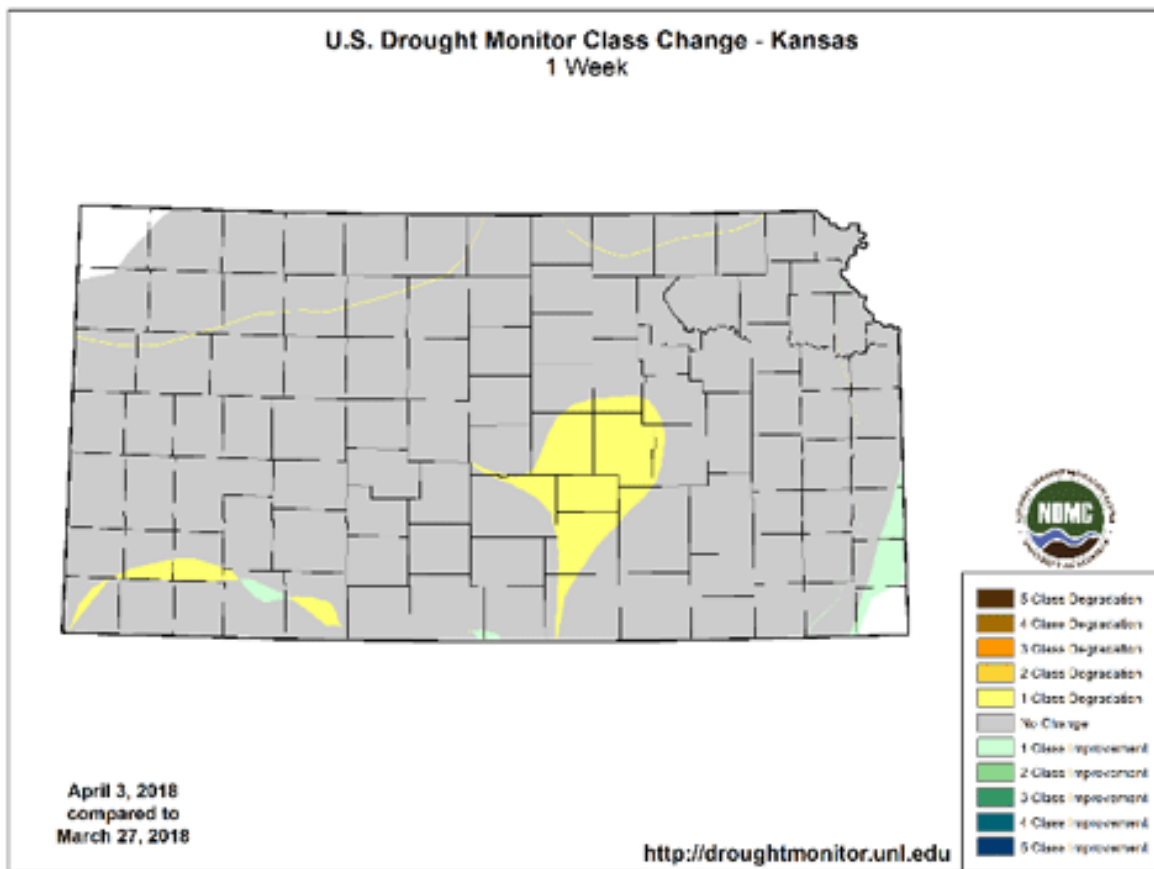


Figure 5. Current drought conditions for Kansas from the Drought Monitor.



⊠

Figure 6. Difference in drought categories.

Precipitation and temperature outlooks

The quantitative precipitation forecast for the 7-day period ending on April 5th isn't encouraging. The areas with highest expected amounts are along the Kansas/Missouri border, particularly in the southeast corner of the state (Figure 7). That region may see up to a quarter of an inch. However, that would only be 80 percent of the normal for the week, and amounts drop sharply as you head west. From central Kansas to the southwest, the accumulation is expected to be less than a trace.

The 8 to 14-day precipitation outlook (Figure 8) indicates a slightly increased chance of above-normal precipitation across the state, but in those areas that is only a slight chance. The temperature outlook is neutral for all except the Southwest, where there is an increased chance of warmer-than-normal temperatures.

