1. Soil water and winter wheat prospects

Parts of Kansas have been in a prolonged, severe drought. Where soils are extremely dry, wheat producers may wonder how much rain will be needed at this point to fill the profile – or at least provide enough moisture to make a wheat crop.

Filling the profile with water

Most soils in central and western Kansas are loam, silt loam, or silty clay loam in texture. In general, soil profiles of these textures have potential to hold about 2 inches of available water per foot of soil depth. A 4-foot profile will hold about 8 inches of available soil water.

To fill the profile to that depth will take more than 8 inches of rainfall, however. Not all the rain that falls gets into the soil because of runoff. And not all of the rain that infiltrates the soil remains there because of evaporation, transpiration from weeds, or drainage as the profile becomes wetter.

As a general rule, about 80 percent of the first inch of rain gets into the soil and remains there. The next inch of rain in a single rainfall event is a bit less efficient. In a 2-inch rainfall event, about 1.5 inches of water could typically be expected to remain in a silt loam soil – about 75 percent intake efficiency. This is under reasonably good soil surface and rainfall conditions.

Runoff is affected by many conditions such as soil roughness, residue cover, soil surface sealing, rainfall rate and amount, soil slope, soil texture, soil compaction, and initial soil water content. If surface runoff is increased by those negative factors, then the infiltration efficiency would be less than the 75 percent value for the 2-inch rain.
Evaporation will work to deplete the soil of water after a rainfall event. In the 5 to 7 days after a rainfall event, total evaporation would likely be from about 0.15 to 0.5 inches – with evaporation being increased by certain conditions, such as tillage, reduced residue cover, high temperature and wind speed, and low humidity. If weed growth is present, that will obviously further reduce the stored soil water.

Using those general figures, here’s how much rainfall it would take to fill the profile of a loam, silt loam, or silty clay loam soil that is at the lower limit of available soil water to the 4-foot depth, using an example of 2-inch rains occurring at 5 to 7 day intervals.

* Target amount of available soil water in 4 feet of silt loam soil: 8 inches
* Amount of water infiltrating into the soil profile from a 2-inch rain: 1.5 inches
* Amount of soil water lost to evaporation in the 5 to 7 days after the rain: 0.15 to 0.5 inches
* Net amount of water remaining in soil after a 2-inch rain, followed by 5 to 7 days of no rain: 1.0 inch (if 0.5 inch of evaporation) to 1.35 inch (if 0.15 inch of evaporation)
* Number of 2-inch rainfall events occurring every 5 to 7 days needed to reach the target of 8 inches of available soil water: 6 (if 0.15 inch evaporation) to 8 (if 0.5 inch of evaporation)

**Total amount of rainfall needed to fill the profile of a silt loam soil**: 12 to 16 inches, occurring in 2-inch events every 5 to 7 days over a 6-week period (12 inches if 0.15 inch of evaporation per rain or 16 inches if 0.5 inch of evaporation per rain). This assumes a rather optimistic infiltration efficiency of 75 percent.

Coarser-textured soils that have little to no available water will also need considerable rainfall to fill the profile. A coarser-textured sandy loam soil has a smaller available water holding capacity (about 1.5 inches per foot of depth) than the loam, silt loam, and silty clay loam soils. So it takes less water to fill the profile of a sandy loam soil with available water than it does a silt loam soil. With our example for the silt loam soils, we gained about 1 inch per rainfall event if 0.5 inches of evaporation or about 1.35 inches per rain if 0.15 inches of evaporation. Assuming similar conditions for the sandy loam soil, to fill the sandy loam soil profile to the 4-foot depth would require about 9 inches of rain if 0.15 inches of evaporation after each 2-inch rain or 12 inches of rain if 0.5 inches of evaporation after each 2-inch rain.

**Relative importance of available soil water and in-season precipitation**

It is unlikely the dry areas of Kansas will receive sufficient rains during the next 6 weeks to fill the soil profile with available water for this year’s wheat crop. A full soil profile at planting time is not required for a decent wheat crop. However, increased available soil water at planting does improve greatly the odds of getting a good wheat crop. In-season precipitation and available soil water at planting are both important in determining the ultimate yield of a wheat crop.

