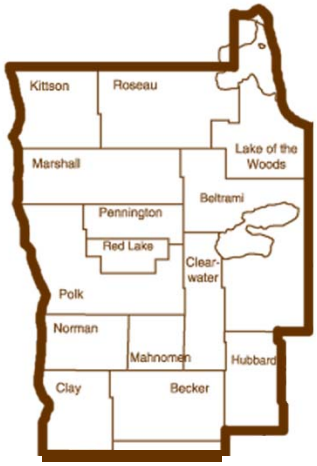

Cropping Issues in Northwest Minnesota

June 4, 2004 / Vol. I, Issue 4

Topics of Interest...

Winter Wheat Survey: Looking for a "Few Good Fields"

The small grains plant pathology project at the NWROC is doing a small study on winter wheat, and I'm am asking for your help. I need winter wheat plant samples submitted to my lab during the next three weeks from approximately 10-20 fields. I'll be looking for a fungus on the roots that I suspect may be causing disease.

A root rot disease, brown root rot of **alfalfa** (caused by *Phoma sclerotioides*) has been confirmed in several Minnesota counties. This disease of forages is caused by a cold-loving fungus that was, in the past, found in Canada on diseased roots of winter wheat. I can't say that the fungus causes disease on winter wheat, because that hasn't been determined. But, I'd like to know if the fungus is on winter wheat plant roots in Minnesota, and if it's responsible for reducing yield. If the fungus is identified on roots, the next step is to check to see if it causes disease (and reduces yield). PLEASE NOTE: Spring wheat cannot be affected by this pathogen, since it requires a winter season to cause root rot.

If you're growing a field of winter wheat, here's what I need:

- Plant samples. Winter wheat plants sampled as soon as possible (preferably over the next three weeks). This is a cold-loving fungus that may be present on overwintering roots rather than roots that have grown out this spring. Collected plants must be alive, and it's best if they're growing near an area where plant growth is limited for some reason. I DON'T WANT DEAD PLANTS! Approximately 15 plants should be dug from each sampled field - 5 plants at a site so that plants are from at least three different locations in the field.

- Field information. Field location where the sample was taken including county, township and range, winter wheat variety, description of overall plant stand in the field, previous crop, field size, and your name, physical and email addresses, and phone number.

Plants should be placed in a sealed plastic bag, and then into a manila envelope for mailing. Send them to me immediately (the longer they stay in the bag, the more they degrade) at the address on the back page of this newsletter.

Thanks for your help!

Char Hollingsworth
Small Grains Extension Plant Pathologist

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Late Planting of Soybeans

Recent weather conditions have caused delays in soybean planting. Many producers are wondering about yield potential of late planted soybeans. In issue #3 of 'Cropping Issues', soybean agronomist Dr. Seth Naeve recommended that growers not make major changes in management strategies for soybeans regarding variety, plant population, and row spacing. Soybean development is determined by day length, so soybean varieties that are well adapted to a producer's latitude will be delayed in maturity by only one or two days when planted through early June. Cool, short nights in September hasten maturity of late planted soybeans. This reduces the effect of late planting on soybean maturity.

Tables 1 and 2 provide information on yield potential of late planted soybeans, and yield of soybeans with reduced plant populations. Soybeans can yield very well even with significantly reduced populations. Often the yield loss due to delayed planting is more than the yield loss due to reduced populations. The number and size of gaps in a reduced stand must also be considered. Larger gaps reduce yields and create weed control challenges.

Table 2. *From*: Naeve, S.L., D.R. Hicks, and J.M. Bennet. 1999. The soybean growers field guide for evaluating crop damage and replant options. University of Minnesota Extension Service #MI-7444-S

Effect of population reduction on soybean yield		
Plants per acre	**Percent of optimum stand**	**Percent of optimum yield produced**
157,000	100	100
118,000	75	98
78,000	50	90
39,000	25	75

Table 1. *From*: Naeve, S.L., D.R. Hicks, and J.M. Bennet. 1999. The soybean growers field guide for evaluating crop damage and replant options. University of Minnesota Extension Service #MI-7444-S

Soybean yield losses and yield potential due to planting after May 1		
Planting Date	**Yield loss (%)**	**Yield Potential**
May 1	0	100
May 5	1	99
May 10	2	98
May 15	3	97
May 20	6	94
May 25	9	91
May 30	13	87
June 4	18	82
June 9	24	76
June 14	30	70
June 19	36	64
June 24	43	57

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Regional Extension Educator—Crops

What Pigweed Is It? Does It Matter?

As temperatures have increased in the past several days, a strong flush of broadleaf and grassy weeds have emerged in many fields. In this flush are one or more pigweed species that in the right light can make the ground look like a red carpet. As small cotyledon and two leaf stage plants, the pigweeds are nearly impossible to identify from one another without thin layer chromatography or other sophisticated techniques (Figure 1).

