k-state extension AGRONOMY e-Updates

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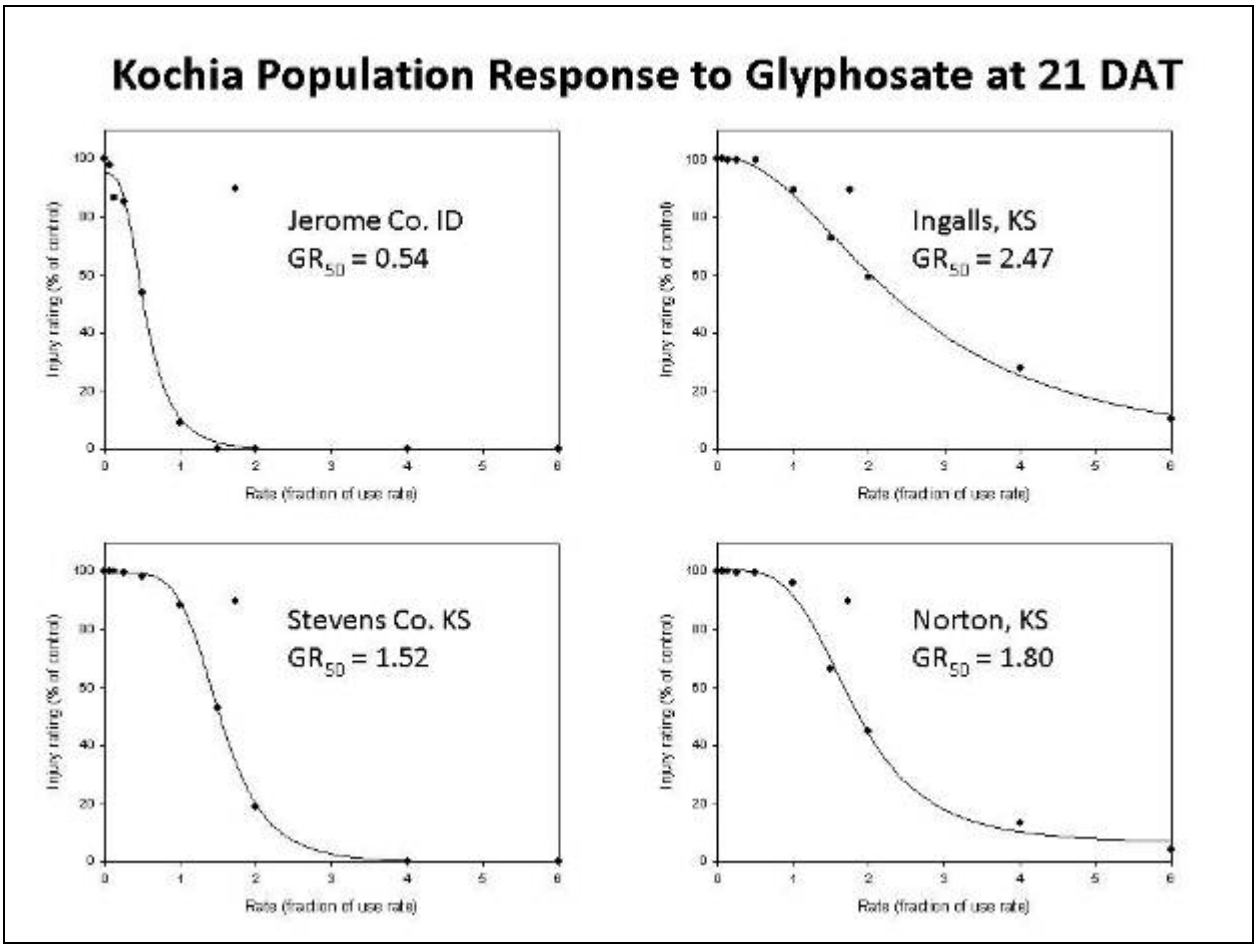
## 1. Herbicide resistance in kochia: How widespread is the problem?

Kochia has long been a serious weed problem in western Kansas, but getting good control of kochia has become even more of a challenge in recent years as populations resistant to atrazine and ALS-inhibitor herbicides have developed. Now there are confirmed populations of glyphosate-resistant kochia sampled during 2007 from several counties in western Kansas. Many more such populations are suspected.

The Weed Science Society of America has defined herbicide resistance as: "The inherited ability of a weed or crop biotype to survive a herbicide dose normally lethal to the original 'wild' population."

In testing populations that are suspected of having developed herbicide resistance, a range of herbicide doses are used – normally ranging from a fraction of the recommended rate to more than 4 times the recommended rate. The resulting dose response curve allows a comparison between suspect and known susceptible populations.

