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1. Weed of the Month: Marestail

A major problem in no-till cropping systems is achieving effective control of marestail (*Conyza canadensis* (L.) Cronq.), also referred to as horseweed. Marestail is a native plant that is considered either a winter or summer annual weed that is often difficult to identify.

Identification and Description

Marestail is a native plant that is considered either a winter or summer annual weed. It is often difficult to identify. Marestail is a dicotyledon plant that has very small round cotyledons as it emerges. The first leaves of marestail are spatulate in shape and have a whorled leaf arrangement to form a rosette. Small plants may be green or purplish in color during periods of cooler weather. The first leaves generally have smooth leaf margin, while later leaves often have and irregular toothed margin. Roots of marestail are fibrous.

After the rosette stage, the marestail will bolt, with a hairy stem. Leaves on the mainstem are alternate, hairy, 1 to 4 inches long, linear to oblanceolate (widest near the leaf apex) in shape, and attached directly to the main stem. Similar to rosette leaves, leaf margins on the mainstem are either entire or toothed. Plants generally reach 3 to 6 ft in height.

Marestail seed heads are arranged in numerous small heads arranged in an elongated panicle. The individual small flowers are generally white in color with the tiny center of the bloom being yellow. Seed are small (about 1/32 inch) and yellow to tan-colored. Attached to the apex of the seed are numerous slender white bristles that form a tuft-like structure that enable wind-aided seed dispersal.



Seedling stage of maretail. Photo by Dallas Peterson, K-State Research and Extension.



Rosette stage of maretail. Photo by Doug Shoup, K-State Research and Extension.



Another photo of marestail seedlings and rosette. Photo by Dallas Peterson, K-State Research and Extension.



Bolting stage of marestail. Photo by Doug Shoup, K-State Research and Extension.



Flowering stage of marestail. Photo by Dallas Peterson, K-State Research and Extension.

Growth Habit

Marestail is generally considered a winter annual weed, however, marestail can germinate 8 to 9 months out of the year. Depending on geography, marestail will tend to germinate more in the fall in the northern regions of the U.S. and in the spring more in the southern regions. Marestail survival through the winter can range from 20 to 91 percent and vary by rosette size, soil type, and environmental conditions. Since Kansas is in the middle of the U.S., marestail may germinate more in the fall in northern Kansas and spring flushes may be more common in southern Kansas. This can be important when planning for marestail control and herbicide choice. It appears the biology of marestail may be shifting to more spring and summer germination as a result of our cropping systems and herbicide use patterns.

Fall-germinated marestail will overwinter in the rosette stage and bolt in the spring prior to seed production. Spring-germinated marestail will often spend little to no time in the rosette stage, proceeding to the bolted stage soon after emergence.

Marestail can produce up to 200,000 seeds/plant. Because the main mechanism of seed dispersal is by wind movement, its spread can be magnified over great distances. Research has shown that a proportion of marestail seed reaches altitudes in excess of 450 feet above ground. Considering the slow settlement velocity of 1.1ft/sec, a single seed at a 450 ft altitude could easily travel over one hundred miles in a single flight with moderate wind speeds.

Control Options

Marestail is fairly easy to control with many herbicides when plants are small and in the rosette stage of growth. However, when plants begin to bolt or shoot a main stem rapidly in the spring, the ability to get effective control with herbicides is greatly reduced. Therefore timing of control of marestail is critical and, depending on growth stage, herbicide selection will be just as important to achieve successful control. .

Since the mid 1990s, marestail has developed herbicide resistance to five herbicide modes of action including glyphosate, paraquat, atrazine, ALS-inhibiting herbicides (i.e. Classic and FirstRate), and diuron across 16 states -- including Kansas. With the relative ease of development of herbicide resistance, difficulty in controlling bolted plants, and the widespread dispersal of seed, it is apparent that marestail is a major challenge for no-till soybean producers in Kansas.

Development of glyphosate resistant marestail populations is becoming more common in Kansas. However, management strategies can be implemented to control resistant individuals. A study in Indiana evaluated several practices and their effect on the incidence of resistant individuals in a naturally occurring glyphosate-resistant marestail population. In general, practices that included spring herbicide applications, residual herbicides, herbicides with alternative modes of action to glyphosate, and non-glyphosate postemergence herbicides had the greatest effect of shifting the population from more resistant to more susceptible individuals.



