k-state extension AGRONOMY e-Updates

Number 334
January 27, 2012

1. Irrigation management: Explanation for using 2012 yield prediction tables

In 2012 irrigators need to tailor their water management to have the expectation of producing at least their irrigated proven yield to qualify for crop insurance as an irrigated practice. If they do not have enough water to produce their proven yield on the whole field, they may need to reduce irrigated acreage to fully irrigate the planted area. They need to know how much water it will take to produce their proven yield.

Predicted corn and sorghum yields for 2012 (see tables below) were based on a crop simulation model developed by K–State Research and Extension (Crop Yield Predictor available at www.mobileirrigationlab.com). The stored soil water that is available for plant use at the beginning of the growing season is one of the sources of water to produce the crop. The other sources are growing season precipitation and irrigation.

In the tables, the change in available soil water (ASW) from October 1, 2011 through April 1, 2012 is based on the average annual precipitation expected during the dormant season. Water accumulation depends on the storage capacity of the soil, how much evaporation occurs at the soil surface, and how much water drains below the expected root zone. K-State Research and Extension irrigation researchers Freddie Lamm and Danny Rogers measured ASW after the 2011 harvest in producers' irrigated fields in southwest Kansas. They found a minimum of 17% ASW and a maximum of 95% ASW among the sampled fields. This demonstrates that producers need to determine ASW in their own fields.

Within each row in the tables, there are columns for the amount of irrigation it will take to produce the predicted yield. An irrigator can find his/her proven yield in the table for each value of ASW (rows) and applied irrigation (columns). The volume of irrigation available for that field in 2012 needs to be determined in units of acre-inches. This volume divided by the inches of irrigation required to produce the proven yield (from the table) is the acreage that can be planted.

These tables are provided by K–State Research and Extension for producers as information for determining possible strategies for 2012. They were not derived by the USDA-Risk Management Agency. Crop insurance underwriters should be contacted for additional information.
Example: Crop = corn

Annual Precipitation = 17 inches
Available water on April 1= 20%
Proven Yield = 168 bu/acre
Then Irrigation needed = 14 inches
Irrigation volume available = 1200 ac-inches (example 12 inches for 100 acres)
Irrigated acres to produce proven yield = (1200 ac-inches)/14 inches) = 88 acres

Corn Predicted Yield
Annual Precipitation = **17 inches**

Available Soil Water 1-Oct	Available Soil Water 1-Apr	--------------------------Applied Irrigation---------------------							
		5"	8"	11"	14"	17"	20"	23"	26"
		Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
%	%	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac
10	20	92	124	149	**168**	184	198	210	220
30	35	120	148	169	186	200	213	220	220
50	50	148	171	189	203	215	220	220	220
70	60	164	184	200	213	220	220	220	220

Corn Predicted Yield
Annual Precipitation = **21 inches**

Available Soil Water 1-Oct	Available Soil Water 1-Apr	--------------------------Applied Irrigation----------------------------							
		5"	8"	11"	14"	17"	20"	23"	26"
		Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
%	%	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac
10	25	135	165	183	193	205	217	220	220
30	45	156	182	197	206	216	220	220	220
50	60	172	194	207	214	220	220	220	220
70	70	178	197	210	217	220	220	220	220

Corn Predicted Yield
Annual Precipitation = **25 inches**

Available Soil Water 1-Oct	Available Soil Water 1-Apr	--------------------------Applied Irrigation--------------------------							
		5"	8"	11"	14"	17"	20"	23"	26"
		Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
%	%	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac
10	35	176	192	206	213	220	220	220	220
30	50	188	202	214	220	220	220	220	220
50	65	193	206	217	220	220	220	220	220
70	70	195	207	218	220	220	220	220	220

Sorghum Predicted Yield
Annual Precipitation = **17 inches**

Available Soil Water 1-Oct	Available Soil Water 1-Apr	--------------------------Applied Irrigation--------------------------							
		5"	8"	11"	14"	17"	20"	23"	26"
		Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
%	%	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac
10	20	108	125	139	149	158	160	160	160
30	35	123	137	149	158	160	160	160	160
50	50	136	148	158	160	160	160	160	160
70	60	144	154	160	160	160	160	160	160

Sorghum Predicted Yield
Annual Precipitation = **21 inches**

Available Soil Water 1-Oct	Available Soil Water 1-Apr	---------------------------Applied Irrigation----------------------------------							
		5"	8"	11"	14"	17"	20"	23"	26"
		Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
%	%	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac
10	25	123	139	147	155	160	160	160	160
30	45	139	148	155	160	160	160	160	160
50	60	146	154	160	160	160	160	160	160
70	70	148	156	160	160	160	160	160	160

Sorghum Predicted Yield
Annual Precipitation = **25 inches**

Available Soil Water 1-Oct	Available Soil Water 1-Apr	---------------------------Applied Irrigation----------------------------------							
		5"	8"	11"	14"	17"	20"	23"	26"
		Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
%	%	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac	bu/ac
10	35	147	155	160	160	160	160	160	160
30	50	153	160	160	160	160	160	160	160
50	65	155	160	160	160	160	160	160	160
70	70	155	160	160	160	160	160	160	160

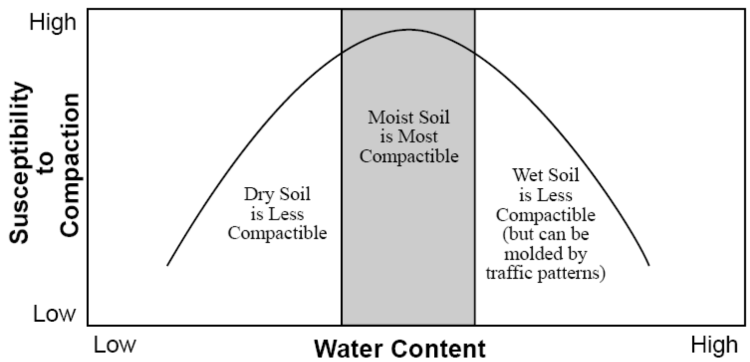
-- Norm Klocke, Irrigation Engineer, Southwest Research-Extension Center
nklocke@ksu.edu

-- Loyd Stone, Soil and Water Management
stoner@ksu.edu

2. Spring is the best time to assess soil compaction

Spring is the perfect time to examine soils for evidence of compaction, and it also happens to be a time when soils are very vulnerable to compaction. Most soils across the state will be recharged with water from winter and spring precipitation. Fields should be assessed for compaction when the soil is at or near field capacity, the point at which the entire soil profile is moist, but not saturated.