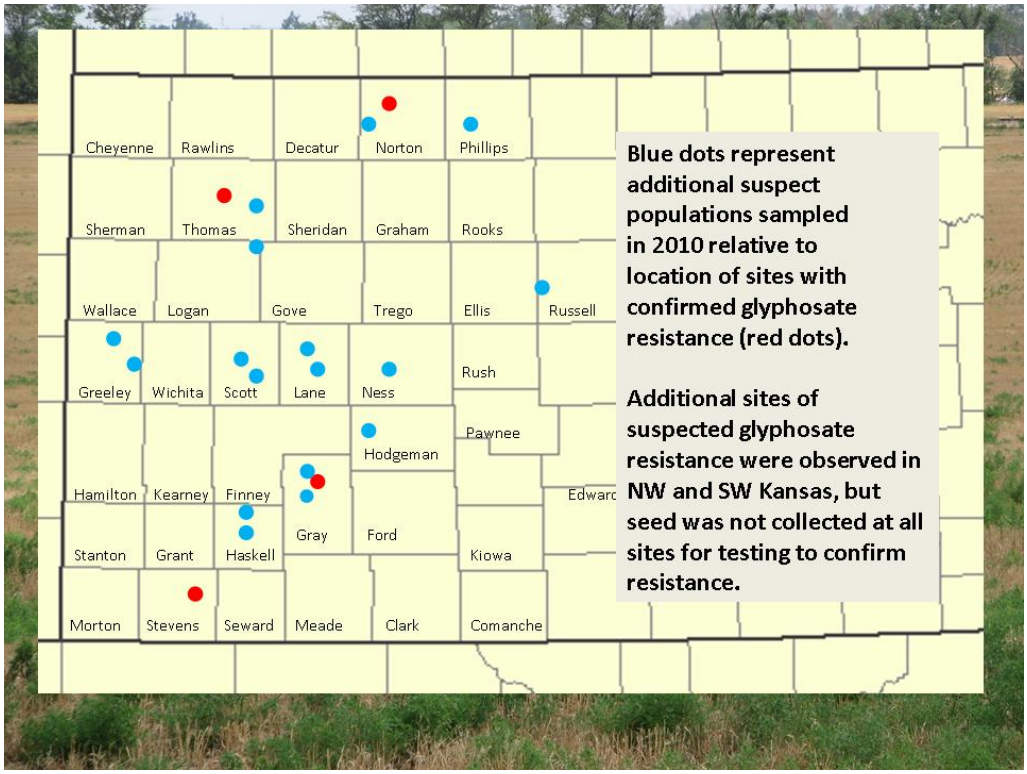
In testing kochia populations for glyphosate resistance using this method, the charts below show the results of four populations. The population from Jerome County, Idaho is susceptible. At the normal, 1X rate of glyphosate, there was almost complete control of this population of kochia. In comparison, there was very little control of three Kansas populations at the 1X rate, and only about 40 percent control or less at the 2X rate. This is one method used to confirm herbicide resistance. A fourth population in Thomas Co. also was confirmed resistant, but is not shown in the charts below.




**Source: Jason Waite, et al., K-State Research and Extension**

The $GR_{50}$ (the dose required to cause a 50 percent growth reduction) shown in these figures represents the fraction of the recommended glyphosate use rate (0.75 lb ae/a) required to reduce the greenhouse-grown kochia population plant growth by 50 percent. In performing such tests, K-State Research and Extension scientists have confirmed glyphosate-resistant populations of kochia in four western Kansas counties (Gray, Norton, Stevens, and Thomas). Reports of lack of control of kochia with glyphosate escalated in 2010. Field inspections confirmed these reports.

The following map shows the locations of both confirmed and suspected glyphosate-resistant populations -- but this map only shows counties where seed was collected for resistance testing. Other locations in western Kansas are suspected of having glyphosate-resistant populations of kochia, but seed was not collected at all locations.




**Red dots are locations where glyphosate-resistant kochia has been confirmed. Blue dots are where glyphosate-resistant populations are suspected based on sampling. Source: Phil Stahlman, KSU Agricultural Research Center-Hays.**

In some cases, resistant populations in the different areas have developed independently. But any give resistant population can also spread to adjacent fields or even adjacent counties. Kochia seed is spread by plants that become detached after their growing season is over, and roll across fields with the wind. This “tumbleweed” effect is illustrated in the photo below, which shows how a single glyphosate-resistant plant can roll through a field, spreading its seed. At least some of these seeds will also produce glyphosate-resistant plants.

**Glyphosate-resistant kochia population that spread as the detached "tumbleweed" plant rolled through this field in Greeley County. Photo by Phil Stahlman, KSU Agricultural Research Center-Hays.**

If no herbicides other than glyphosate are used on fields with glyphosate-resistant populations, these populations will survive and can quickly spread to large areas of the field, as illustrated in the photo below of a soybean field in Lane County.

**Glyphosate-resistant kochia populations such as in this soybean field in Lane County can become quite dense in a field if alternative herbicides are not used to control it. Photo by Phil Stahlman, KSU Agricultural Research Center-Hays.**

Glyphosate-resistant populations of kochia may also be resistant to atrazine and/or ALS-inhibitor herbicides, making control a challenge. It is difficult to state with certainty at this time whether such herbicide-resistant populations are naturally any more or less fit to survive environmental conditions than normal populations.

In the following weeks, we will have a series of articles in the Agronomy e-Update on kochia, including articles on control strategies that can be used on glyphosate-resistant populations in various crops.

-- Phil Stahlman, Weed Scientist, KSU Agricultural Research Center-Hays
stahlman@ksu.edu

-- Brian Olson, Northwest Area Crops and Soils Specialist
bolson@ksu.edu

-- Curtis Thompson, Weed Management Specialist
cthompso@ksu.edu

2. Assessing winter damage to alfalfa stands

This could be a tough winter for alfalfa in Kansas, especially on newly seeded stands. The two main concerns for alfalfa are winterkill and heaving.

## Winterkill

There is a wide range of winterhardiness among alfalfa varieties. Some varieties may have suffered winterkill injury this winter, especially where the crop had no snow cover. As in wheat, winterkill in alfalfa occurs when the crown is frozen. When this occurs, the taproot will turn soft and mushy. In the early spring, check for bud and new shoot vigor. Healthy crowns are large, symmetrical and have many shoots. Examine them for delayed green-up, lopsided crowns and uneven shoot growth. If any of these characteristics are present, check the taproots for firmness. Some plants may even begin to greenup and then die. Plants that put out second leaves are likely unaffected.

The following set of questions and answers is adapted from a 2008 informational piece by Dan Undersander, of the University of Wisconsin (www.uwex.edu/ces/forage/pubs/winterkill2008.pdf/):

* Can I interseed with alfalfa to thicken the stand?

Interseeding alfalfa to thicken an alfalfa stand will generally not work. If the stand is one year or less old, plants will generally come up and then be outcompeted by the survivors from last year. Large dead spots should be disked first and then seeded. If the stand is two or more years old, interseeding alfalfa will not work because of autotoxicity. In this situation, you should wait one year before reseeding.

* What legume credits can I expect from the killed alfalfa?

If the stand is more than one year old you can expect 150 lbs N/acre legume credit if the stand had 4 or more plants per square foot when killed. This is sufficient to grow a crop of corn for grain or silage with some starter fertilizer. If the alfalfa was seeded last spring, legume credits would be about 90 lbs N/acre if topgrowth was not harvested and about 30 lbs less if only stubble prior to winter.