The following table is based on results from 30 years of research data collected at the K-State Southwest Research-Extension Center at Tribune. The wheat yields listed were calculated from equation 3.5, table 3, page 1361 of “Yield—Water Supply Relationships of Grain Sorghum and Winter Wheat”, L.R. Stone and A.J. Schlegel, 2006, Agron. J. 98:1359-1366. Wheat yields were calculated in response to both available soil water at emergence and total in-season precipitation.
Effect of Available Soil Water at Emergence and In-season Precipitation on Dryland Wheat Yields: Tribune 1974-2004

<table>
<thead>
<tr>
<th>In-season precipitation (inches)</th>
<th>Available soil water at emergence (inches)</th>
<th>Average wheat grain yield (bushels/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>10</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>12</td>
<td>27</td>
<td>31</td>
</tr>
<tr>
<td>14</td>
<td>28</td>
<td>32</td>
</tr>
</tbody>
</table>

In the above table, keep in mind that 2 inches of available soil water is equivalent to having moisture to a depth of one foot in a silt loam soil, since a silt loam soil holds about 2 inches of available soil water per foot. Likewise, 4 inches of available soil water means a silt loam soil is moist to a depth of 2 feet. In a sandy loam soil, 2 inches of available soil water would be moisture to a depth of roughly 1.33 feet.

The chart shows the influence of available soil water and in-season precipitation at producing long-term yield results. Having water in the fall is critical for germination, emergence, stand establishment, and vigor. Precipitation during winter is closely related with yield potential, providing for winter survival and increased soil water at the beginning of spring regrowth. Water in spring is normally most effective at increasing wheat yields if received at about boot through head extension, providing for decreased water stress at flowering and grain development.

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-- Alan Schlegel, Agronomist-in-Charge, Southwest Research-Extension Center, Tribune
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2. Precipitation in Kansas: Year-to-date, normal fall amounts, fall outlook

As drought continues, the following is a quick recap of the 2011 summer moisture (through August 24), and the comparison to average values for the period:

<table>
<thead>
<tr>
<th>Region</th>
<th>August (inches)</th>
<th>Jun-Aug (inches)</th>
<th>Departure from average (1981-2010)</th>
<th>Average Percent Field Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>2.39</td>
<td>10.01</td>
<td>0.84</td>
<td>30.8</td>
</tr>
<tr>
<td>North Central</td>
<td>3.46</td>
<td>12.48</td>
<td>3.31</td>
<td>65.9</td>
</tr>
<tr>
<td>Northeast</td>
<td>3.63</td>
<td>12.43</td>
<td>3.26</td>
<td>74.5</td>
</tr>
<tr>
<td>West Central</td>
<td>1.39</td>
<td>7.94</td>
<td>-1.23</td>
<td>5.4</td>
</tr>
<tr>
<td>Central</td>
<td>2.53</td>
<td>7.39</td>
<td>-1.78</td>
<td>18.4</td>
</tr>
<tr>
<td>East Central</td>
<td>2.05</td>
<td>7.19</td>
<td>-1.98</td>
<td>22.5</td>
</tr>
<tr>
<td>Southwest</td>
<td>1.19</td>
<td>3.49</td>
<td>-5.68</td>
<td>1.0</td>
</tr>
<tr>
<td>South Central</td>
<td>1.94</td>
<td>4.67</td>
<td>-4.50</td>
<td>4.8</td>
</tr>
<tr>
<td>Southeast</td>
<td>2.57</td>
<td>6.67</td>
<td>-2.50</td>
<td>19.4</td>
</tr>
<tr>
<td>State Average</td>
<td>2.35</td>
<td>8.03</td>
<td>-1.14</td>
<td></td>
</tr>
</tbody>
</table>
What are normal precipitation values for the wheat planting season? How likely are different areas of the state to receive enough moisture to support a wheat crop?

Defining the fall season as September through November, below is a chart showing the average precipitation values, and the number of times there has been at least 6 inches of precipitation in the fall -- based on 30-year, 1981-2010 data:

<table>
<thead>
<tr>
<th>Division</th>
<th>Average Sep-Nov precip. (inches)</th>
<th>Number of falls out of 30 with &gt; 6”</th>
<th>Number of falls out of 30 with &gt; 8”</th>
<th>Number of years when a dry summer = wet fall</th>
<th>Percent of years receiving 6” in the fall</th>
<th>Percent of times with 6” of precipitation in fall after dry summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>3.92</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>13%</td>
<td>25%</td>
</tr>
<tr>
<td>North Central</td>
<td>5.75</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>37%</td>
<td>27%</td>
</tr>
<tr>
<td>Northeast</td>
<td>8.58</td>
<td>23</td>
<td>16</td>
<td>3</td>
<td>77%</td>
<td>13%</td>
</tr>
<tr>
<td>West Central</td>
<td>3.82</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>Central</td>
<td>6.04</td>
<td>14</td>
<td>7</td>
<td>2</td>
<td>47%</td>
<td>14%</td>
</tr>
<tr>
<td>East Central</td>
<td>9.36</td>
<td>26</td>
<td>17</td>
<td>5</td>
<td>87%</td>
<td>19%</td>
</tr>
<tr>
<td>Southwest</td>
<td>3.83</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>17%</td>
<td>60%</td>
</tr>
<tr>
<td>South Central</td>
<td>6.28</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>47%</td>
<td>21%</td>
</tr>
<tr>
<td>Southeast</td>
<td>10.56</td>
<td>27</td>
<td>22</td>
<td>0</td>
<td>90%</td>
<td>0%</td>
</tr>
<tr>
<td>State Average</td>
<td>6.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While the eastern divisions have the greatest chances of getting six inches of precipitation in the fall, these areas are least likely to have a wet fall after a dry summer. In the West Central and Southwest Divisions, chances of having a wet fall are slim. However, there is also less chance that a dry summer will preclude a wet fall.

The Climate Prediction Center outlook for Sep-Nov calls for equal chances of above normal, normal, or below normal precipitation statewide. Models indicate a chance for above-normal precipitation in Nebraska, and below-normal precipitation from Oklahoma southward.

-- Mary Knapp, State Climatologist
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3. Corn earworms on sorghum and soybeans

Corn earworms have been found on both sorghum and soybeans in Kansas this summer, and the infestations will continue for the next few weeks. Earworms are often called "headworms" when feeding on sorghum or "podworms" when feeding on soybeans. The main impact on yield is when the larvae infest the heads of sorghum or the pods of soybeans. In either crop they can cause significant yield reductions very quickly as they are feeding directly on the marketable product.

Corn earworm larvae need to be detected while they are still small (less than a half-inch long), before they do much feeding. Less will be gained by treating older, larger larvae because they are
nearing the end of their feeding period. Sorghum will be vulnerable until it reaches the dough stage and soybean pods are vulnerable until the seeds begin to harden.

Field sampling should begin as soon as sorghum starts heading. At several points in the field, bend over a few sorghum heads into a clean, white 3-quart or 1-gallon bucket and shake them vigorously against the sides to determine how many worms are present per sorghum head. Keep track of how many heads you have shaken into the bucket. One to two worms per head can result in approximately 5 to 10 percent yield loss. The decision to treat should balance the expected loss of yield and crop value against treatment cost and the amount of damage that can be prevented.

Begin sampling soybeans once they have started setting pods. At a minimum of 10 locations in a field, bend over one-foot sections of row, shaking insects onto a cloth spread on the ground on both sides of the row. Then calculate the average number of larvae per row-foot. In soybeans, control measures generally should be implemented when an average of one small worm per foot of row is detected.
Insecticides labeled for this application all seem to work well provided they are applied with enough water to get adequate coverage. Most insecticides will provide 10 to 14 days of residual activity, maybe even a bit more, so continue scouting until the sorghum or soybean seed have become too tough to be attractive to the worms.

For more information relative to sorghum headworm or soybean podworm management refer to K-State’s *Sorghum Insect Management Guide, 2011*, MF-742, available at your local county Extension office or at: [http://www.ksre.ksu.edu/library/ENTML2/Mf742.pdf](http://www.ksre.ksu.edu/library/ENTML2/Mf742.pdf)


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4. Goss’s bacterial wilt in corn

Goss’s bacterial wilt (also called leaf freckles) has been active across a large part of the western Corn Belt in 2011. In Kansas, it has been found mostly west of the Flint Hills.
Symptoms

Symptoms are similar to those of Stewart’s bacterial wilt. There are various degrees of leaf blight, appearing as gray to light yellow stripes with wavy or irregular margins that follow the leaf veins. Within these lesions, dark green to black, water-soaked, irregular spots (freckles) usually appear and are an excellent diagnostic symptom.

Freckles within a Goss’s wilt lesion.

Lesions are usually most pronounced as plants near silking. Dried bacterial exudate is common on the surfaces of lesions. The symptoms are sometimes confused with leaf scorching associated with high temperature and high winds.
Disease Cycle and Epidemiology

Goss’s wilt overwinters in debris on or near the soil surface from a previously diseased crop. The pathogen has not been detected in soil absent of residue. Plant injury, such as from hail or sandblasting damage, is required for penetration of the pathogens. The most severe epidemics follow leaf damage caused by hail.

Management

Use of partially resistant hybrids is the most practical means of disease control. Resistance does not imply immunity, although losses will be considerably less than where susceptible hybrids are grown. Crop rotation and deep plowing of infested debris, preferably immediately after harvest, are effective in reducing disease severity. Where soil erosion concerns require no-till or reduced tillage methods, rotation can help reduce the primary inoculum, but will not totally eliminate the bacteria.

-- Doug Jardine, Extension Plant Pathologist
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5. Request for help locating suspected glyphosate-resistant Palmer amaranth

Glyphosate-resistant weeds have become a major issue in Kansas and around the world. We now have five species of confirmed glyphosate resistant weeds in Kansas, including horseweed (marestail), waterhemp, giant ragweed, common ragweed, and kochia.

In our winter meeting surveys the last several years, a fairly high percentage of people indicated they thought they had glyphosate-resistant Palmer amaranth. However, glyphosate-resistant Palmer amaranth still has not been officially reported in the state. Glyphosate-resistant Palmer amaranth has become a very serious problem in the Southeast U.S., even to the point that many farmers are no longer planting Roundup Ready crops.

We suspect glyphosate-resistant Palmer amaranth may be present in Kansas. We would like to make some collections from fields around the state with suspected resistance to determine whether glyphosate resistance is present and to what extent. At the same time, we will also plan to screen the same populations of Palmer amaranth for other herbicide resistance traits, such as atrazine, ALS, and possibly HPPD resistance.

Assessing the potential for herbicide resistance this summer has been complicated by the hot, dry conditions and poor herbicide performance overall. However, if you suspect you have or know of someone else who might have glyphosate-resistant Palmer amaranth, we would be interested in collecting seed this fall to do greenhouse testing.

If you have problem fields from which we could collect seed samples this fall, please contact either Dallas Peterson, Extension weed management specialist, at dpeterso@ksu.edu or 785-5323-0405, or graduate student Josh Putman at jputman@ksu.edu or 585-703-3674. We appreciate your cooperation in advance.

-- Dallas Peterson, Weed Management Specialist
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-- Joshua Putman, Agronomy Graduate Student
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6. Winter canola insurance deadline fast approaching

Farmers wanting to insure winter canola for the upcoming growing season need to visit with their crop insurance agents without delay if they haven’t done so already. August 31 is the deadline to request a written agreement to insure winter canola in Kansas south of and adjacent to I-70. For first-time canola growers, a similar crop qualification can be used when they have at least three years of winter wheat production experience.

Written agreements contain a statement which sets the earliest planting date for winter canola at September 1. The final planting date is September 30. These dates cover the entire state.