Soil compaction occurs when soil particles are pressed together, limiting the space for air and water. The amount of soil water present is a critical factor in soil compaction potential.



Assessing soil compaction

If compaction is suspected, a shovel or soil probe can be used to find out for sure. With a shovel, look for either a surface crust, or for platy soil structure, i.e., when the soil structure resembles a stack of dinner plates. Insert a soil probe slowly, and feel for a layer of increased resistance. Quite often, if a compacted subsurface layer is present, you can "punch through" the tillage pan, and the soil beneath it will feel less resistive.

Cone penetrometers may also be used to locate compaction. Since penetration resistance is a function of soil density, texture, and moisture content, and not necessarily just compaction, penetrometers need to be used in combination with some device to assess soil moisture and texture, such as a soil probe. Readings should be taken when the whole profile is at or near field capacity (approximately 24 hours after a soaking rain). The best time of the year for the compaction measurement is the spring because the whole profile has usually been thoroughly moistened during the winter. If the soil is too wet and muddy, compaction could be underestimated because the soil water acts as a lubricant. If the soil is too dry, compaction could be overestimated because roots will be able to penetrate the soil when it re-wets. The idea behind using the penetrometer at field capacity is that this is the best-case scenario to mimic the penetration power of roots.

If using a penetrometer, push or drive it into the soil at a rate of 1 inch per second. Record the penetration resistance at each depth increment. Note the depths at which the penetration resistance exceeds 250-300 pounds per square inch (psi), a range that is root-limiting when the soil is moist.

Controlling different types of compaction

Shallow, surface compaction is related to pressure applied to the surface of the soil, and can be controlled by better distribution of a load, either by using a larger tire size or more tires. GPS-based auto-steering systems are a tremendous aid for establishing and maintaining a controlled traffic system. Shallow compaction is normally removed with subsequent tillage operations and to some extent by freeze-thaw and wet-dry cycles, but should be avoided at planting time in conventional or reduced tillage, and at all times in no-till.

Sub-surface compaction is related to the maximum axle load, and is not reduced by distributing the weight across more tires or larger tires. The only way to avoid sub-surface compaction is to limit traffic with heavy axle loads. Keep in mind that a 1000-bushel grain cart can weigh 36 tons or more!

Another-type of compaction is sidewall compaction that occurs if the crop is planted when the soil is too wet and the planter openers push on the side of the soil furrow, creating a compacted zone. Sidewall compaction is preventable by delaying planting until soils are sufficiently dry. Use of spoke wheel seed slot closers can also be helpful. If you can mold the soil into a ball in your hand and the soil ball will not easily crumble apart, it is too wet to plant.

Preventing soil compaction

The best cure for compaction is abstinence -- that is, not working or driving on soils that are too wet. Crop fields can be at risk from compaction from grazing animals or when spreading manure just as much as when using any other farm equipment, especially in conditions near field capacity. Fall-planted cover crops could provide support for livestock and/or manure spreaders, while spring-planted cover crops might be a good option for soils with excess moisture at planting time.

In order to decide if the soil is too wet for tillage or other ground-engaging practices (tillage, fertilizer application, etc.), take a spade and dig up some soil from the zone in which you plan to work. For example, if you plan to perform an operation at a depth of about 6 inches, dig down 6 inches and pull out a handful of soil. Take that handful of soil and see if it is moldable like putty, and then roll it back and forth between your hands. If you can form it into a wire that is 1/8 inch in diameter, then it means that your soil is above the “plastic limit,” and it really needs to dry out before doing the field work.

Can you manage soil compaction once you have it?

If you determine that you have compacted soils, fall or winter is usually the most appropriate time to address the issue (when the soil is dry). Deep tillage, such as subsoiling, takes a lot of time, fuel, and power, so you need to make certain it is absolutely necessary and economically feasible before performing such operations. The best remedy for eliminating compaction is prevention.

Tillage system and frequency	Corn 6-yr avg	Soybean 6-yr avg
No-till	98	35.4
Chisel every year	100	36.6
Subsoil every year	103	37.0
Subsoil every other year	99	37.3
Subsoil every third year	105	37.9
Note: None of these yields is statistically different.		

Data from Keith Janssen, East Central Kansas Experiment Field, Ottawa.

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

-- Randy Price, Biological and Agricultural Engineering
rrprice@ksu.edu

-- Keith Janssen, East Central Kansas Experiment Field
kjanssen@ksu.edu

3. Topdressing wheat with nitrogen: Timing, application methods, source, and rates

Now is a good time to start planning for topdressing nitrogen (N) of the winter wheat crop. With adequate soil moisture in most areas of the state, and some fairly small wheat in many fields due to late planting and dry weather in early fall, there are some key elements that need to be considered when deciding on the exact program you plan to use. These include: timing, N source, application method and N rate.

Ideally, the N in topdress applications will be moved into the root zone with precipitation well before jointing begins in order to be most efficiently utilized by wheat. With some of the small wheat out there this spring, having adequate N available to support spring tillering when it breaks dormancy will be important. Some combination of fall preplant or at-seeding N, and/or early topdressed N, is also normally needed to supply adequate N to support head differentiation. This is the stage when head size is being determined, and can begin about two weeks before jointing. The following will discuss some of the issues to considering when making topdressing decisions.

* Timing. The most important factor in getting a good return on topdress N is usually timing. It is critical to get the N on early enough to have the maximum potential impact on yield. While some producers often wait until spring just prior to jointing, this can be too late in some years, especially when little or no N was applied in the fall. For the well-drained medium- to fine-textured soils that dominate our wheat acres, the odds of losing much of the N that is topdress-applied in the winter is low since we typically don’t get enough precipitation over the winter to cause significant denitrification or leaching. For these soils, topdressing can begin anytime now, and usually the earlier the better.