Glyphosate-resistant marestail amid susceptible plants. Photo by Doug Shoup, K-State Research and Extension.

Control in Corn and Sorghum

Fortunately, several options exist to control marestail in reduced or no-till corn and grain sorghum. Atrazine is very effective at controlling marestail both as a preemergence application and when applied to small seedlings. As plants bolt in the spring, control with atrazine begins to decline. Caution on repeated use of atrazine as the sole alternative herbicide needs to be considered since marestail has the ability to develop resistance to this herbicide mode of action. Growth regulator herbicides such as dicamba, 2,4-D, and fluroxypyr (Starane) also are effective for control of marestail and are often tank-mixed with atrazine to provide more consistent control. The HPPD inhibiting (or “bleacher”) herbicides such as Lumax, Lexar, Callisto, Balance, Corvus, Capreno, Laudis, and Impact are generally effective for marestail control in corn. Of these, only Lumax and Lexar can be used in sorghum. Lastly, there are several ALS-inhibiting herbicides that have efficacy against marestail for both corn and sorghum, unless the marestail are ALS-resistant.

Control in Wheat

As with corn and sorghum, there are several effective herbicides that control marestail in wheat. Growth regulator herbicides such as dicamba, MCPA, 2,4-D, or fluroxypyr can effectively control marestail in wheat. In addition, several ALS-inhibiting marestail, unless they are resistant to ALS herbicides. Huskie, which is a combination of pyrasulfotole (an HPPD inhibitor) and bromoxynil is also very effective at managing marestail.

Control in Soybean

Controlling marestail in soybeans has been the biggest challenge for central and eastern Kansas no-till producers. Because soybeans are generally planted later in the season, and marestail germinates in the fall or early spring, weed size is the biggest challenge for growers.

In the early spring, using a growth regulator herbicide such as 2,4-D or dicamba is a very inexpensive and effective option to control rosette marestail. In addition, using a herbicide with some residual control will help with those weeds that germinate between the fall/early spring burndown and soybean planting. Products that include Classic, FirstRate, Authority, or Valor should give effective residual control against several broadleaf species including marestail.

As soybean planting nears, marestail control can become difficult because plants will usually be bolted and may have considerable size. Herbicides to apply as a burndown prior to planting include tank mixes of glyphosate with FirstRate, Classic, Sharpen, Optill, or 2,4-D. Be very careful to follow label directions when using 2,4-D prior to soybean planting because the plant-back restriction ahead of soybean can be from 7-30 days. Sharpen is a relatively new herbicide that has provided good marestail control and can be applied any time prior to soybean emergence. Marestail control with Sharpen can be maximized by applying it in combination with methylated seed oil and at spray volumes of 15 gallon per acre or more.

One additional herbicide to consider as a burndown application prior to planting is Ignite, which can provide good to excellent control of marestail. In several K-State studies, Ignite has done well on both rosette and bolted marestail at the 29oz/a rate -- and there is no soybean plant-back restriction. Ignite also has broad spectrum non-selective activity on other broadleaf and grass species if treated at a young growth stage. Ignite however is more of a contact herbicide than glyphosate so applications of 15-20 gpa will increase activity. In addition, Ignite tends to work better with higher humidity and warm sunny conditions at application time.

Controlling marestail in the soybean crop with a postemergence applications can be the biggest challenge for producers. Glyphosate alone is often not effective on larger marestail or on glyphosate-resistant marestail. The most successful treatments at controlling large marestail in Roundup Ready Soybeans have been with combinations of glyphosate plus FirstRate, glyphosate plus Classic, or glyphosate plus Synchrony. Another option to control marestail in soybean is to use Liberty Link soybeans. These soybeans are resistant to the herbicide Ignite, which can be a very effective marestail herbicide. Liberty Link soybeans are currently available to producers.

-- Doug Shoup, Southeast Area Crops and Soils Specialist
dhoup@ksu.edu

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

2. Resources for giving talks or demonstrations on soil and water quality

Many of us working in agriculture are asked from time to time to give talks or demonstrations to producers, watershed groups, or youth. If you're looking for ideas, the web is a great place to look, though the amount of information can be a bit overwhelming sometimes. So here are a few ideas regarding soil science and water quality to get you started.