## Heaving

This winter could also result in a more common form of injury to alfalfa. As the soil freezes and thaws, alfalfa stands can be damaged by the heaving effect. This will be more likely to occur where soils are not under continuous snow or ice cover, and where temperatures have been in the single digits at night. This winter has been cold enough to freeze the soil where it is not under snow cover. Soils with high levels of clay are especially prone to winter heaving.

If heaving has occurred, dig up some plants to determine if the taproot is broken. Plants with broken taproots may green-up, but they perform poorly and eventually die. Slightly heaved plants can survive, but their longevity and productivity will be reduced. Crowns that heaved one inch or less are not as likely to have a broken taproot. With time, these plants can reposition themselves. Raised crowns are susceptible to weather and mechanical damage. Raise cutter bars to avoid damaging exposed crowns.

## Evaluating Plants and Stands

Producers can start to evaluate the health of their alfalfa stands in March or April, as soon as the soils thaws. They should look at the crowns and roots. Buds should be firm, and white or pink in color if they have survived with good vigor. The bark of roots should not peel away easily when scratched with a thumbnail. When cut, the interior of healthy roots will be white or cream in color.

When alfalfa growth reaches 4 to 6 inches, producers can use stems per square foot to assess density measure. A density of 55 stems per square foot has good yield potential. There will probably be some yield loss with stem counts between 40 and 50 per square foot. Consider replacing the stand if there are less than 40 stems per square foot and the crown and root health is poor.

If an established stand was injured by winterkill or heaving, and large patches are dead, producers may want to buy some time before replacing the stand by temporarily thickening the bare areas with red clover. Red clover is not susceptible as alfalfa to the plant toxins released by alfalfa (allelopathy), and help provide good quality forage.

-- Jim Shroyer, Extension Agronomy State Leader
jshroyer@ksu.edu

3. Early spring management practices for alfalfa

As alfalfa breaks dormancy, producers should plan to keep a close watch for insect activity. This is also a time of year when producers can apply lime or fertilizer, if needed.

## Insect Activity

Alfalfa weevils are probably first and foremost insect pest to start scouting for at this time of year. Scouting for alfalfa weevil should begin as soon as the plants break dormancy. Some eggs were probably deposited last fall. With the warm weather we have had sporadically and which can be expected over the coming weeks, we have now accrued several degree days or thermal units towards hatching these eggs. Heat units accumulate for alfalfa weevils at temperatures above 48 degrees F. However, do not be too quick to treat for alfalfa weevil. Wait until the field reaches the treatment threshold.

The next insect to start watching for would probably be pea aphids. They can also start relatively early in the spring, and can be a problem on first-year stands. If weevil treatments are applied, they will wipe out any beneficial insects -- which normally do a good job of keeping aphid populations under control.

Also, producers will need to keep an eye out for army cutworms as there were some reports of army cutworm activity last fall. Army cutworms will start feeding again anytime temperatures are above 50 degrees F. Armyworms are another potential problem. We had problems with armyworms after the April freeze in 2007.

Those are the early season pests which have the most potential for damaging alfalfa prior to the first cutting. For more information on control, see K-State publication MF-809, Alfalfa Insect Management 2011, at: www.ksre.ksu.edu/library/entml2/mf809.pdf

## Fertility Decisions

Alfalfa is a crop with high nutrient removal rates, with average values of 10-12 lbs of $P_2O_5$ and 60 lbs of $K_2O$ per ton of alfalfa. Annual fertilizer application of P and K is often needed to maintain soil nutrient levels, which also helps to maintain good stand vigor and therefore the longevity of an alfalfa field.

| K-State Phosphorus Recommendations for Alfalfa | | | | | | |
|---|---|---|---|---|---|---|
| | | Soil test for phosphorus (ppm) | | | | |
| Condition | Area of state | Very low 0-5 | Low 6-12 | Medium 13-25 | High 26-50 | Very high >50 |
| | | Pounds per acre of $P_2O_5$ | | | | |
| New seeding | | | | | | |
| Irrigated | Entire | 90-120 | 70-90 | 50-70 | 0-50 | None |
| Nonirrigated | Eastern | 80-100 | 60-80 | 40-60 | 0-40 | None |
| | Western | 60-80 | 40-60 | 20-40 | 0-20 | None |
| Established stand | | | | | | |
| Irrigated | Entire | 90-110 | 60-90 | 40-60 | 0-40 | None |
| Nonirrigated | Eastern | 60-80 | 40-60 | 30-40 | 0-30 | None |
| | Western | 40-60 | 30-40 | 0-30 | None | None |

| K-State Potassium Recommendations for Alfalfa | | | | | | |
|---|---|---|---|---|---|---|
| | | Soil test for potassium (ppm) | | | | |
| Condition | Area of state | Very low 0-40 | Low 41-80 | Medium 81-120 | High 121-160 | Very high >160 |
| | | Pounds per acre of $K_2O$ | | | | |
| New seeding | | | | | | |
| Irrigated | Entire | 100-140 | 80-100 | 50-80 | 0-50 | None |
| Nonirrigated | Entire | 100-120 | 70-100 | 40-70 | 0-40 | None |
| Established stand | | | | | | |
| Irrigated | Entire | 100-120 | 70-100 | 50-70 | 0-50 | None |
| Nonirrigated | Entire | 90-120 | 60-90 | 40-60 | 0-40 | None |

**Source: K-State *Alfalfa Production Handbook***

Alfalfa also shows responses to some secondary and micronutrients and in Kansas sulfur and boron can often limit yield potential and should be monitored periodically.

If phosphorus, potassium, sulfur, or boron are needed, when should they be applied?

First of all, for new seedings, it is important to build up soil test P and K to the optimum range before seeding, because this is the only opportunity (for the life of the stand) to mix the nutrients through the topsoil. At seeding, small amounts of P and K can be banded below the seed, making sure to allow adequate separation between the seed and the fertilizer band.

On established stands, broadcasting phosphorus has proven effective on soils low in phosphorus because alfalfa has roots near the soil surface. For nonirrigated stands, top dressing is normally done in the fall, early spring, or even after the first cutting. Irrigated stands can be fertilized in the fall, early spring, or after any cutting because moisture can be supplied to make the top-dressed fertilizer available to plants.