For wheat grown on sandier soils, earlier is not necessarily better for N applications. On these soils, there is a greater chance that N applied in the fall or early winter could leach completely out of the root zone if precipitation is unusually heavy during the winter. Waiting until closer to spring green-up to make topdress N applications on sandier soils will help manage this risk.

On poorly drained and/or shallow claypan soils, especially in south central or southeast Kansas, N applied in the fall or early winter would have a significant risk of denitrification N loss. Waiting until closer to spring green-up to make topdress N applications on these soils will help minimize the potential for this N loss.

Also keep in mind that N should not be applied to the soil surface when the ground is deeply frozen and especially when snow covered. This will help prevent runoff losses with snow melt or heavy precipitation.

* Application method. Most topdressing is broadcast applied. In high-residue situations, this can result in some immobilization of N, especially where liquid UAN is used. If no herbicides are applied with the N, producers can get some benefit from applying the N in a dribble band on 15- to 18-inch centers. This can help avoid immobilization and may provide for a little more consistent crop response.

* Source. The typical sources of N used for topdressing wheat are UAN solution and dry urea. Numerous trials by K-State over the years have shown that both are equally effective. In no-till situations, there may be some slight advantage to applying dry urea since it falls to the soil surface and may be less affected by immobilization than broadcast liquid UAN, which tends to get hung up on surface residues. Dribble (surface band) UAN applications would avoid much of this tie-up on surface crop residues as well. But if producers plan to tank-mix with a herbicide, they'll have to use liquid UAN and broadcast it.

Some of the new controlled-release products such as polyurethane coated urea (ESN) might be considered on very sandy soils prone to leaching, or poorly drained soils prone to denitrification. Generally a 50:50 blend of standard urea and the coated urea -- which will provide some N immediately to support tillering and head development and also continue to release some N in later stages of development -- works best in settings with high loss potential.

* Rate. Producers should have started the season with a certain N recommendation in hand, ideally based on a profile N soil test done before the crop is planted and before any N has been applied. If some N has already been applied to the wheat crop, it is too late to use the profile N soil test since it is not reliable in measuring recently applied N. Topdressing should complement or supplement the N applied in the fall, with the total application amount equaling that targeted rate.

If the wheat was grazed this fall and winter, producers should add an additional 30-40 lbs N/acre for every 100 lbs of beef weight gain removed from the field. If conditions are favorable for heavy fall and/or spring grazing, additional N maybe necessary, especially for a grain crop.

-- Dorivar Ruiz Diaz
ruizdiaz@ksu.edu

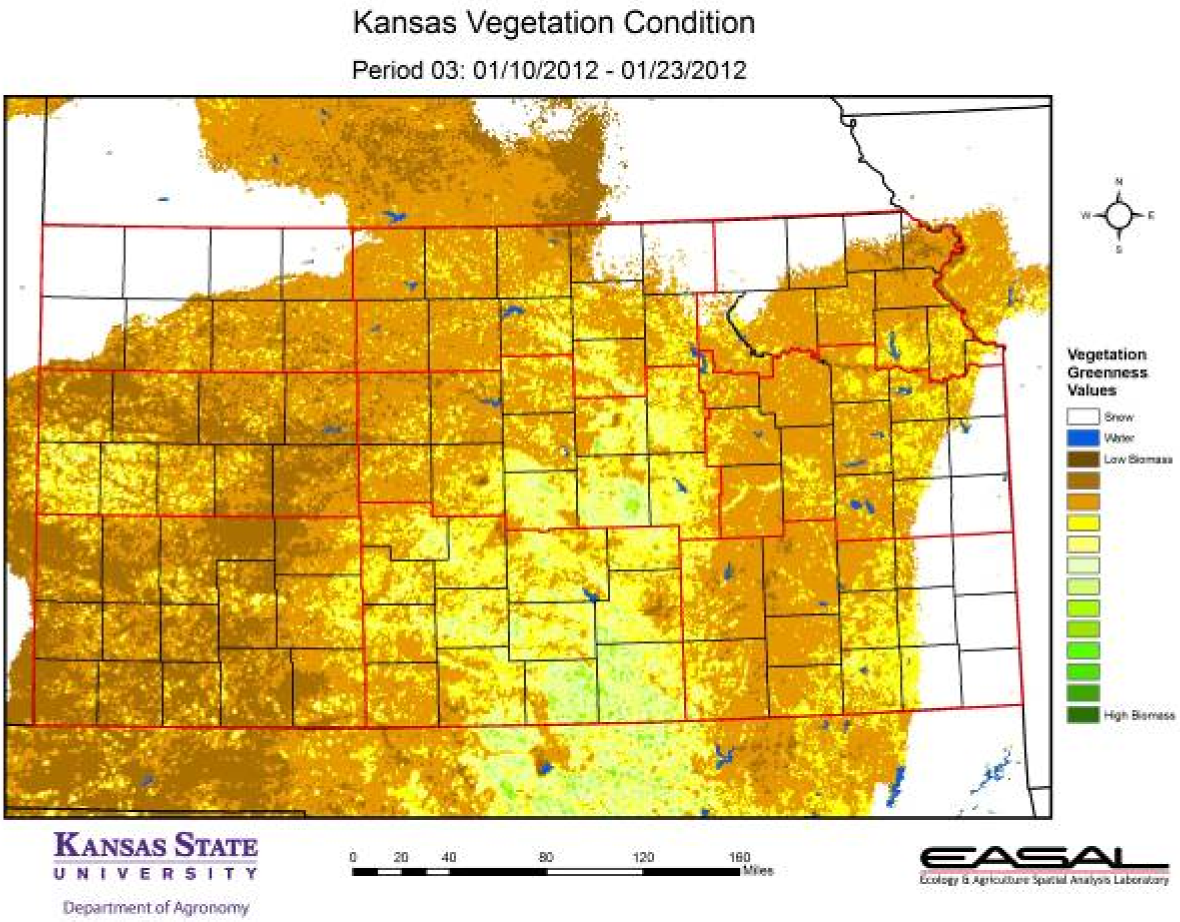
4. Comparative Vegetation Condition Report: January 10 – 23

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.