If you only had a few seconds to make a point about soils, what would you say?
<http://www2.ngdc.wvu.edu/~hferguson/sample%20soil%20talks/> Some key points:

- Soils vary
- Soils are living
- Soils link the land, air and water
- Soils can be degraded or improved, depending on management

Henry Ferguson, NRCS Soil Scientist, has a webpage that has ideas for presenting a variety of concepts, and what's especially nice about his page is that he has posted short videos of his demonstrations. <http://www2.ngdc.wvu.edu/~hferguson/educationNGDC/>

Another good website is from Dr. Dirt aka, Dr. Clay Robinson from West Texas A&M University: <http://www.wtamu.edu/~crobinson/DrDirt.htm> He also has videos of some of his demonstrations posted on YouTube, which I suggest you use to get ideas on how to present concepts. Check out "Soil is a Filter" and "Erosion Shuffle" at: <http://www.youtube.com/user/DrDirtSoilVideos>

The K-State Agronomy website has links for K-12 educators at: <http://www.agronomy.ksu.edu/p.aspx?tabid=755> Notice the link for the "Willie and the Beanstalk" contest, a competition for youth to grow soybeans, which starts March 7th! Also, on the grades 9-12 page, there is a video and diagram for teaching people how to determine soil texture by feel, also referred to as the "ribbon test." <http://www.agronomy.ksu.edu/p.aspx?tabid=762>

Two more webpages that contain a lot of resources for educators are the USDA-NRCS Soil Education site <http://soils.usda.gov/education/> and a page from the Soil Science Society of America, which has lesson plans for K-12 at: <https://www.soils.org/about-soils/lessons/resources>

If you need help finding resources for educational talks or demonstrations, please contact DeAnn Presley, Extension Soil Management Specialist.

P.S. Did you know (and everyone should!) that Kansas has a state soil, and it is named "Harney"? ftp://ftp-fc.sc.egov.usda.gov/NSSC/StateSoil_Profiles/ks_soil.pdf

-- DeAnn Presley, Soil Management Specialist
deann@ksu.edu

3. Kansas Flint Hills Smoke Management Plan: Fire Practices for Smoke Management

The following is a slightly edited transcript of the second in a series of K-State's Agriculture Today radio broadcasts on the Kansas Flint Hills Smoke Management Plan. This is an interview with Walt Fick, K-State Range Management Specialist, conducted by Eric Atkinson of the K-State Radio Network. Podcasts of all Agriculture Today interviews on the Flint Hills Smoke Management Plan can be found at:

<http://ksfire.org/p.aspx?tabid=21>

Q: What are the basic tenets of smoke management in regards to prescribed burning?

A: The key words are "avoiding," "diluting," and "reducing." In a fire management plan, the goal is basically to reduce the negative impacts on air quality: visibility, safety, and health. Those are all important issues. The approach is that by avoiding smoke movement into sensitive areas, we try to dilute any effect of smoke concentrating at high levels. And then there may be some management practices we can use to reduce the amount of smoke that is given off.

Q: Let's talk about those one-by-one then. Are there any fire management tactics that will help avoid air quality problems?

A: The key thing is to watch our weather conditions and try to avoid burning when smoke dispersal is going to be bad. Or another way of saying that is that managers should select days when smoke dispersal will be good. The weather is a key factor in that. We've always looked at temperature, humidity, and wind speeds. But for smoke dispersal, other key factors include mixing height. As we watch smoke rise into the atmosphere, it will get up to a certain level then start mixing with the atmosphere above. We like to see that at a minimum of about 1,800 feet. That gets the smoke off the ground where you don't have to worry about visibility at ground level.

Associated with that are the transport winds at that elevation. We like those to be about 8 to 20 miles per hour. Also, clouds play a role. If it's a completely cloudy day, that holds the smoke down. About 30 to 50 percent clouds is okay in terms of the impact it has on smoke dispersal. Most of this information is available on our website ksfire.org, or on the National Weather Service website at nws.org/topeka or nws.org/wichita, or whatever location you want. You can find all that information on those sites.

Q: The second part of this that you mentioned are the diluting effects that one can strive for in fire management. That gets back to the time of the burn?