Potassium application times and methods are similar to those for phosphorus, and in most cases, the nutrients will be applied together.

For established stands, the critical time when alfalfa needs the most P and K is usually in preparation for winter. In order to boost the winterhardiness of the crop, a good supply of P and K needs to be added before the critical fall growth period. Phosphorus and potassium are needed during this period to enhance storage of soluble carbohydrates in the roots. Early fall fertilization when there is still some plant growth (4-6 weeks before dormancy) is usually more effective in increasing winter survival, because nutrients are supplied in time for adequate uptake.

When high nutrient application rates are needed to boost soil fertility, splitting the total required amount into two or more applications is recommended in order to avoid salt injury and luxury consumption beyond the alfalfa nutritional requirement.

Little difference exists between liquids or solids, or ortho- or polyphosphates, as phosphorus sources for alfalfa. Use of straight phosphate sources (0-46-0) over ammonium phosphate is preferred for topdressing to minimize weed competition, but availability of straight phosphates is limited, and the use of ammonium phosphates (18-46-0, 10-34-0) as phosphorus sources for alfalfa has been successful.

Lime is also important for alfalfa, but lime should be applied before seeding and during land preparation for planting. Alfalfa grows best in a soil pH range of pH of 6.5 to 7.5 and when needed, lime should be applied to reach a pH of 6.8.

It is not necessary, or desirable, to apply nitrogen to established stands of alfalfa. Nitrogen fertilizer applied to well-nodulated alfalfa will only stimulate grassy and broadleaf weeds, and may reduce stand longevity.

For more information, see K-State publication C-683, *Alfalfa Production Handbook*, at: http://www.ksre.ksu.edu/library/crpsl2/c683.pdf

-- Jeff Whitworth, Extension Entomologist
jwhitwor@ksu.edu

-- Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

4. Winter canola crop update

As the recent snowfall melts and warmer weather returns, the winter canola crop exits the three-month vegetative rest period. Generally speaking, winter canola will resume active growth when the average daily temperature is greater than 40ºF for several days. Some winter canola in Oklahoma and southern Kansas is already showing signs of spring re-growth.

Normally winter survival can be assessed visually after the danger of further stand loss from freezing temperatures has passed. When evaluating winter survival, look for green leaf tissue at the center of the rosette or crown. If green leaf tissue is present and the crown is firm when squeezed, it is highly likely the crop will resume active growth as temperatures rise and day length becomes longer. A harvest population of four to 15 plants per square foot is optimum; however, a stand of one plant per square foot is acceptable although yield potential may be somewhat reduced. Remember that the branching ability of canola allows it to easily compensate for a thinned stand.

To be equipped for the second half of the winter canola growing season, here are several management guidelines to keep in mind as we enter a period of rapid growth and development.

- Now is the opportune time to topdress any remaining nitrogen scheduled for application. Topdress applications should be based on an updated assessment of yield potential, less profile residual nitrogen and the amount of nitrogen applied in the fall. Either solid or liquid forms of nitrogen can be applied in late winter. This application should be made just as the crop returns to active growth but prior to bolting. It is important to avoid crushing bolted winter canola with applicator tires. This may cause lodging and delay maturity which can slow harvest.

- Producers can control winter annual grasses and broadleaf weeds in the spring. Cheat, downy brome, feral rye, Italian ryegrass, and other grassy weeds can be controlled with Select 2 EC or Assure II herbicides in conventional canola, or with glyphosate if using a Roundup Ready cultivar. As spring weeds begin to actively grow these herbicides should be applied. Do not apply glyphosate if canola is bolting since severe injury will occur.

- Insecticidal seed treatments provide protection against green peach aphid and turnip aphid through January, yet fields must be scouted this time of year whether or not a seed treatment was used. Aphid scouting recommendations have been established by Oklahoma State University. They suggest walking in a diagonal path across the field, sampling three consecutive plants at 10 stops every 25 yards. To prevent economic losses, aphids should be managed when there are 50-180 aphids per plant. Left uncontrolled, aphids can completely devastate a canola stand in the early spring. Producers will often tank mix an insecticide with their spring herbicide application as a preventive measure.

- As temperatures increase, army cutworms start to aggressively feed and damage can be severe if unnoticed. The larvae hide in loose soil at the base of plants, emerging to feed in the evening. Cutworms also can be found underneath the previous year’s crop residue, or

under dead leaves at the base of the rosette. Look for foliar tissue damage and severed green leaves lying on the ground as evidence of feeding. Canola should be treated when there is an average of two or more larvae per foot of row.

Follow these key management guidelines to guarantee a strong finish and profitable returns from the 2010-2011 winter canola crop.

-- Mike Stamm, Canola Breeder
mjstamm@ksu.edu

5. Kansas Flint Hills Smoke Management Plan: The Burning Decision Support Tool

The following is a slightly edited transcript of the seventh in a series of K-State's Agriculture Today radio broadcasts on the Kansas Flint Hills Smoke Management Plan. This is an interview with Tom Gross, Bureau of Air, Kansas Department of Health and Environment, conducted by Eric Atkinson of the K-State Radio Network. Podcasts of all Agriculture Today interviews can be found at: http://www.ksre.k-state.edu/DesktopDefault.aspx?tabid=197

Q: One of the main cogs in the new Kansas Flint Hills Smoke Management Plan is the burning decision support tool. This will be an online device allowing grassland managers to plug in their own burning factors, and will render a recommendation on whether to burn on any given day in a given area. What is the purpose of this tool?

A: The primary purpose is to provide information to a rancher or a producer so he or she can go to the website and look at the impact of burning from the perspective of their own acreage. That website is hosted by K-State Research and Extension. It is at: ksfire.org

An individual can go in and plug in information on fuel load, acreage to be burned, and location, and see on a map what direction the smoke from their fire is projected to move, how far it will move, and a general, relative indication of how concentrated the smoke plume is projected to be. A different location on the website will have the projected cumulative impact of burning in a given area on a given day. That's a piece we're still working on. To make this projection, we would go back in time and look at one or more days from a year in which there were cumulative air quality impacts from smoke on Kansas City or Wichita. We'll plug in the amount of acreage burned on that day and the meteorological conditions on the following day. Then, based on the conditions that caused a problem in the past, we'll see if the model would predict similar air quality problems in those metropolitan areas to occur today as a result of burning in various locations, or if meteorological conditions be better so that we wouldn't have a problem.