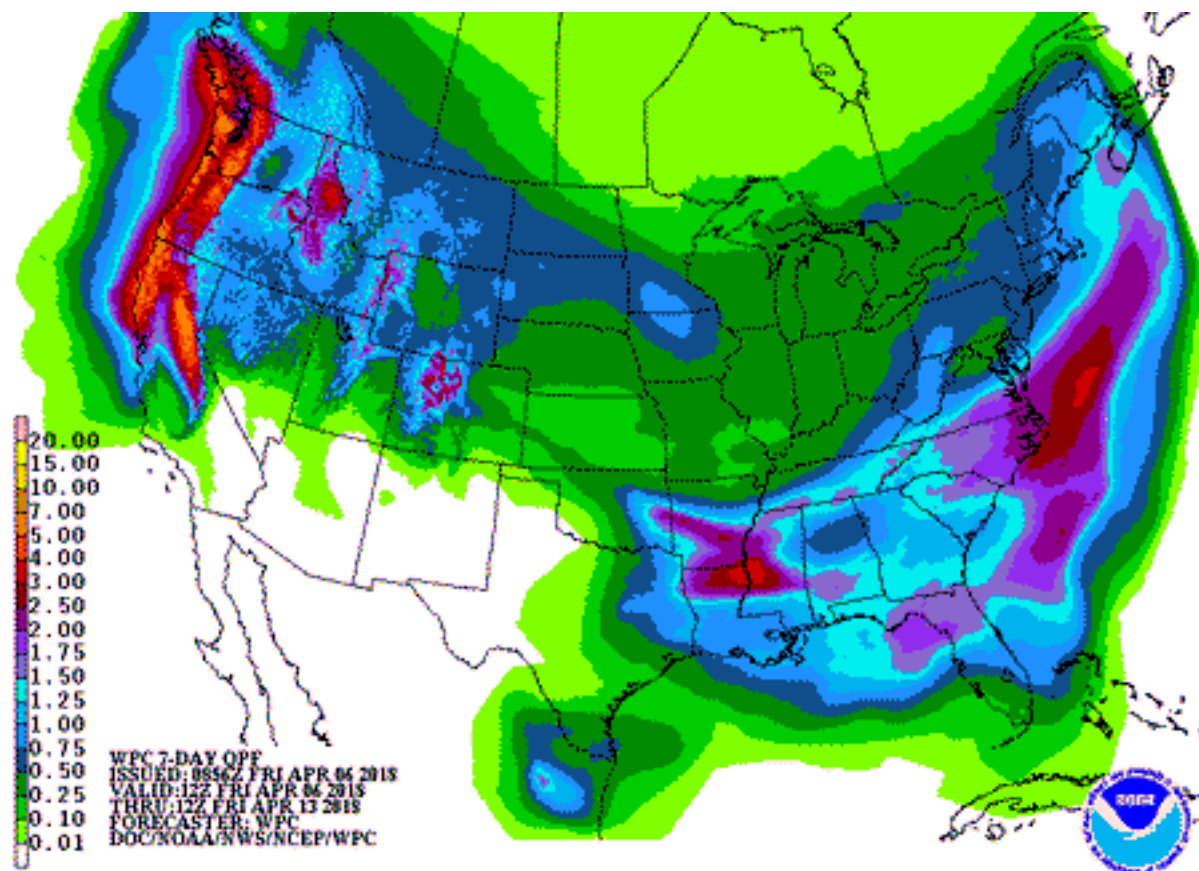


Figure 7. Quantitative Precipitation Forecast for week ending April 5, 2018.