Figure 1. Can you identify these pigweeds? (from left to right redroot pigweed, Powell amaranth)

However, it may be possible to guess at the species emerging based on ambient temperatures prior to emergence according to research conducted by Steckel, Sprague, Stoller, and Wax[2]. They reported the germination response of nine pigweed species to temperature and included in Table 1 (on following page) are the four more common species in NW Minnesota. In this research, Powell amaranth germinated over a wide range of temperatures and had the greatest germination at cooler temperatures. This information fits my own observations, in small plot trials, that Powell amaranth emerges several days before redroot pigweed in the spring. As average temperatures reach the 60 -70^{o}F both prostrate pigweed and redroot pigweed begin to germinate often. Common and/or tall waterhemp do not begin to germinate in significant numbers until average temperatures are in the 80 to 90 range. It isn't difficult to see why mixed populations of waterhemp and the other pigweed species are difficult to manage with such a wide window of germination and emergence temperatures. ***(Continued on Page 3)***

Rock Rolling Soybeans

Rock rolling is a common and effective practice in many regions of Northwest Minnesota to push rocks into the soil. This allows growers to operate headers very low to the ground and harvest pods that are produced low on the soybean stem. Rolling is done after planting, and most of the time before soybean emergence. However, soybeans can also be rolled after they emerge. Preemergence rolling does not injure plants, and may improve soil to seed contact and enhance germination. However, preemergence rolling can greatly increase the potential for wind erosion, and rolling may be delayed because of rain or other factors. To avoid wind erosion or if rolling is delayed for another reason, soybeans can be rolled after they emerge. Rolling after emergence has the potential to cause plant injury. Plants broken off below the cotyledons will not regrow.

A rolling study was conducted by NDSU at the Carrington, ND Research and Education Center in 2003. Soybeans were rolled during afternoons in late May on a dry soil surface. Results are given in the table above.

Soybean plant injury increased as rolling was delayed, however stand and yield were similar to the untreated plots. Postemergence rolling is likely to do the least damage to soybeans when performed in the afternoon of warmer days when soybeans are less prone to stem breakage. Soil conditions, tractor tires, and other factors may also contribute to injury. Be sure to inspect plants at the beginning of a rolling operation to determine if excessive injury may be occurring.

Impact of time of rolling on soybeans

Plant Stage	Soybean Stand 1-2 Weeks After Treatment	Plant Injury * 1-2 Weeks After Treatment	Yield
	Plants/ft^2	%	Bu/A
Untreated	31	0	29.2
Preemergence	29	1	30.9
50% Cotyledons Emerged	30	0	28.7
Cotyledon	38	6	29.1
1st Trifoliate	36	14	30.8
Mean	33	4	29.7
C.V. %	9	71	13
LSD 0.05	5	5	NS
***Injury included bent, broken, or calloused stems.**			

Source: NDSU Carrington, ND Research and Education Center. Greg Endres, Extension Area Agronomist, and Bob Henson, Research Agronomist. 2003.

Zachary Fore
Regional Extension Educator

What Pigweed Is It? (...continued)

Table 1. Temperature[2] effects on germination of four pigweed species

Species	41F	50F	59F	68F	77F	86F	95F
	----------% germination----------						
Redroot pigweed	3	2	11	36	65	73	50
Powell amaranth	19	33	54	65	74	86	50
Prostrate pigweed	1	3	18	39	37	21	2
Common waterhemp	0	0	1	5	27	75	70

[2] Temperatures were varied in a diurnal pattern

Fall surveys determining the relative abundance of pigweed species in NW MN found that Powell amaranth was the most abundant pigweed in sugarbeet fields, but redroot pigweed was more abundant in soybean and corn. These surveys were conducted after weed control practices had been completed and indicate that herbicides in sugarbeet may not be as effective on Powell amaranth as they are on redroot pigweed. Research was conducted in 2002 to evaluate the efficacy of broadleaf herbicides on these two pigweed species.

Results in Table 2 on the following page show that the evaluated postemergence broadleaf herbicides used in corn and soybean did not control the species differently, but there were differences in control with some of the sugarbeet herbicides. We did not evaluate control of waterhemp in this research, but other research has shown that this pigweed is more difficult to control with herbicides and often escapes treatment with late germination in fields. Waterhemp infestations have been expanding in this part of the state and are identified as far north as Norman County. Two excellent pigweed identification publications can be found on the internet at:
http://www.oznet.ksu.edu/library/crpsl2/s80.pdf
http://www.extension.iastate.edu/Publications/PM1786.pdf

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Table 1 Control of Powell amaranth and redroot pigweed with selected broadleaf herbicides.