A: Yes. It really gets back to the time that everybody's burning. If everyone burns the same day, or within the same few days, that's when we've had the problems. Normally, the burning is more spread out. In the southern Flint Hills they're typically starting in mid- to late-March, then the burning works its way north. If it would proceed like that year after year, we probably wouldn't have any problems with smoke concentration. But when everybody burns within a short period of time, all that smoke is up there at the same time. So one way of diluting it is to spread out burning dates. That's easier said than done because people are waiting for the right timing based on their objectives. When the right conditions come around, then what's good for me is probably good for my neighbor. But we could reduce the amount of smoke if we could have a little more widespread planning, but that's maybe down the road if we don't do something different.

Q: The third facet of this is reducing the smoke emissions themselves. Can a pasture manager achieve that in the way they manage the fire?

A: I think so. At least they can take it into consideration. One thing that affects the amount of smoke is the quantity of material being burned. The type of grazing system we're using, whether the land is being grazed at all, the total number of acres that we burn – all of that has a big impact. Even the kind of vegetation has an impact. If you have a lot of woody vegetation, it takes a lot of heat to get it ignited but then it burns a long time. You're going to have a longer period of time with smoke coming off. The more frequent burning helps keep the woody plants down. But if you're burning every year, you may be contributing to regional smoke problems. Reducing the quantity of fuel that is burned is one thing we can do and have an impact.

The other thing to consider is how efficiently the fuel itself is consumed, or burned. Some people use back fires, and some use head fires. A back fire, that is going into the wind, does a more thorough job of burning but it takes a longer time. One way to reduce the amount of smoke produced is to get the fire over with quickly. As long as I can get a burn done safely in the shortest period of time, that's usually what I would like to do. In terms of the amount of smoke, though, we may be producing more smoke that way. The bottom line is that there are some differences between back fires and head fires.

Q: So it comes down to producers becoming more aware of how their practices affect smoke management?

A: I think so. We're going to burn for the same reasons we've always burned. I've always said that if you tell me what your goal is then we can talk about what the proper time might be and if there are some alternative times that would accomplish the same thing. If one of those alternatives is outside the month of April, I'd say go ahead and do it that way because we've got a lot of burning going on in April. So when you're deciding when to do a burn, take into account not only the effects it may have immediately on what you're trying to accomplish or the smoke concentration immediately around the burn site. We're just asking producers to think about where that smoke is going to go downwind.

One of the tools we're trying to add on our website is a model that should help predict where the smoke is going to go. It's going to be very user friendly. It will have a map so you can see where the plume of smoke is predicted to go. If it happens to be headed toward a metropolitan area like Wichita or Kansas City, all we are asking is that if you have another day that you could burn, then consider doing that so we don't get these problems with air quality in those cities.

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

4. Late-winter greenup of poorly developed wheat

In western Kansas, some (but not all) of the dryland wheat is poorly developed at this time, with little or no secondary root system. Some of these fields have brown leaves from cold temperatures. This browning of leaves is not a concern as long as there is a good secondary root system and still green tissue in the crown area, which is still below the soil surface – or should be, unless the seed was planted too shallowly or into residue instead of soil.



Dryland wheat in Stevens County on February 16, 2011. There is very little topgrowth, and secondary root development is poor. Photos by Jim Shroyer, K-State Research and Extension.



Although it may look like there are a lot of roots on this wheat, most of these are just primary roots, not the secondary roots needed for optimum growth this spring.

What should producers do about fields in this condition, or where stands are thin and patchy? Nothing, at least not at the moment. There is no agronomic reason yet to tear up or spray out these fields. It's best to plan on managing the fields as normal (see the e-Update from Feb. 4, 2011, No. 281 for a discussion of management strategies). If spring environmental conditions are favorable, this wheat could have yields that would pleasantly surprise most producers. And at today's wheat prices, it's worth the wait. Remember that 20-bushel yields at \$8/bu will generate revenues that are just as good, or maybe even better, than 40 bu/acre at \$4/bu.

One of the potential dangers for wheat in this condition, however, is that temperatures will warm up quickly at times during the coming weeks, winds will pick up, and the upper two inches of soil where most of the roots are will remain dry. If wheat with little or no crown root development does

not receive some moisture while it's still mostly dormant -- and start to develop a good, deep crown root system -- it will be at risk of stress damage from trying to grow too soon and use up its resources too quickly. If that happens, the wheat could begin to "go backward" rapidly this spring and perhaps die from desiccation or drought stress. That's the time to start getting ready for replanting the fields to a summer crop, depending on moisture and insurance considerations.

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

5. Prospects for wheat that has not yet emerged

There are still some dryland fields in western Kansas this year where the wheat has not yet emerged. Blowing is the biggest immediate concern on these fields, but there is also a question of whether there is still viable wheat seed in the soil that has a chance to emerge. In digging up the seed from one such field in Stevens County on Feb. 16, I could find that the coleoptile had just cracked the seed coat, but had not grown much.



Field of dryland wheat in Stevens County that had not yet emerged as of Feb. 16. Photo by Josh Morris, Stevens County Extension Agent.



Seeds from a field in Stevens that have not yet emerged as of Feb. 16, 2011. These seeds are still firm and viable. The coleoptiles have just barely started to crack through the seed coat and grow.

This seed is still viable, and should emerge at some point, depending on moisture and temperatures. Wheat that emerges in the spring is entirely at the mercy of spring weather conditions. In the best case, with a long, cool filling period, spring-emerged winter wheat can yield about 40-60 percent of normal, or perhaps even more. If the weather turns hot and dry early, or if drought conditions persist, then it's possible this wheat could have very poor yields.

Some producers wonder whether spring-emerged wheat will have vernalized. The answer is almost always yes. This wheat will have vernalized, so it will head out unless prevented from doing so by continued stress conditions.

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

6. Can wheat lose winterhardiness during winter warm spells?

On February 17, there were many record-high temperatures set throughout Kansas. This raises some questions.

Can this cause wheat to break dormancy and become more susceptible to cold temperatures that are sure to come within the next few weeks? At what temperatures do we start worrying about wheat breaking dormancy and being at risk of cold injury later?

To the first question, the answer is yes. Very warm temperatures can cause wheat to break dormancy at this time of year, especially where moisture conditions are adequate. As to the second question, there are no hard and fast numbers to go by in answering these questions. When wheat breaks dormancy and becomes physiologically active during late winter, it can regain some level of winterhardiness if temperatures gradually get colder again. The best case scenario is that there are just one or two days of unusually warm temperatures, then a gradual drop of 10-20 degrees over the following week. Most wheat varieties grown in Kansas can easily survive these conditions.

The worst case scenario is if daytime temperatures are very warm and nighttime temperatures remain in the upper 40's or warmer for several days during the winter, then temperatures plunge into the low teens or below in just one day, as happened in 1989. Some varieties may break dormancy quickly in these conditions, and then be unable to withstand a sudden return to bitterly cold temperatures.

The more often these warm spells occur, the longer they last, and the more often wheat breaks dormancy, the less able the wheat will be to recover some degree of winterhardiness as temperatures get colder again. So if there are just one or two brief warm spells with nighttime lows above 50 degrees over the next few weeks, and no sudden blasts of Arctic air that follow these warm spells, the wheat should be able to withstand it with little or no winterkill.

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

7. Nitrogen fertilization of bromegrass this spring

With nitrogen (N) fertilizer costs increasing dramatically, and hay prices remaining fairly constant, many farmers are questioning how much, if any, N fertilizer should be applied to brome this spring. To answer that question, we summarized the results of more than 100 experiments conducted in Kansas since 1975, and looked closely at the response of brome to spring-applied N fertilizer.

The summary gives a nice response curve, with average yields ranging from an unfertilized check yield of 1.35 tons of hay per acre, to a maximum yield of 3.15 tons of hay with 140 pounds of N. Doing some simple cost-and-return calculations, using \$60 per ton as the value of the hay produced and \$0.55 per pound for the N, the following table was generated:

N Rate (lbs N/acre)	Hay Yield (tons dry matter/acre)	Hay Yield Increase From 20 pounds N (tons dry matter/acre)	Return to an additional 20 pounds of N fertilizer (ton dry matter/acre)
0	1.35	-----	-----
20	1.80	0.45	\$16
40	2.20	0.40	\$13
60	2.52	0.32	\$8.20
80	2.78	0.26	\$4.60
100	2.97	0.19	\$0.40
120	3.10	0.13	-\$3.20
140	3.15	0.05	-\$8.00
160	3.14	-0.01	-\$11.00

From these calculations, the appropriate N rate this spring to maximize profit is between 80 and 100 pounds of N per acre -- not the 140 pounds of N which gives maximum yield. One issue these calculations don't consider, however, is hay quality. Protein levels will be increased at the higher N fertilizer rates. So in cases where producers are relying on high-quality hay as their primary protein source, they may want to push N rates a little higher, or add supplemental protein to rations.

-- Dave Mengel, Soil Fertility Specialist
dmengel@ksu.edu

8. Comparative Vegetation Condition Report: February 1 – 14

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:

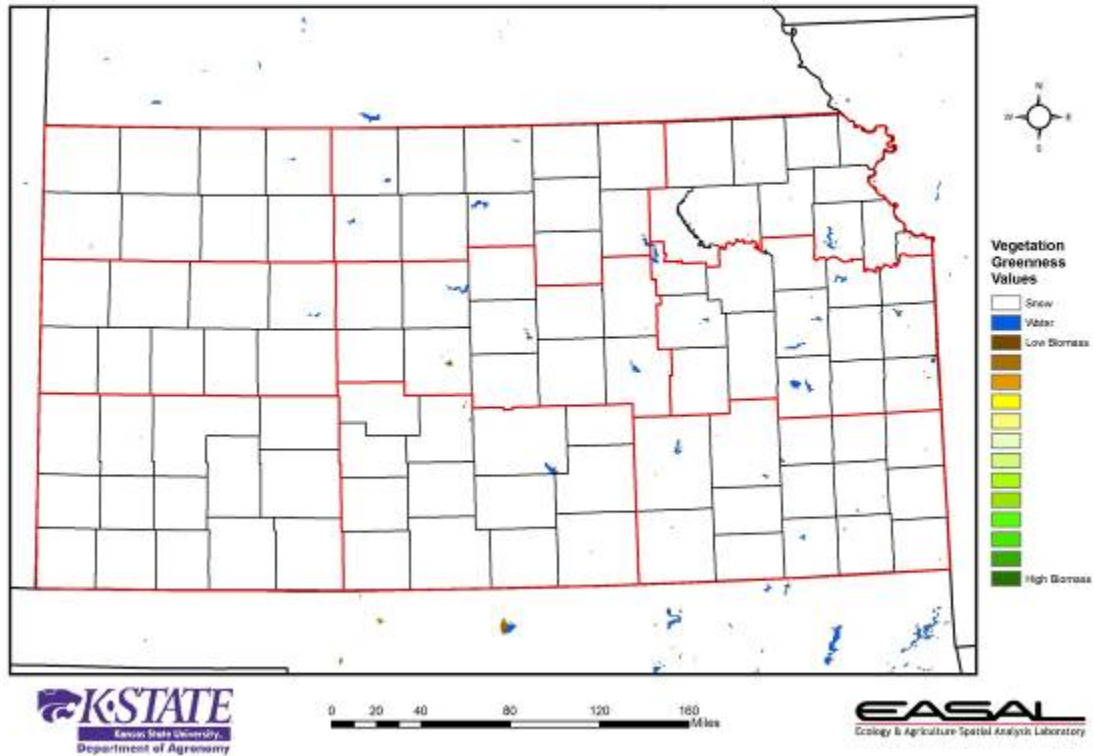
<http://www.youtube.com/watch?v=CRP3Y5NIggw>
<http://www.youtube.com/watch?v=tUdOK94efxc>

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:

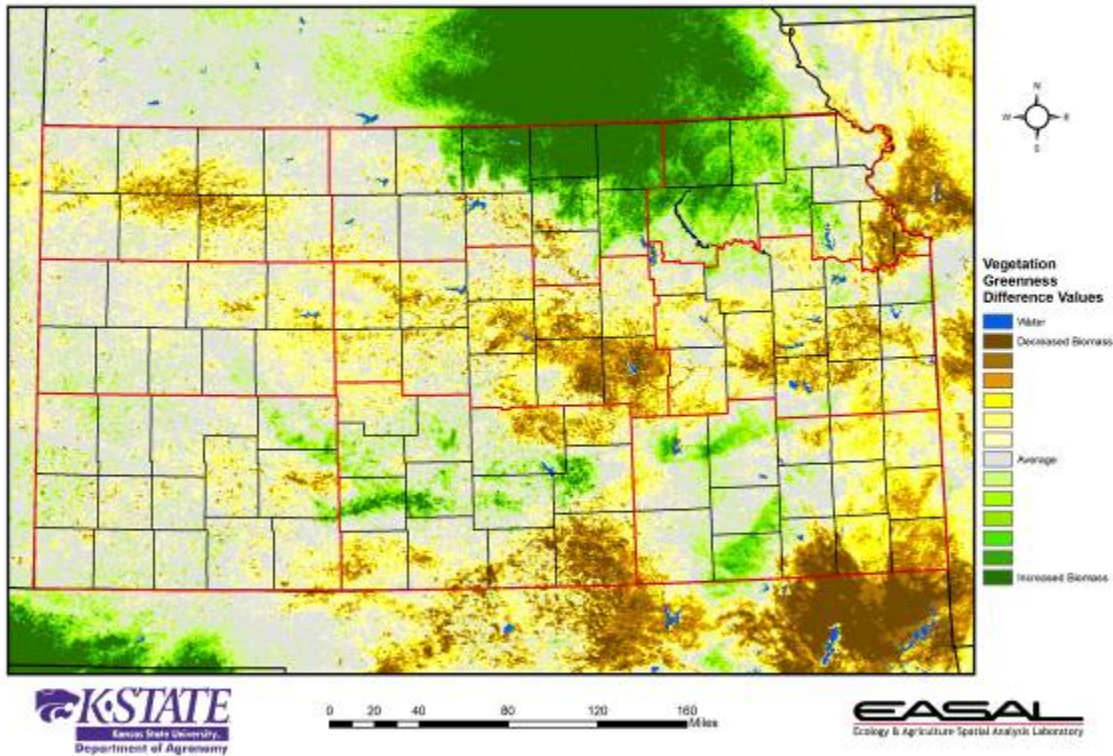
Kansas Vegetation Condition

Period 07: 02/01/2011 - 02/14/2011



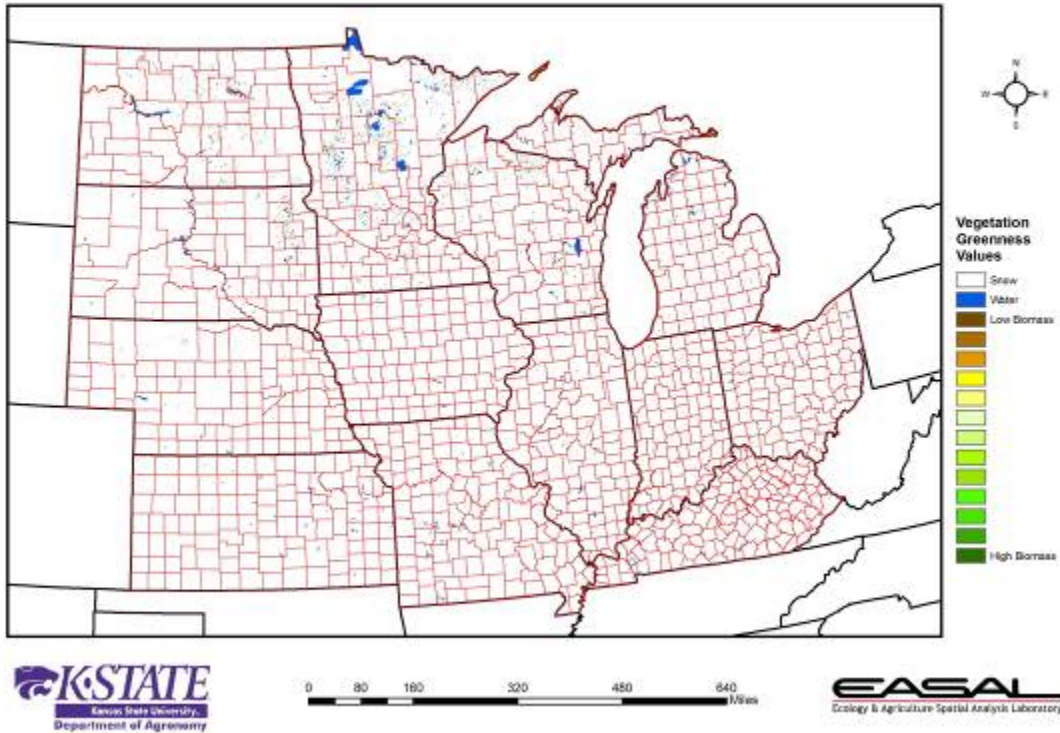
Map 1. The Vegetation Condition Report for Kansas for February 1 – 14 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that snow was the big story for the first half of February. Unfortunately, the moisture equivalent of the snowfall was not as impressive as the depths. Southeast Kansas, an area with some of the greatest snow depths, saw only an average of 0.58 inches of moisture, which is 79 percent of normal. South central averaged only 0.37 inches, which is 68 percent of normal.

Kansas Vegetation Condition Comparison
Early-February 2011 compared to the Early-February 2010



Map 2. Compared to last year at this time, this year's Vegetation Condition Report for February 1 – 14 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows as greener along the north central division into Nebraska, as well as parts of south central Kansas, with darker areas in southeast and central Kansas this year. This is actually due to differences in snow cover compared to last year rather than differences in photosynthetically active biomass production. The light green areas of southwest Kansas are signs that more of the winter wheat is beginning to green in that area this year compared to the same time last year.

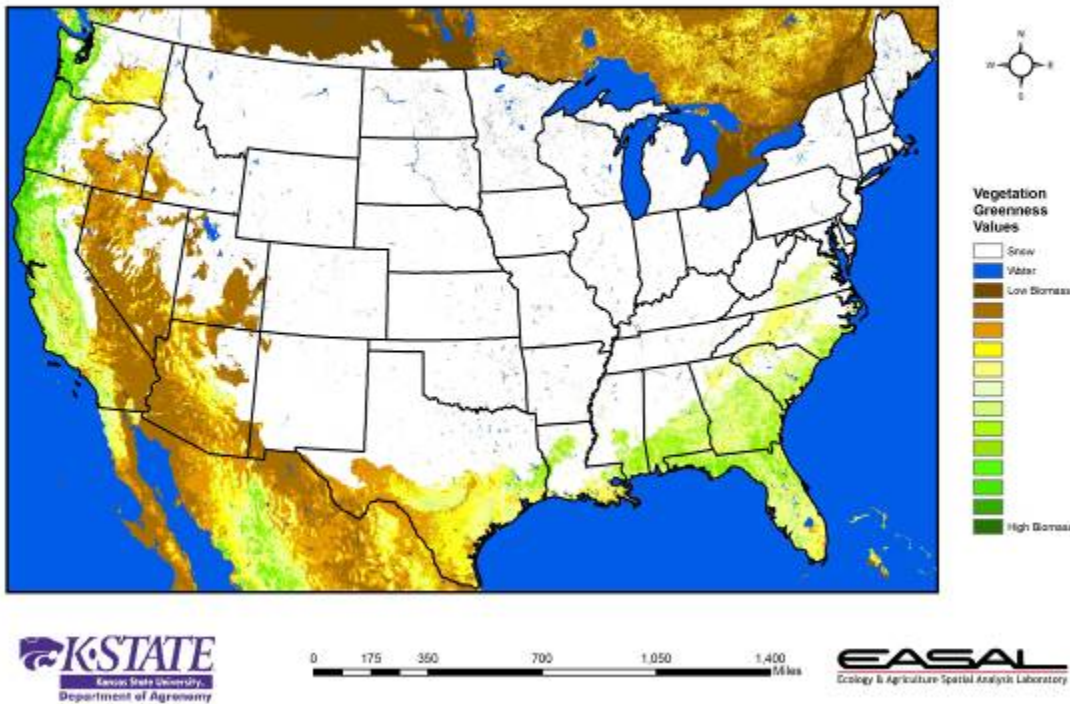
U.S. Corn Belt Vegetation Condition
Period 07: 02/01/2011 - 02/14/2011



Map 3. The Vegetation Condition Report for the Corn Belt for February 1 – 14 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that snow continues to dominate the Corn Belt region. Concerns are now being raised about the potential for floods when spring snowmelt strains already saturated grounds. The above-average risk of flooding covers large areas of North Dakota, eastern South Dakota, Minnesota, and parts of Iowa, Wisconsin, and Missouri along the Mississippi River.

Conterminous U.S. Vegetation Condition

Period 06: 02/01/2011 - 02/14/2011



Map 4. The Vegetation Condition Report for the U.S. for February 1 – 14 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows snow is again the story across much of the lower 48. Moisture early in the winter has translated to slightly higher than average biomass production in the Southeast into Florida.

-- 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