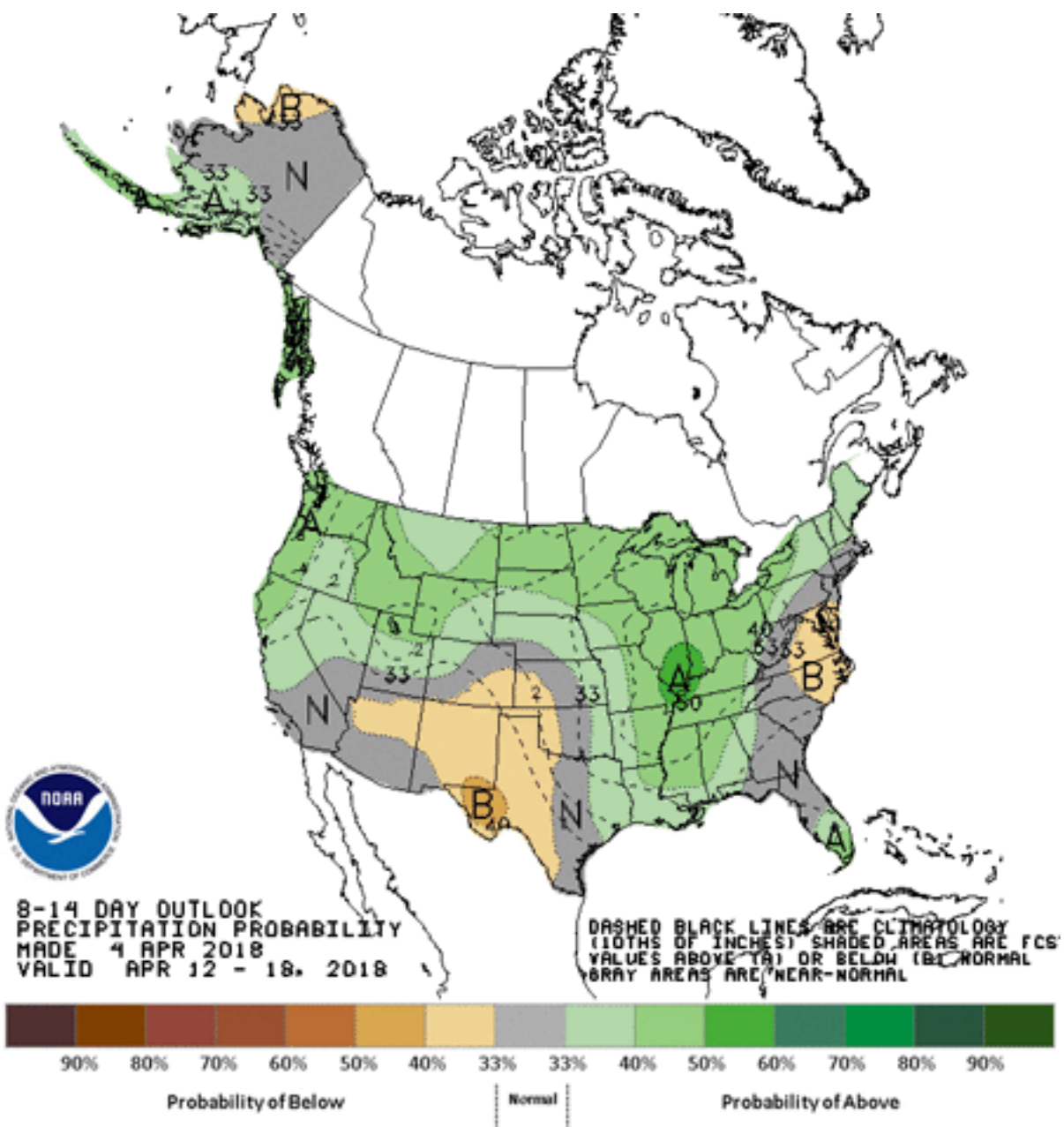


Figure 8. 8-10 day Precipitation Outlook for period ending April 11, 2018 (CPC)

Additional information can be found in the latest Agronomy eUpdate at:

https://webapp.agron.ksu.edu/agr_social/eu.throck

Or on the Kansas Climate website under weekly maps or drought reports:

<http://climate.k-state.edu/maps/weekly> and <http://climate.k-state.edu/reports/weekly/2018/>

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8. 2018 In-Depth Wheat Diagnostic School, May 9-10 in Garden City

K-State Research and Extension will hold the 2018 Wheat In-Depth Diagnostic School on May 9th and 10th at the Southwest Research-Extension Center, 4500 E Mary Street, Garden City. The hours on May 9 are 9 a.m. to 4:30 p.m. On May 10, the hours are 8 a.m. to 2 p.m.

Registration cost is \$140 before May 1 and \$180 after May 1, including walk-ins. Breakfast and lunch is included with your registration along with an extensive take-home field book.

The latest techniques and technology in agriculture are within your reach! Join us for this year's In-Depth Wheat Diagnostic School to learn from KSRE experts and discover cutting edge breakthroughs in wheat production.

Topics to be covered this year include:

- Wheat growth and development
- Weed management
- Disease identification and management
- Growing 100 bushel dryland wheat in western KS
- Irrigation technology
- Wheat fertilizer management
- Insect management in wheat and canola
- Canola production
- Weed identification
- Production cost of wheat and canola
- Farmer's success story of growing canola in western KS

Speakers at the event include:

- Romulo Lollato
- Stu Duncan
- Dallas Peterson
- Erick DeWolf
- Horton Seed Services representative
- Jonathan Aguilar
- Ajay Sharda
- Dorivar Ruiz Diaz
- AJ Foster
- Sarah Zukoff
- Mike Stamm
- John Holman
- Kevin Donnelly
- Monte Vandever
- Tyson Good

This event will also offer Certified Crop Advisory and Commercial Applicator credits.

Interested individuals can register online at <http://www.global.ksu.edu/wheat-diagnostic>

For registration questions, please contact registration@ksu.edu or call 785-532-5569



2018 In-Depth Wheat Diagnostic School

9:00 a.m. – 4:30 p.m. May 9th and 8:00 a.m. – 2:00 p.m. May 10th

Location

K-State SW Research-Extension Center
4500 E Mary Street
Garden City, KS 67846

Cost:

\$140 before May 1; \$180 for registrations after May 1 and walk-ins. Breakfast & lunch is included with registration and will be provided.

The latest techniques and technology in agriculture are within your reach. Join us for this year's Wheat Diagnostic School to learn from K-State Research and Extension experts and discover the cutting edge breakthrough in wheat production. Registration is \$140 before May 1, and includes access to renowned speakers and an extensive take-home field book.

Topics

- Wheat growth and development
- Weed management
- Disease identification & management
- Growing 100 bu. Dryland wheat in Western KS
- Irrigation Technology
- Fertilizer Application Technology
- Wheat Fertilizer management
- Insect Management Wheat & Canola
- Canola Production
- Weed Identification
- Production Cost of wheat & canola
- Farmer's success story in growing canola in Western Kansas

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Register online at <http://www.global.ksu.edu/wheat-diagnostic>

For registration questions, please contact registration@k-state.edu

or

call 785-532-5569.

Kansas State University is committed to making its services, activities and programs accessible to all participants. If you have special requirements due to a physical, vision, or hearing disability, contact AJ Foster, 620-275-9164.

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9. KDA now accepting approved on-line dicamba applicator training

The Kansas Department of Agriculture has announced that they will be accepting the label required dicamba specific training online in the state of Kansas starting April 1 for the dicamba products approved for use on Xtend crops. KDA has stipulated that the online training must have accountability built in to ensure that an individual must participate in the training module. On-line training is offered by some of the surrounding states, as well as from Monsanto, BASF, and DowDuPont.

Below are links to the company websites for additional information about application requirements and dicamba training:

Monsanto: <http://www.roundupreadyxtend.com/>

BASF: <https://www.engeniastewardship.com/#/training>

DowDuPont (Corteva): <http://www.dupont.com/products-and-services/crop-protection/soybean-protection/articles/fexapan-application.html>

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10. 2017 Census of Agriculture - It's not too late to be counted!

Kansas farmers and ranchers still have time to be counted in the 2017 Census of Agriculture, according to the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS). Although the first deadline has passed, NASS will continue to accept Census information through the spring to get a complete and accurate picture of American agriculture that represents all farmers and ranchers.

"We thank everyone who has completed their Census to date. Kansas currently has a return rate of just 57 percent of the Census questionnaires mailed to producers last December," said Doug Bounds, Kansas State Statistician. "A lot is at stake if producers are not represented in this data. Census data have and will continue to influence important decisions for American agriculture. The data will affect every operation and every farming community at some point, whether it be through farm policy, disaster relief, insurance or loan programs, infrastructure improvements, or agribusiness setup. There is accuracy and strength in numbers, which is why NASS is committed to giving producers every opportunity to respond."

Federal law mandates that everyone who received the 2017 Census of Agriculture questionnaire complete it and return it even if not currently farming. NASS will continue to follow-up with producers through the spring with mailings, phone calls, and personal visits. To avoid these additional contacts, farmers and ranchers are encouraged to complete their Census either online at www.agcounts.usda.gov or by mail as soon as possible. Responding online saves time by skipping sections that do not apply and automatically calculating totals. The online questionnaire is accessible on desktops, laptops, and mobile devices.

For more information about the 2017 Census of Agriculture, visit www.agcensus.usda.gov. For questions or assistance filling out the Census, call toll-free (888) 424-7828.