Treatment	Rate/A (product)	July 8			July 15	
		Powell amaranth	Redroot pigweed		Powell amaranth	Redroot pigweed
		% control				
Roundup Ultra Max	0.8 pt	99	99		99	99
Accent + COC	0.33 oz + 1.5 pt	90	89		96	96
Clarity	0.33 pt	71	70		80	77
Callisto + COC	3 oz + 1% v/v	84	85		88	94
Basagran + COC	1.5 pt + 2 pt	66	70		40	44
Flexstar + COC	0.75 pt + 1% v/v	99	99		95	97
Betanex	2.5 pt	74	77		52	56
Raptor + NIS	4 oz + 0.125% v/v	89	86		93	95
Upbeet	0.5 oz	35	52		19	44
Option + Scoil	1.25 oz + 1.5 pt	84	85		92	93
2,4-D	1 pt	77	77		82	83
Ultra Blazer + NIS	1 pt + 0.125% v/v	96	96		93	94
Stinger	0.5 pt	19	31		9	12
Betanex + Upbeet + Stinger + Select + Scoil	0.5pt+0.125oz +1.4oz+2oz +1pt	46	59		27	39
LSD (0.05)[1]		6.5			8.5	

[1]LSD for comparing Powell amaranth and redroot pigweed % control for the same herbicide treatment

[2] Steckel, L. E., Sprague, C. L., Stoller E. W., and L. M. Wax. 2004. Temperature effects on germination of nine *Amaranthus* species. Weed Sci. 52 217-221.

Carlyle Holen
Extension IPM Specialist

Soil Water Movement

As the heavy rains over Memorial Day weekend have subsided, it may be of interest to write a few words about how water moves through soil.

During long-continued heavy rains, infiltration of soil water continues under the force of gravity, carrying the water down to successively greater depths. Soil pores become filled with water, with only a small amount of free air remaining entrapped in bubbles. The soil may, for a time, become almost completely saturated with water. Downward percolation continues beyond the *soil water belt* into the *intermediate belt*, a zone too deep to be reached by plat roots. Water may ultimately reach the ground-water zone below (Fig. 1 on following page).

After the rain has ceased, water continues to drain downward under the influence of gravity, but some remains held in the soil, clinging to the soil grains in thin films, by the force of *capillary tension*. This is the same force that causes ink to be drawn upward in a piece of blotting paper and which permits small water droplets to cling to the side of a vertical pane of glass. Films of *capillary water* in the soil remain held in place until gradually dissipated by evaporation or drawn into root systems.

After soil has been saturated by prolonged rains and then drains until no more water moves downward under the force of gravity, the soil is said to be holding its *field capacity* of water. Most excess water drains out in a day's time; usually not more that two or three days are required for gravity drainage to cease. Soil-moisture content can be stated in terms of the equivalent depth in inches of water in a given thickness of soil. At *field capacity*, soil-moisture content ranges from 1 to 4 inches per foot of soil, depending upon soil texture (Fig. 2 on following page). Sandy soils have low *field capacity*, which is rapidly reached because of the ease with which the water penetrates the large openings (*macro pores*). Clay soils, on the other hand, have a high *field capacity*, but require much longer periods to attain it because of the slow rate of water penetration due to the much smaller openings (micro pores).