What the person would see as an output from this decision support tool would be a map showing areas of either red, yellow, or green throughout the Flint Hills to indicate whether it would be a good day to burn in terms of air quality.

Q: This sounds like a very sophisticated instrument. It's incorporating a lot of different types of information – weather, fuel load, the amount of acreage that might potentially be burned that

same day in the area surrounding you. You've tried to capture the real picture of the effect an individual's grassland burn will have in terms of smoke output and direction, correct?

A: It sure is. We've had discussions with some of the experts in Agronomy at K-State Research and Extension on how to plug in some of the data that the computer model needs in order to create these predictions. To get the model calibrated, we'll look back at days in 2010 and 2009 when we had air quality impacts from smoke in Kansas City and Wichita. We'll put the meteorological conditions and the acreage burned on those days into the model and see how well it does at predicting the results. Then we'll use that to fine-tune and improve it. It is a new thing and I hope that it works perfectly, but we'll learn along the way. We want to get feedback from the producers and see whether they think it is easy to use tool, whether they would use it again, and whether they understand the output it gives them. Also, we want to know whether there are any changes and improvements we need to make. We'll try to make any necessary adjustments and improvements before next year.

Q: You and those working on this tool are putting the finishing touches on it now. One of the pieces of information the producer will have to plug in would be their fuel load. Does the tool give some guidance on estimating fuel load?

A: The way it's currently set up, we have three levels of fuel load: "light," "average," and "heavy." We're going to have a paragraph off to the side explaining this in terms of pounds per acre. If anyone has any questions, perhaps they could get with their local Extension agent to help come up with the right fuel load.

Q: So they'll have plenty of props on the tool itself?

A: Yes, it's pretty straightforward. We hope it's easy and intuitive to use.

Q: It is in real time. The weather will be updated constantly.

A: Yes. As new meteorological information is released, we'll have the next day's prediction uploaded probably by mid-afternoon so that somebody could go in at 2:00, 3:00, or 4:00 and get an idea of what the next day would bring in terms of being a good, moderate, or not-so-good day to burn.

Q: What is your timetable for having this tool in place and ready to run?

A: Right now we're looking at getting it up and running by March 15. We'll continue to make improvements on it after that time.

Q: You will be addressing this topic at the upcoming K-State Cattlemen's Day, and you'll certainly welcome feedback from the producers on the process at that time as well?

A: Yes, we'll talk about it and answer questions. Overall, I think it's important not to just ask somebody to make changes, but to provide the necessary tools to do so, and I think this decision support tool is one of the key ones.

-- Steve Watson, Agronomy e-Update Editor
swatson@ksu.edu

6. Good pesticide application recordkeeping

To prepare for the application of various pesticides -- herbicides, fungicides, or insecticides – this spring, this would be a good time to review USDA requirements for pesticide recordkeeping. Although the recordkeeping requirements apply only to restricted use pesticides, it is a good idea to keep quality records for all pesticide applications.

The Food, Agriculture, Conservation and Trade (FACT) Act of 1990, commonly called the 1990 Farm Bill, states that private applicators must record the use of any restricted use pesticides (RUP) they apply. Under the act, RUP application records must be maintained for two years from the date of application. The certified pesticide applicator should retain these RUP records, and must be able to make them accessible for copying by authorized regulatory and medical representatives.

There is no set method for recording the use of RUPs. Applicators can develop their own method. But there are requirements as to what must be recorded. For each field application the records must include:

- Brand/product name
- EPA registration number (EPA Reg. No.)
- Total amount applied
- Crop/commodity/site/stored product
- Field location
- Area treated
- Application date
- Name of certified applicator and certification number (Cert. No.)

Greenhouse and nursery applicators also must keep all the data elements shown above. When applying spot treatments with total area of less than one-tenth of an acre, the private applicator must record the following information: Brand/product name; EPA registration number; Total amount applied; Location must be designated “spot treatment;” and Application date.

The following is a more detailed look at what is required for each of the record terms.

* Record No.: Each application must be recorded individually, e.g., Record 1 - a preplant herbicide; Record 2 - an at-planting corn rootworm insecticide; Record 3 - a foliar fungicide, etc.

* Application date: Must include month, day, and year.

* Brand/Product: Is found on the front panel of the label, e.g., Ambush Insecticide, Atrazine 4L.

* Amount: This is the “total amount,” or quantity of the formulated product used. It does not include the water or other carrying agent. For example, 3 qts; 2.5 gal.; 150 lb. (for a G or WP formulation product).

* EPA Reg. No.: This is usually located in the lower part of the front label panel. It is a hyphenated set of numbers, e.g., 1234-56. Occasionally, there is a second hyphen.
NOTE: Do not record the EPA Est. No.

* Location: This is the location of the application. It can be recorded as: 1) county, range, township, and section; 2) a system using maps and/or written descriptions; 3) the field numbers designation used by USDA agencies; or 4) the legal property description.

* Area Treated: This is the total area treated and should be in terms of the label directions, e.g., acres, linear feet, square feet, etc. For livestock and poultry, enter the number of animals treated.

* Crop/commodity/site/stored product: Use general terms, e.g., wheat, corn, alfalfa, (do not use scientific or variety names). Commodity includes stored products such as grain or apples. Site is entered as livestock, fence rows, poultry, etc.

* Applicator’s name: This is the name of the certified private applicator who made or supervised the application. It would be good to note the name of the applicator if it was not the certified applicator.

* Cert. No.: This is the private applicator’s certification number (issued by the Kansas Department of Agriculture, or by a reciprocal state).

Other valuable, but not required, information could include:

* What the target pest(s) were — greenbugs, pigweeds, corn borer, etc.

* Size/density of target pest — e.g., 100 (greenbugs or weeds) per row or square foot, larvae/adults (insects), seedling (weeds), etc.

* Adjuvants, drift agents, and other additives used to enhance the application effectiveness.

