Soybean and Small Grains

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Early Season Wheat Stand and Yield Assessment

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Near record wheat commodity prices coupled with increasing input costs for corn and soybean prompted many Wisconsin growers to increase their wheat acres in 2007. As the ice and snow begins to dissipate over the next few weeks it is critical that we accurately assess the winter injury to the wheat crop and make the appropriate management decisions regarding the wheat stand, nitrogen timing, and yield potential.

Although it is premature to make a full assessment of the overwinter survival of the wheat crop, what we have seen so far leaves us optimistic. Many wheat fields in southern WI still have ice and snow on parts of the field. The fields we have been in are mud in the top two inches and still frozen underneath. The exposed areas (usually higher ground) are pale green indicating a good chance that the wheat has tolerated the heavy snows and cold of this past winter. Brown, dried leaves evident in some fields do not necessarily indicate winter injury, and green leaves are not a sure sign that the crop has survived either. (Image 1) The only way to properly assess the condition of individual plants is to examine the crown for the development of new white roots. It has been too cold here to see any of that growth yet. If the crown appears white and healthy, and new roots are developing, the plant is probably in good condition. Growth of roots from the crown tissue is soil temperature dependent. For now, we should wait until the soil warms up and root growth restarts. (Image 2) When that happens, dig, (don't pull) plants and carefully wash the soil from the roots and examine them. If you are anxious about the status of your wheat, dig several shovelfuls of wheat and soil and take it inside. Keep the soil moist and assess crowns for new root growth in about 5-7 days.

Image 1. Brown leaves don't necessarily mean wheat has not survived.

Image 2. Wait until the snow has melted and warmer temperatures spur new growth before deciding the fate of your wheat.

A valuable point to remember this spring is that in wheat, nitrogen serves two important functions. Nitrogen fertilizer may be used to manipulate the population (increase tiller number) as well as supply the nutritional needs of the crop to produce protein (Maowski et al. 1999; Soon and Clayton, 2002; Vaughan et al. 1990; Weisz et al. 2001). Therefore, wheat tiller number is an important indicator of nitrogen application timing. Research indicates that if tiller (stem) number is greater than 70 per square foot it may be beneficial to delay nitrogen application until just prior to jointing (Scharf et al., 1993). The advantage of a delayed nitrogen application is an increase in nitrogen use efficiency and a potential yield increase, however if tiller number is less than 70 per square foot, it is recommended to apply nitrogen at green-up in order to increase the effective plant population.

Nitrogen is a key component to producing good wheat yields; however, applying too much N fertilizer can have detrimental effects on yield. Excessive N fertilization encourages excess vegetative growth, which increases the possibility of lodging, making harvest more difficult and also increases disease potential due to a dense canopy. With the current high price of N fertilizer and very good wheat prices, some growers are wondering if 70 lb N/a for soil with 2.0 to 9.9% organic matter is still valid (Laboski et al., 2006). To answer this question data collected over the past 12 years in southern Wisconsin was re-evaluated using current wheat and N fertilizer prices following the maximum return to N (MRTN) approach we use for corn N recommendations. The amount of N needed for wheat is strongly related to preplant soil nitrate levels (PPNT). PPNT for wheat is determined on 0-1' and 1-2' soil samples taken in late summer prior to planting wheat in the fall. If the PPNT is < 50 lb NO_3-N/a, then the MRTN rate is 70 lb N/a (with a profitable range of 65 to 80 lb N/a) which matches our recommendations for soils with 2 to 9.9% organic matter. If the PPNT is between 50 and 100 lb NO_3-N/a, then the MRTN rate is 45 lb N/a. And if the PPNT is > 100 lb NO_3-N/a, then the MRTN is 0 lb N/a (no N is needed). In these studies if wheat followed soybean then the MRTN rate was about 20 lb/a less. If PPNT soil samples were not collected last year, then it would be appropriate to use 70 lb N/a on soils with 2.0-9.9%. Also remember to take any N credits for manure applications or forage legumes if appropriate.

Nitrogen applications to wheat should be made in early spring at Feekes GS3 to GS5 (green-up to pre-joint). Applying N on slightly frozen ground in mid to late April in southern WI minimizes wheel traffic problems and meets the early season N needs of wheat, however off-site movement of N can occur.

Spring N management decisions are often difficult for growers when winter wheat stands are thin at green-up. The common questions are:

- What will this stand yield?
- How much N should I invest into this poor looking wheat stand?
- And finally, should I even keep this crop?

A good assessment of live plants is an essential first step. We recommend a minimum of 12-15 live plants per sq ft as a cutoff. It will usually not be economical to keep a wheat crop with less plant density than this. Use Table 1 as a guide when counting plants in various row widths. When counting, be sure to distinguish between whole plants and tillers. These recommendations are for plants per square foot. Whole fields do not have to be abandoned if one area is low in stand. Before you tear up a poor stand of wheat, be sure to calculate the input costs you have in the existing wheat crop, the costs of establishing another crop in relation to the expected yields of either crop, and lastly, current crop prices. Net profits from wheat are competitive with soybean and corn when you add in the return for the straw and the rotation benefits.

Table 1. Wisconsin Winter Wheat - Spring Plant Stand Recommendations

Minimum spring stands
Good spring stands
Excellent spring stands

Plants/acre		Row Width		
		6	7	7.5
million	plants/sq ft	Plants per foot of row		
0.3	7	3	4	4
0.4	9	5	5	6
0.5	11	6	7	7
0.6	14	7	8	9
0.7	16	8	9	10
0.8	18	9	11	11
0.9	21	10	12	13
1.0	23	11	13	14
1.1	25	13	15	16
1.2	28	14	16	17
1.3	30	15	17	19
1.4	32	16	19	20
1.5	34	17	20	22
1.6	37	18	21	23
1.7	39	20	23	24
1.8	41	21	24	26
1.9	44	22	25	27
2.0	46	23	27	29
2.1	48	24	28	30
2.2	51	25	29	32
2.3	53	26	31	33

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