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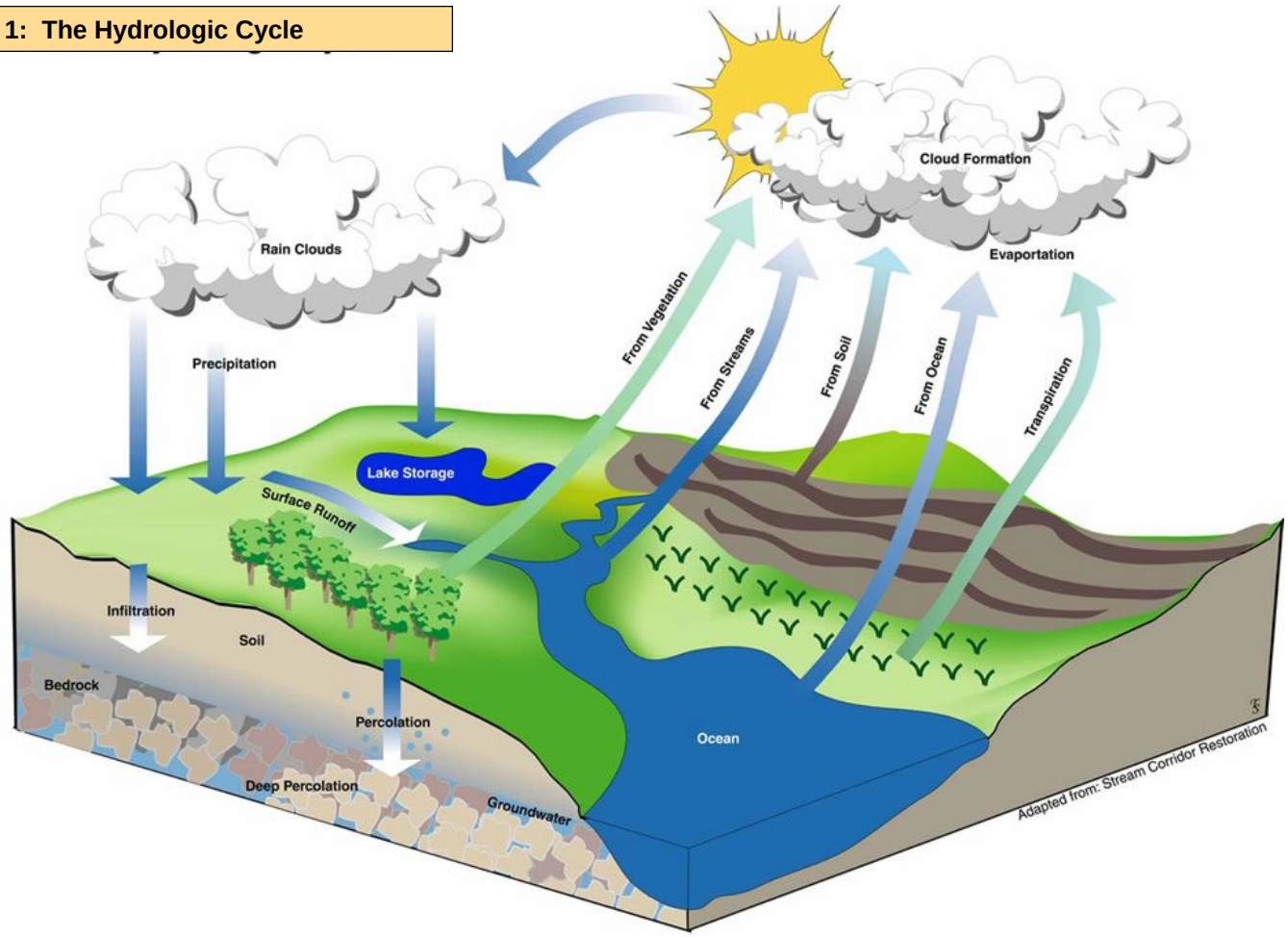
Figure 1: The Hydrologic Cycle



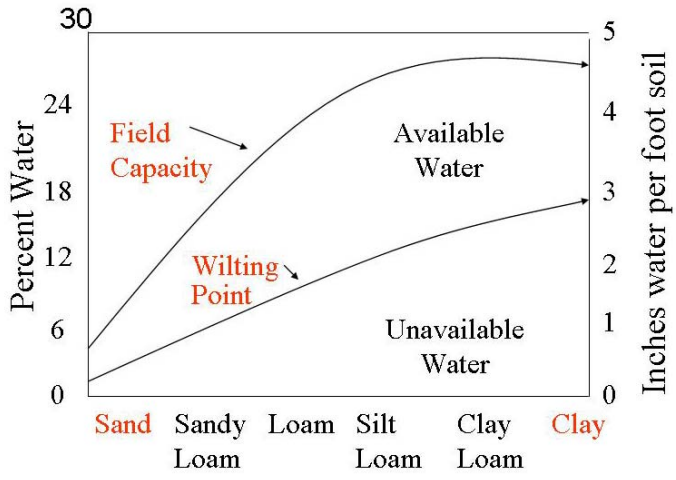
SOIL WATER MOVEMENT...continued from Page 4

A comparable, but lower value of soil moisture is the *wilting point,* below which foliage wilts because of the inability of the plants to extract the remaining moisture (Figure 2).

A few points to consider: only after heavy rainfall does the water "flow" through the soil. This is especially true in our area where evapotranspiration exceeds precipitation. During most of the growing season the water can be said to be "pulled" through the soil by *capillarity. Field Capacity* can be thought of as "all the water a soil can hold *against the pull of gravity*". When the *field capacity* of a particular soil is exceeded, water begins to flow downward. One last point to consider is that *available water* to the plant is only the water held in the soil at tensions between *field capacity* and *wilt point,* or realistically, the water held at tensions less than *wilt point* (Fig. 2).

The characteristic annual cycle of changes in soil moisture content deserves study because it leads to a better understanding of the principles of ground-water movement, surface runoff, and various aspects of the sculpturing of the land by running water.

Figure 2: Soil Texture and Available Water



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