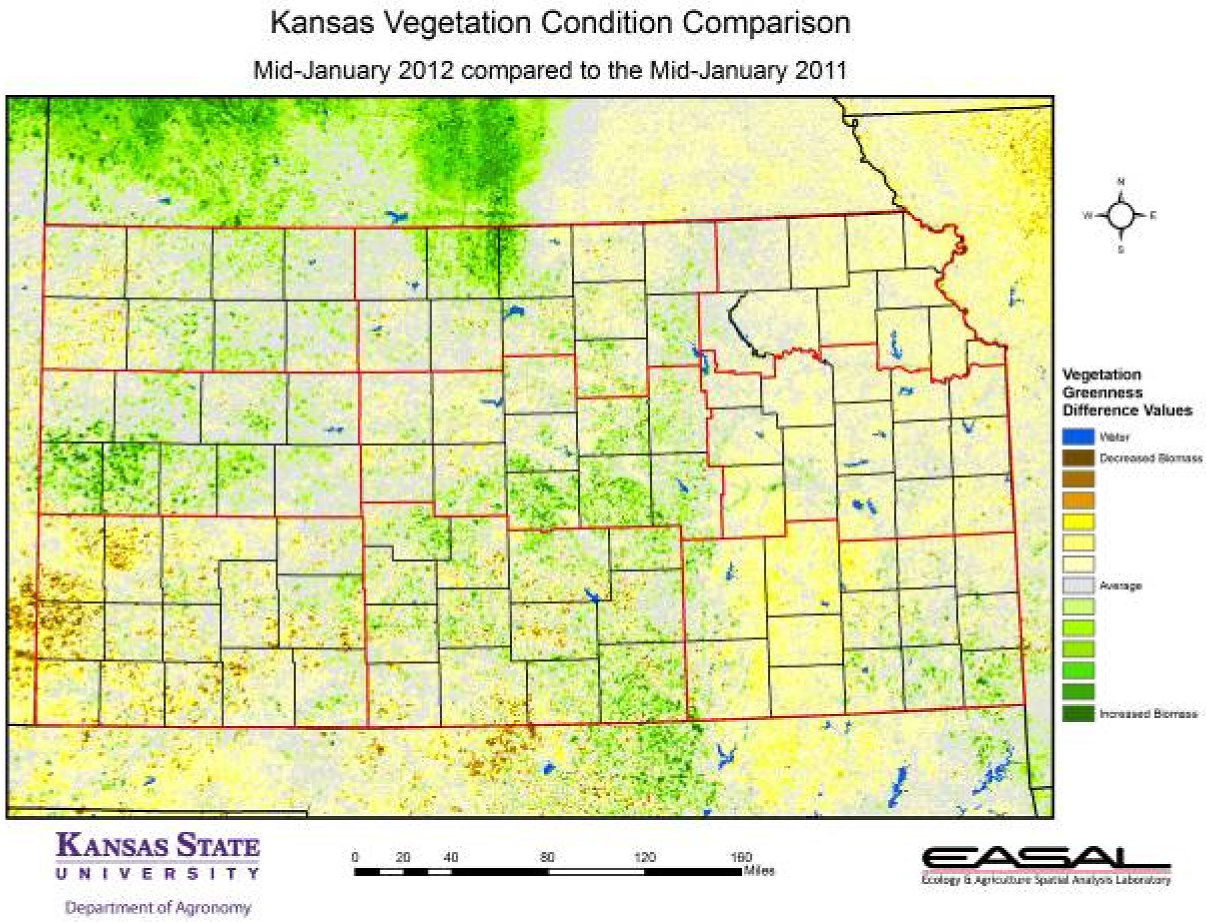
Two short videos of Dr. Kevin Price explaining the development of these maps can be viewed on YouTube at:
http://www.youtube.com/watch?v=CRP3Y5NIggw
http://www.youtube.com/watch?v=tUdOK94efxc

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.

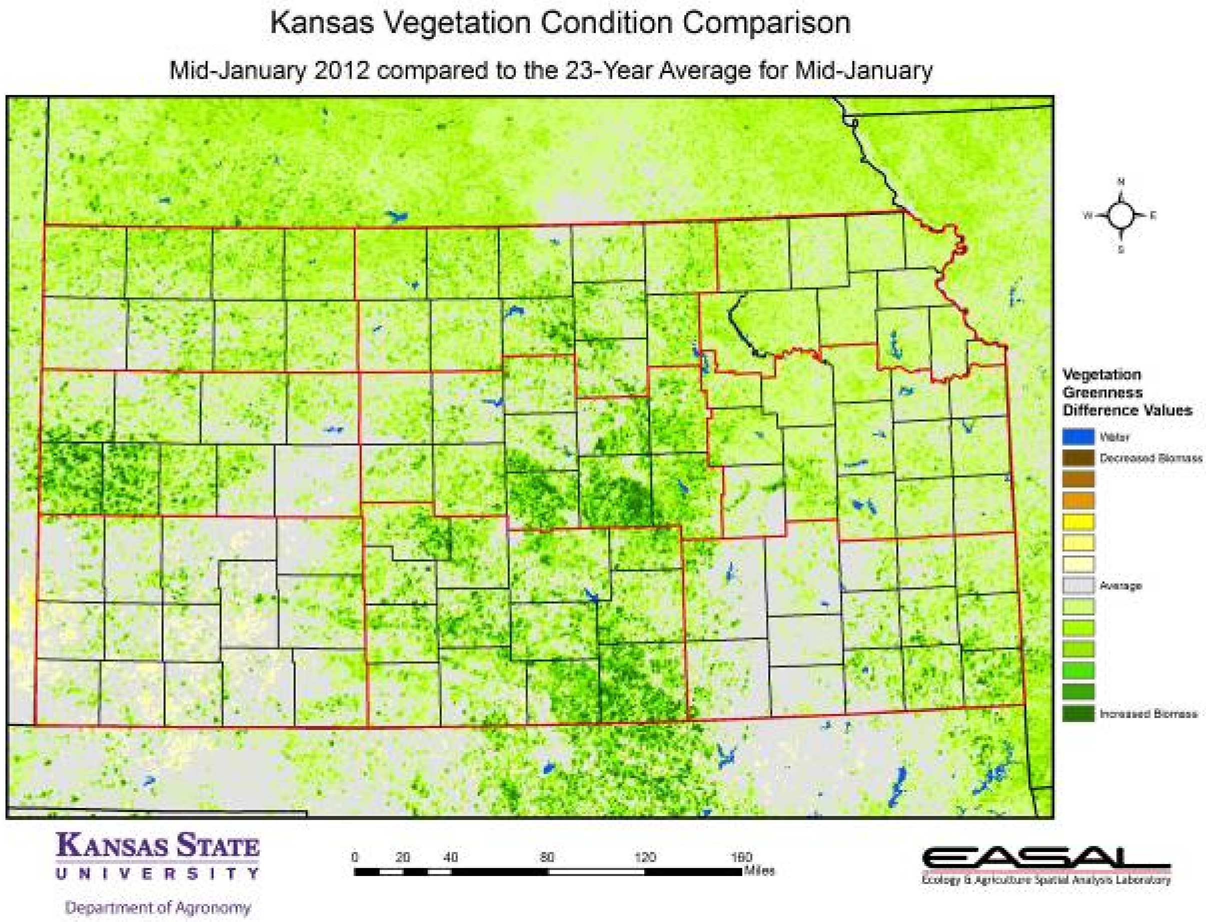
The maps below show the current vegetation conditions in Kansas, the Corn Belt, and the continental U.S, with comments from Mary Knapp, state climatologist:



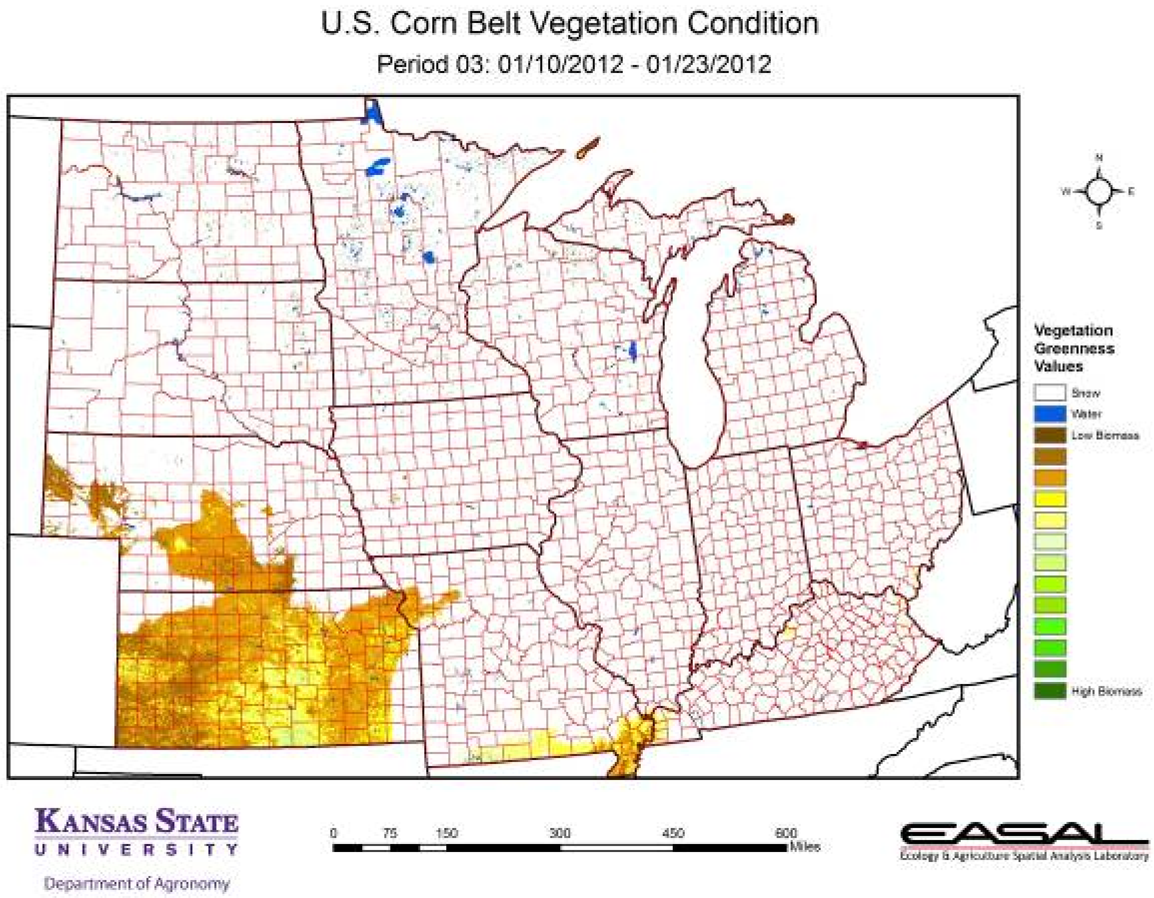
Map 1. The Vegetation Condition Report for Kansas for January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that snow was limited to the fringes of the state. Actual snow depth was generally less than an inch. As most vegetation is dormant, only south central Kansas shows slight biomass productivity.



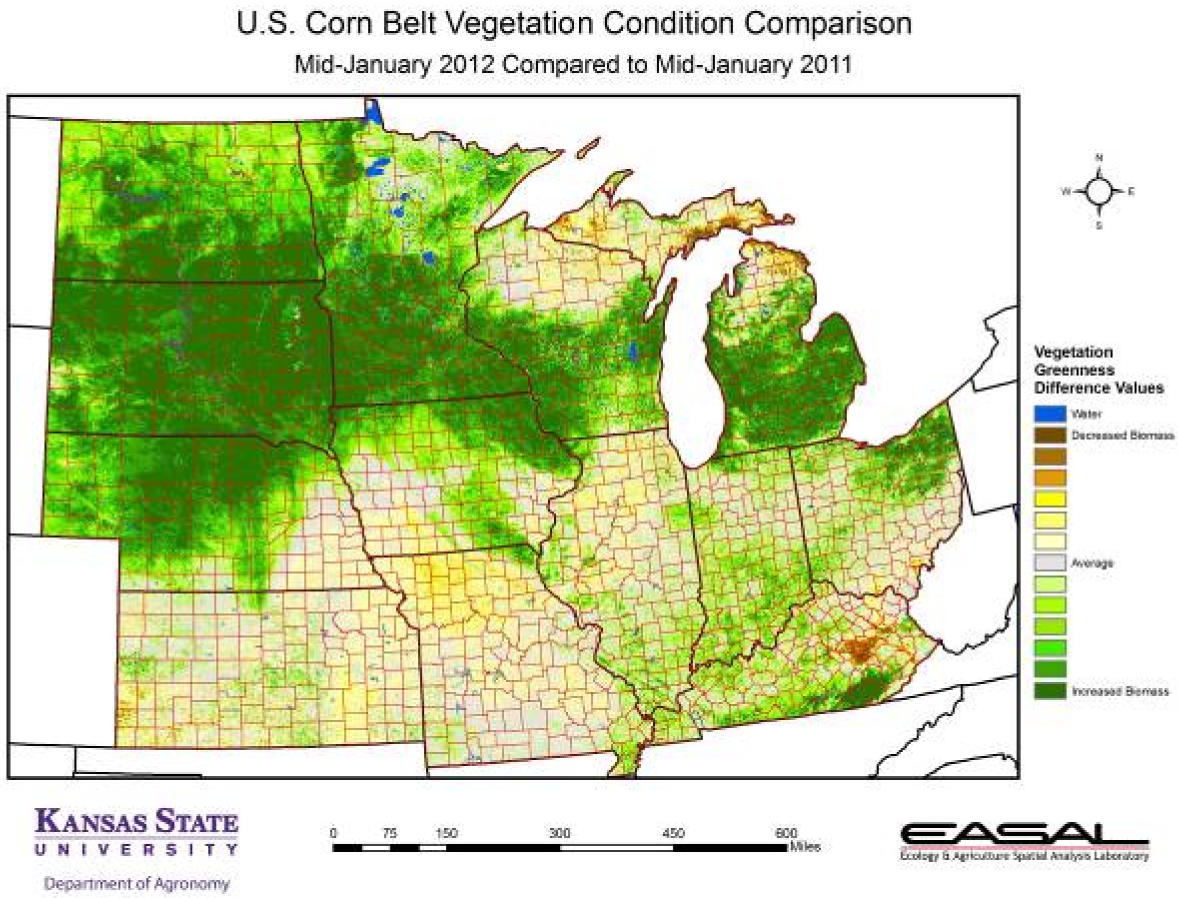
Map 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that photosynthetic activity is slightly greater in the West Central Division, as well as the central corridor of the state. This is in keeping with the milder temperatures and greater moisture available as a result of the fall storms.



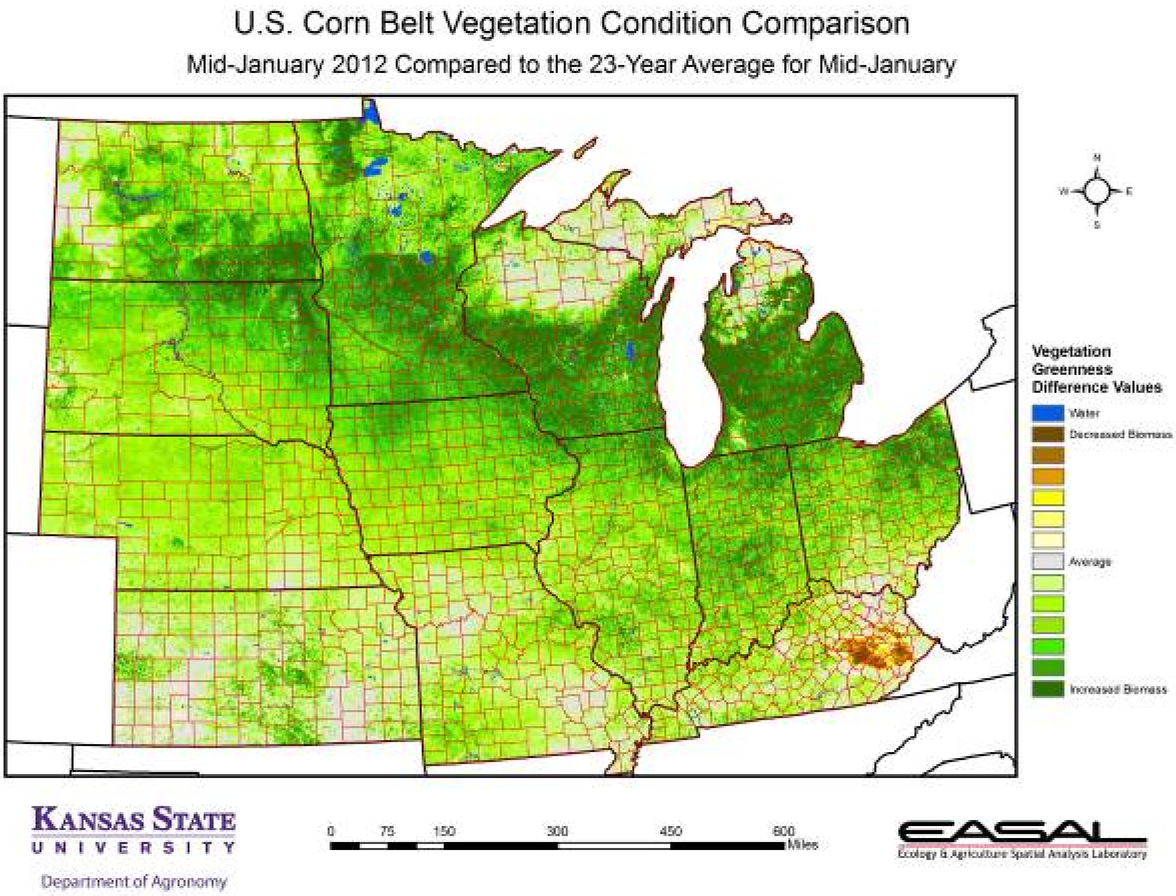
Map 3. Compared to the 22-year average at this time for Kansas, this year's Vegetation Condition Report for January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that photosynthetic activity is greater than would be expected. Note, that while the vegetation index value (Normalized Difference Vegetation Index, or NDVI) is greater than average this does not indicate high rates of biomass production. Most vegetation is currently dormant.



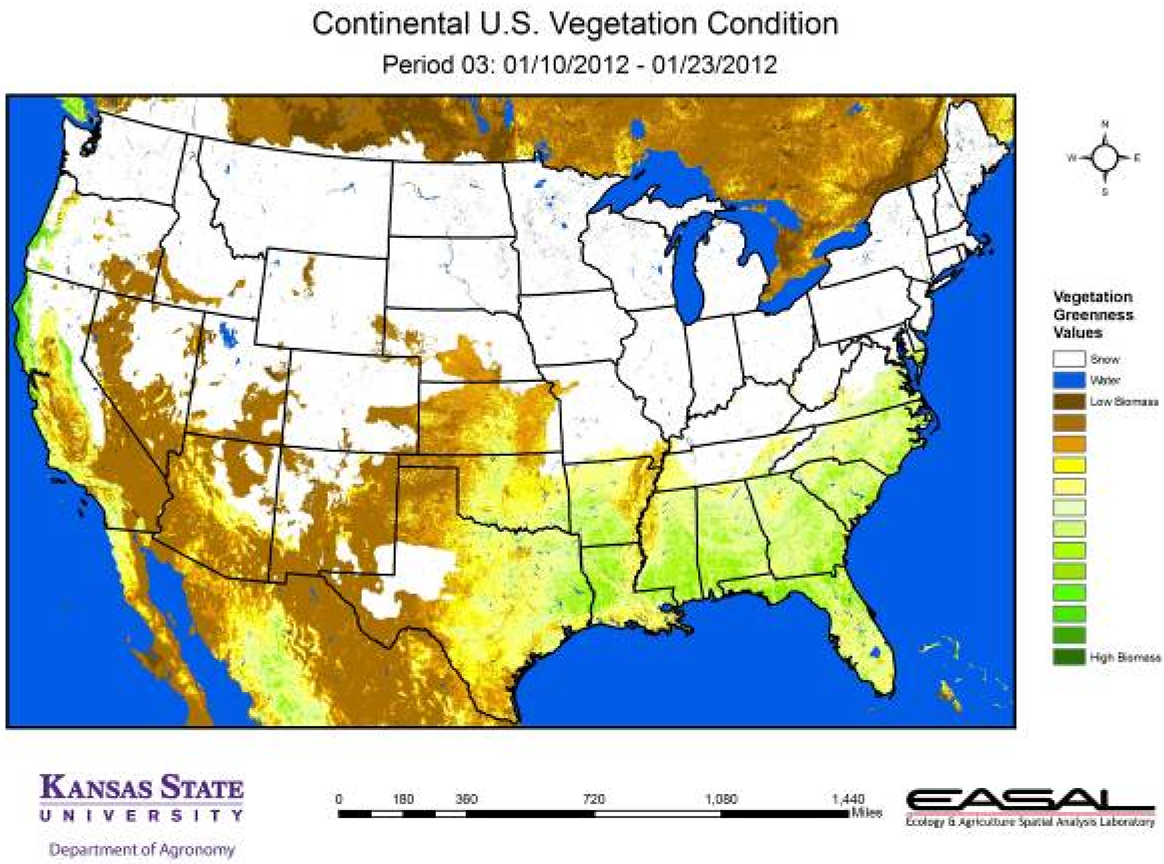
Map 4. The Vegetation Condition Report for the Corn Belt for January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that much of the Corn Belt experienced snow during the period. Central Nebraska and Kansas stand out as missing the snow events. Abnormally dry conditions continue to expand in these areas.



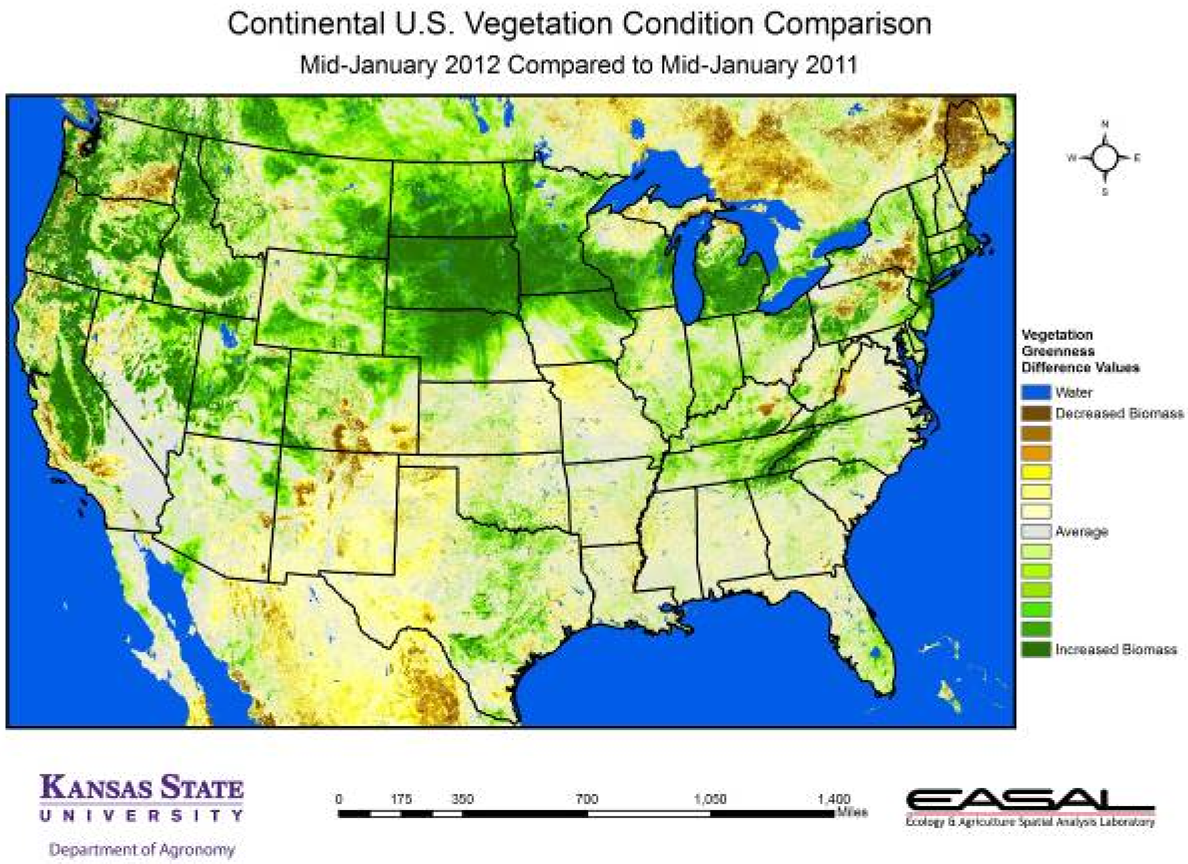
Map 5. The comparison to last year in the Corn Belt for the period January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that vegetation index values (NDVI) continue to be higher. Even with the recent storms, snow depth across the upper reaches of the Corn Belt continues well below last year's depths.



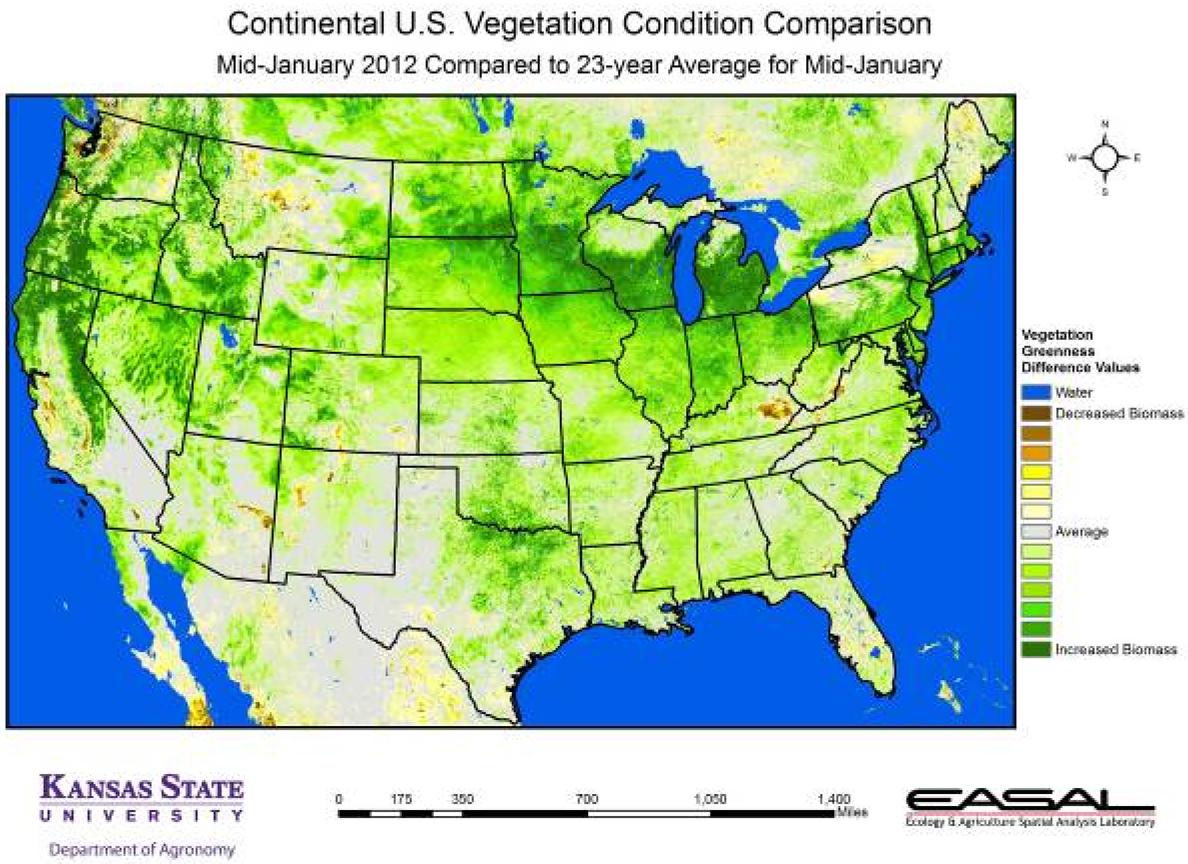
Map 6. Compared to the 22-year average at this time for the Corn Belt, this year's Vegetation Condition Report for January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that most of the region has greater-than-average vegetation index values (NDVI). Most noticeable departures are along the center of the Corn Belt where snow cover has been lacking, and mild temperatures persist. Despite the greater-than-average NDVI, which measures reflectance from exposed vegetation and soil, photosynthetic activity is relatively light, as most vegetation is still dormant.



Map 7. The Vegetation Condition Report for the U.S. for January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that greatest photosynthetic activity is in the South. Noteworthy is the area of snow still present in west Texas, which is unusually persistent for this region. Drought conditions in the Texas Panhandle have moderated slightly, but this region of West Texas is still in extreme to exception drought.



Map 8. The U.S. comparison to last year at this time for the period January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows continued higher vegetation index values (NDVI) along the northern states. Most of this is due to the reduced snow cover, when compared to last year. Increased photosynthetic activity along the Texas-Oklahoma border and into northern and central Texas is due to the more favorable moisture conditions in these areas. Extreme to exceptional drought conditions still persist from central Texas southward.



Map 9. The U.S. comparison to the 22-year average for the period January 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the milder-than-average winter continues to favor greater-than-average vegetation index values (NDVI). The higher NDVI readings across the Northern U.S. are due mainly to lesser snow cover in the region than average. More significant is the increased biomass in along the Oklahoma and Texas borders. This is in an area that continued to receive beneficial moisture, providing some relief to the long-term drought in the area.

Note to readers: The maps above represent a subset of the maps available from the EASAL group. If you'd like digital copies of the entire map series please contact us at kpprice@ksu.edu and we can place you on our email list to receive the entire dataset each week as they are produced. The maps are normally first available on Wednesday of each week, unless there is a delay in the posting of the data by EROS Data Center where we obtain the raw data used to make the maps. These maps are provided for free as a service of the Department of Agronomy and K-State Research and Extension.

-- 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