* Environmental conditions — Record as actual data or estimates. Wind speed should be recorded in miles per hour, not generalities such as calm, light etc.

* Method of application —Examples are air, ground, chemigation, incorporation, etc.

* Equipment used — This can be general, such as boom, band, aircraft; or specific equipment can be listed.

* Reentry time/date (t/d)—For worker protection standards information.

* Comments—This can relate to any aspect that may be helpful in the future. For example: 3 days of cool temps (or other factors) occurred after application, which may reduce the pesticide's level of control.

For more information, see K-State publication P-1102, *Pesticide Application Field Records,* at: www.ksre.ksu.edu/library/entml2/p1102.pdf

Also see the Kansas Department of Agriculture website at: http://www.ksda.gov/pesticides_fertilizer

-- Bill Heer, Agronomist-In-Charge, South Central Experiment Field
bheer@ksu.edu

-- Kraig Roozeboom, Crop Production and Cropping Systems Specialist
kraig@ksu.edu

-- Dallas Peterson, Weed Management Specialist
dpeterso@ksu.edu

-- Frannie Miller, Pesticide Safety and Integrated Pest Management Coordinator
fmiller@ksu.edu

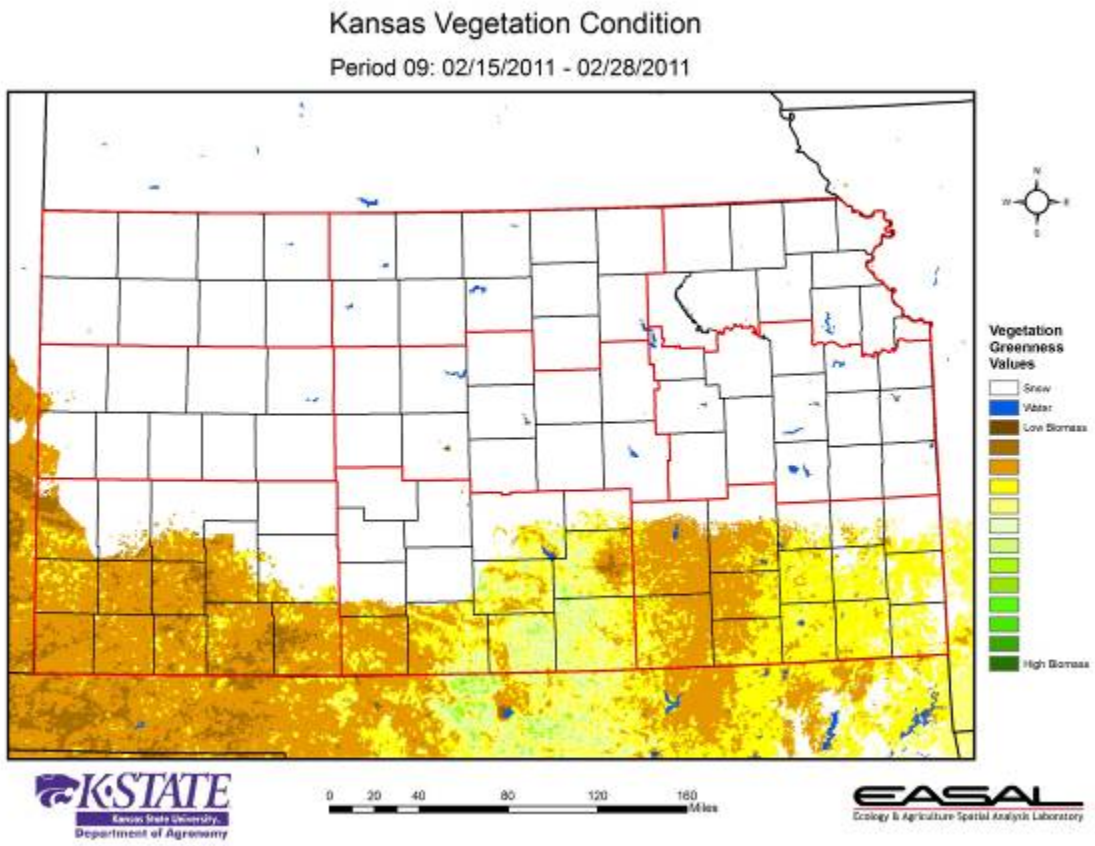
7. Comparative Vegetation Condition Report: February 15 – 28

K-State's Ecology and Agriculture Spatial Analysis Laboratory (EASAL) produces weekly Vegetation Condition Report maps. These maps can be a valuable tool for making crop selection and marketing decisions.

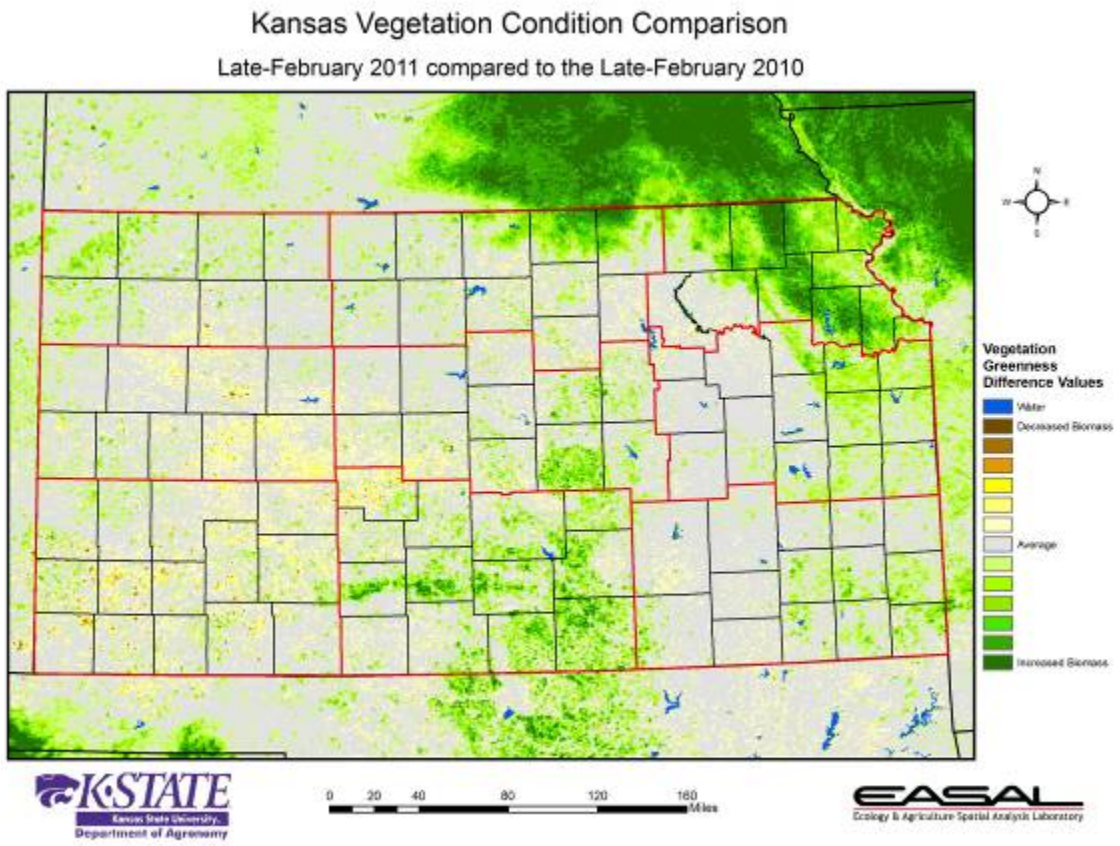
Two short videos of Dr. Kevin Price explaining the development of these maps can be viewed on YouTube at:
http://www.youtube.com/watch?v=CRP3Y5NIggw
http://www.youtube.com/watch?v=tUdOK94efxc