Research conducted at the Southwest Research-Extension Center in Garden City shows that the planting window for winter canola in southwest Kansas is between August 15 and September 15, with the optimum date being about September 1. This raises some questions as to when to plant
canola for the best profitable production yet still be covered by crop insurance in southwest Kansas.

If a producer plants winter canola prior to the earliest insurance planting date (September 1) and suffers a loss that requires replanting, the producer won’t receive the replant payment and must bear the expense of replanting on those acres planted prior to the earliest planting date. These acres could still qualify for a loss payment if damage occurred later in the growing season. In other words, canola is insurable if planted prior to September 1; however, those acres will not be eligible for the replant payment if an early-season loss occurs.

There is a late planting period for winter canola that lasts an additional five days after the final planting date (September 30); however, the guarantee for each acre is reduced by 3 percent for each day planted after the final planting date.

The research findings from Garden City will be shared with the Risk Management Agency to help them further develop insurance programs for profitable winter canola production in Kansas.

-- Mike Stamm, Canola Breeder
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-- John Holman, Crop Production Agronomist, Southwest-Research Extension Center
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7. Comparative Vegetation Condition Report: August 9 – 22

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=CRP3Y5Nlggw
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 August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that vegetative productivity continues to be highest in the northeast. In this area, favorable moisture and temperatures have led to high photosynthetic activity. Some fairly high photosynthetic activity was experienced in areas that had rains in early August. Particularly noticeable are spots in McPherson County where some locations had more than 4 inches of rain.
Map 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that only the North Central and Northeastern divisions are seeing more vegetative production than last year. Graham and Rooks counties are particularly visible in their improvement. On the opposite end, the Flint Hills corridor from Morris County to Cowley County shows much less productivity than last year.
Map 3. Compared to the 22-year average at this time for Kansas, this year’s Vegetation Condition Report for August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the variable rains in early August had limited impact. Along the Cowley/Sumner County line, conditions are slightly better than average, but east and west of the line conditions are much worse. Southwest and south central Kansas continue the trend of below-average photosynthetic activity. This reduced photosynthetic activity is also visible in the western portions of the East Central and Southeastern divisions. Drought conditions in these areas have been moved from moderate drought to severe drought.
Map 4. The Vegetation Condition Report for the Corn Belt for August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that decreased photosynthetic activity has expanded from the west. Areas of abnormally dry conditions are beginning to be seen, particularly in western South Dakota and the Nebraska Panhandle. In Illinois, Indiana, and Ohio, expanding areas of decreased productivity are visible. In these areas, row crops are responding negatively to the excessive heat. Drought conditions in southwest Kansas continue to push eastward into southwestern Missouri.
Map 5. The comparison to last year in the Corn Belt for the period August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that much of the region has a simple pattern. The greatest increase in vegetative productivity can be seen in the East, where precipitation and temperature patterns have been favorable all season. North and South Dakota, as well as Nebraska, while generally showing more productivity, are also experiencing the impacts of excessive spring moisture.
Map 6. Compared to the 22-year average at this time for the Corn Belt, this year’s Vegetation Condition Report for August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows most of the Corn Belt is experiencing greater-than-average photosynthetic activity. Of the high-biomass-productivity regions, most notable are North and South Dakota, where crops and pastures are rated in mostly good to excellent condition.
Map 7. The Vegetation Condition Report for the U.S. for August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the eastern half of the country, as well as the Pacific Northwest, continue to have high levels of photosynthetic activity. Low biomass production continues to be the case in the Southern Plains, and is expanding eastward.
Map 8. The U.S. comparison to last year at this time for the period August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the Southern Plains region, from eastern Colorado to Louisiana, is much behind last year in terms of biomass production. In contrast, areas of the Northeast from Pennsylvania through Maine are experiencing much greater levels of photosynthetic activity.
Map 9. The U.S. comparison to the 22-year average for the period August 9 – 22 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the Southwest continues to have the greatest decrease in biomass production, due to drought conditions. The Northern Great Plains shows the largest increase in productivity compared to average. In Oklahoma, 92 percent of the hay is rated in poor to very poor condition. In North Dakota, 80 percent of the hay is rated as good to excellent.

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.

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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