The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 21-year average. The report is used by individual farmers and ranchers, the commodities market, and political leaders for assessing factors such as production potential and drought impact across their state.

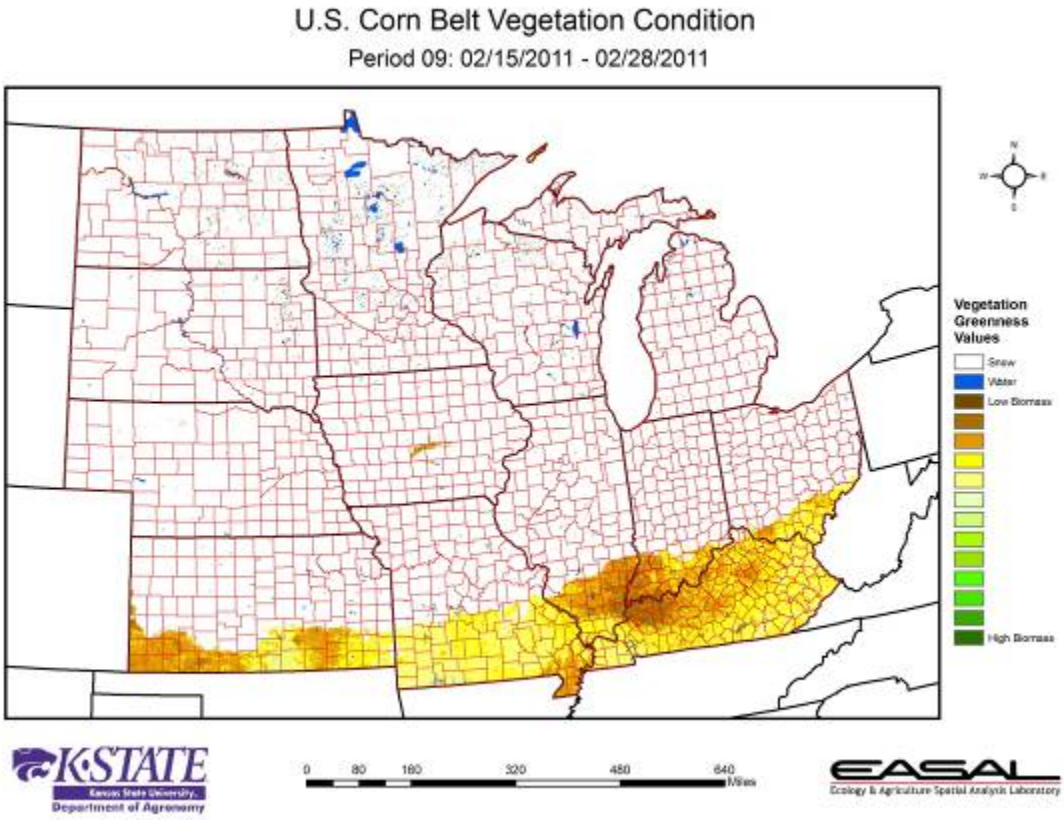
The maps below show the current vegetation conditions in Kansas, the Corn Belt, and the continental U.S, with comments from Mary Knapp, state climatologist:



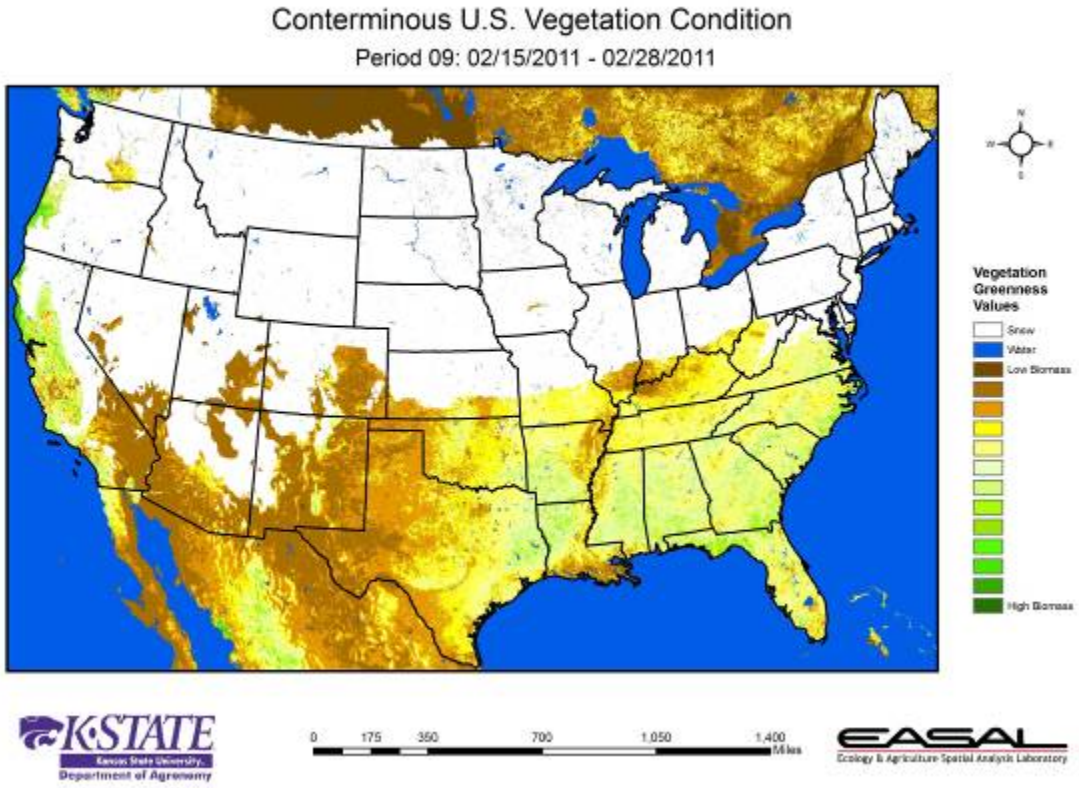

**Map 1. The Vegetation Condition Report for Kansas for February 15 – 28 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that again snow cover was a major feature of the period. The western areas of the state continue to see little benefit from the snow with the southwest division having only 45% of normal precipitation in February.**



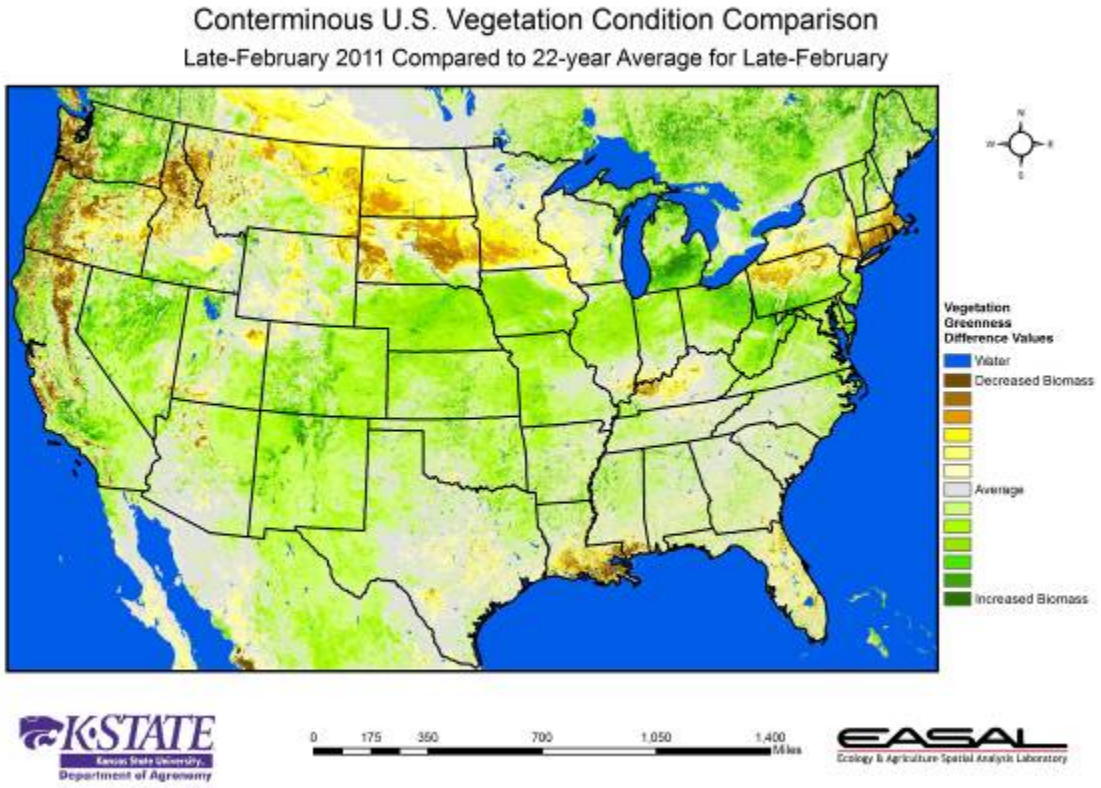

**Map 2. Compared to last year at this time, this year's Vegetation Condition Report for February 15 – 28 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows more photosynthetically active material in south central Kansas. Much of that is due to the fact the wheat was actually planted this year, while last year's acres planted to wheat were reduced. The eastern portions of west central Kansas show the signs of below-normal precipitation.**




**Map 3. The Vegetation Condition Report for the Corn Belt for February 15 – 28 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that snow cover is beginning to retreat northward, but greenup has yet to begin in much of the area.**




**Map 4. The Vegetation Condition Report for the U.S. for February 15 – 28 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows signs of activity in the South, particularly in east Texas and Louisiana. West Texas continues to have low photosynthetic activity. Much of that is due to the cooler-than-normal conditions, with temperatures running five degrees cooler than normal. In contrast, temperatures in east Texas averaged about a degree warmer than normal.**




**Map 5. The U.S. comparison to the 22-year average for the period February 15 – 28 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows much of the country with more photosynthetically active vegetation than is typical in February. Cold and snow is reducing activity in the upper Great Plains and along the Pennsylvania-New York border into Massachusetts, Connecticut, and Rhode Island. Drought remains a factor in Louisiana.**

-- Mary Knapp, State Climatologist
mknapp@ksu.edu

-- Kevin Price, Agronomy and Geography, Remote Sensing, Natural Resources, GIS
kpprice@ksu.edu

-- Nan An, Graduate Research Assistant, Ecology & Agriculture Spatial Analysis Laboratory (EASAL)
nanan@ksu.edu

These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, 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 Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu