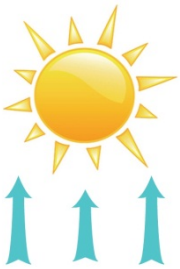
BLACKFOOT CHALLENGE WEEKLY IRRIGATION REPORT

Friday August 1, 2014

Hot weather continued this last week broken up only by a few thunderstorms and just enough rain to interfere with haying but not add soil moisture. Crop water remains high at about 1.5 inches per week for hay and pasture crops which is slightly above-average. Soil moisture dropped considerably last week unless irrigated. Haying has progressed across the drainage. Haying reduces crop water use by about 2/3 the first week and 1/3 the next. Get water back onto cut fields as soon as possible to revive plants, stimulate regrowth and reduce weed infestation. The last page of this report is a condensed summary of recommendations for the entire season. Work towards these goals for best results and check out our irrigation guide for more details at: http://blackfootchallenge.org/Articles/wp-content/uploads/2013/06/BFIrrigationGuideFinalv3.0.pdf.

WEATHER – HOT/DRY BUT COOLING SLIGHLTY NEXT WEEK

Most Blackfoot drainage croplands received little or no rain this past week except for a few folks who had scattered showers (and probably just cut hay). Temperatures reached into the 90s again in most areas. Next week looks like an unsettled mix of hot temperatures and scattered thunderstorms. The 30 and 90 day forecasts still suggest normal temperatures and above normal rainfall.

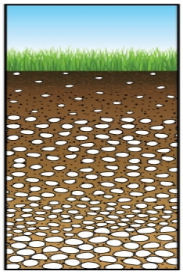


CROP WATER USE – REMAINS HIGH

Crop water use was high again this last week and has reached its peak due to recent hot and dry conditions. Crop water use should continue to be high for the next week except for cut hay crops and maturing small grains. See the table and chart on Page 3 for more details.

WATER USE IN INCHES	LAST 7 DAYS	NEXT 7 DAYS[1]		SEASON TOTAL[2]
HAY CROPS	**1.6**	**1.6**	(1.5 - 1.8)	16.9
PASTURE	**1.3**	**1.4**	(1.3 -1.6)	14.7
SPRING GRAINS (5-15 planting)	**1.7**	**1.5**	(1.6 - 1.9)	14.1
WINTER WHEAT	**0.5**	**0.3**	(0.5 - 1.0)	14.1
LAWNS	**1.5**	**1.5**	(1.4 -1.7)	15.9

[1]Expected water use (range if weather becomes cooler or hotter than expected)
[2]Beginning May 1 - season start date



SOIL MOISTURE – DROPPING FAST WITH HIGH CROP USE

Soil moisture levels again dropped by 1 ½ inches or more this week due to high crop water use. In cut hay fields crop water use is reduced by about 2/3 the first week and 1/3 the second. Crop water use slows as soil moisture gets low. Remember to fill up the soil before cutting and then getting back with water quickly to reduce crop stress and boost production.

WEEKLY TIPS

BUILD UP SOIL MOISTURE BEFORE CUTTING AND GET WATER BACK ON QUICK!

The highest stress period for hay crops is at cutting (imagine someone cutting your head off – you would be stressed too). Try to store up soil moisture before cutting, leave time between irrigating and cutting to let the surface soil dry so equipment does not rut or compact the soil, then get back across the cut field as soon as possible.

CROP WATER USE DECREASES WITH CUTTING

Crop water use decreases with cutting by approximately 2/3 the first week after cutting, 1/2 the second and 1/3 the third. This is the best time to increase soil moisture while crop use is reduced. Since less gets used by the crop, more goes into soil storage.

WHEN TO STOP IRRIGATING GRAINS – NOT YET IN MANY FIELDS!

Take a close look at your kernels and ask yourself if you will be happy with a dried version of what you see – if not, keep irrigating. Most guides suggest irrigating grains up to the milk to soft dough stage. However, at that point you must have enough moisture in the soil and the plant roots, leaves and stems to produce plump kernels and prevent shriveling. It's safest to have an inch or so of stored soil moisture left when you stop irrigating, especially if it's hot. (Growth stage guide attached). Of course we all know about the problems late irrigation can cause like lodging so irrigate responsibly.

GROWING SEASON RAINFALL STILL UNDER-AVERAGE BUT RIVER NEAR AVERAGE

Blackfoot streamflow is about average this week. Conditions remain good making irrigators, fish, and boaters happily optimistic. The Blackfoot River at Bonner is flowing at about 1000 CFS. The highest flow on this date was 2810 (1899) and the lowest flow was 392 (1988).

YOU THINK YOU HAVE BEEN WALKING THAT DITCH A LONG TIME?

The first irrigation ditch was dug over 5000 years ago (3000 BCE) in the middle east. Jordan, Iraq, and Egypt are usually cited as having the earliest serious irrigation works. Irrigation allowed concentrated civilizations to form and rulers often formed armies first and irrigation works second. The first "Famous" irrigators were people like Chinese irrigation engineer Yu (2000 BCE) and a string of Egyptian and Syrian Kings around the same time. It's interesting that some of these irrigation structures, built over 2000 years ago are still used today. Maize was irrigated in the American southwest around 1500 BCE. More irrigation history next week.

For further information contact Jennifer Schoonen, Blackfoot Challenge Water Steward, 406-360-6445 or Barry Dutton, Professional Soil Scientist, 406-240-7798 barry@landandwaterconsulting.net

BLACKFOOT 2014 GROWING SEASON WEEKLY RAINFALL & CROP WATER USE (INCHES OF WATER)

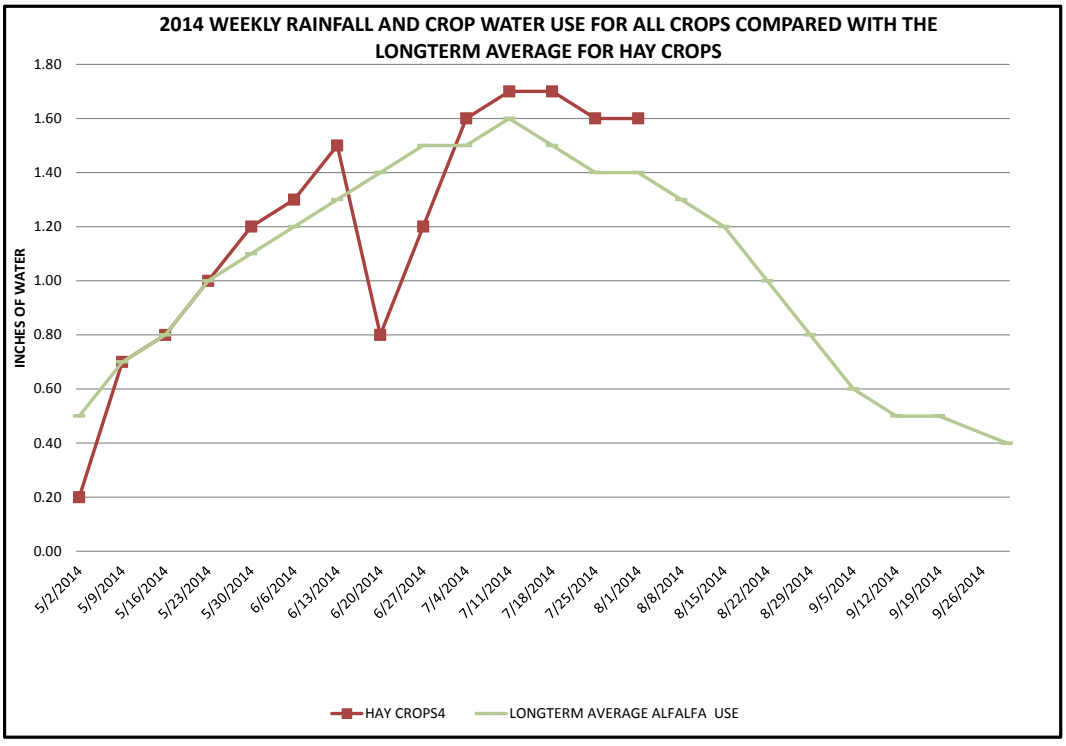
	RAIN[1]	2013 WEEKLY POTENTIAL CROP WATER USE[2]						AVERAGE POTENTIAL CROP WATER USE[3]		
	RAIN	HAY CROPS[4]	PASTURE	SPRING GRAINS 5-15 START	SPRING GRAINS 5-30 START	WINTER WHEAT	LAWNS	LONGTERM AVERAGE ALFALFA USE	HOT WEEK ALFALFA HAY WATER USE	COOL WEEK ALFALFA HAY WATER USE
5/2/2014	0.10	0.20	0.20	0.00	0.00	0.20	0.20	0.50	0.80	0.20
5/9/2014	0.50	0.70	0.60	0.00	0.00	0.80	0.70	0.70	0.90	0.30
5/16/2014	0.30	0.80	0.70	0.00	0.00	0.90	0.80	0.80	1.00	0.40
5/23/2014	0.30	1.00	0.80	0.25	0.00	1.10	0.90	1.00	1.10	0.60
5/30/2014	0.10	1.20	1.10	0.75	0.00	1.30	1.10	1.10	1.20	0.80
6/6/2014	0.10	1.30	1.20	0.90	0.30	1.40	1.20	1.20	1.30	0.90
6/13/2014	0.10	1.50	1.25	1.25	0.75	1.75	1.40	1.30	1.50	1.00
6/20/2014	1.25	0.80	0.70	0.80	0.60	0.80	0.80	1.40	1.70	1.10
6/27/2014	0.50	1.20	1.00	1.40	1.00	1.40	1.10	1.50	1.90	1.10
7/4/2014	0.10	1.60	1.40	1.75	1.50	1.50	1.50	1.50	2.00	1.20
7/11/2014	0.00	1.70	1.50	1.80	1.80	1.40	1.60	1.60	2.10	1.30
7/18/2014	0.00	1.70	1.50	2.00	2.00	0.80	1.60	1.50	2.00	1.20
7/25/2014	0.20	1.60	1.30	1.70	1.70	0.50	1.50	1.40	1.90	1.10
8/1/2014	0.10	1.60	1.40	1.50	1.50	0.25	1.50	1.40	2.20	1.10
8/8/2014								1.30	1.70	1.00
8/15/2014								1.20	1.50	0.90
8/22/2014								1.00	1.30	0.70
8/29/2014								0.80	1.00	0.50
9/5/2014								0.60	0.80	0.40
9/12/2014								0.50	0.70	0.30
9/19/2014								0.50	0.70	0.30
9/30/2014								0.40	0.60	0.20
TOTAL	**3.65**	**16.90**	**14.65**	**14.10**	**11.15**	**14.10**	**15.90**	**23.20**	**29.90**	**16.60**

[1] Rainfall should be reduced to account for immediate evaporation from crop and soil surfaces (0.1-May and Sept, 0.15-June and August, 0.2-July)

[2] This years maximum water use by healthy crops that are well-fertilized and irrigated, disease and insect-free. Will vary slightly across the drainage.

[3] Average water use for each crop each week based on historic data.

[4] Hay Crop water use should be reduced by approximately 2/3 the first week after cutting, 1/2 the second and 1/3 the third.



Grain Development Stages

Fig. 44. Watery ripe wheat kernel.

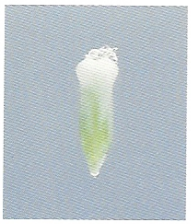


Fig. 45. Watery ripe barley kernel.

Watery Ripe Stage

During the watery ripe stage, kernel length and width are established and the kernel rapidly increases in size, but does not accumulate much dry matter (Fig. 44-45). A clear fluid can be squeezed from the developing kernel. The plant is green, but the lower leaves begin to die.

Fig. 46. Milk stage wheat kernel.

Fig. 47. Milk stage barley kernel.

Milk Stage

During the milk stage a white, milk-like fluid can be squeezed from the developing kernel (Fig. 46-47). By the end of milk stage the embryo is fully formed and about 1/32 inch in length. During the course of this stage, nutrients stored in lower leaves are redistributed to the upper plant, including the developing kernels, causing several of the bottom leaves to die.

Fig. 48. Soft dough wheat kernel.

Fig. 50. Soft dough barley kernel.

Soft Dough Stage

The water concentration of the kernel has decreased to the point where the material pressed out of the kernel is no longer a liquid but has the consistency of meal or dough (Fig. 48-51). The kernel rapidly accumulates starch and nutrients and by the end of this stage the green color begins to fade. Most of the kernel dry weight is accumulated in this stage. In barley, the palea and lemma become firmly adhered to the kernel. Once kernel water concentration decreases to about 75 percent, swathing of spring wheat can begin without reducing yield, test weight, or protein level.

Fig. 49. Soft dough wheat head.

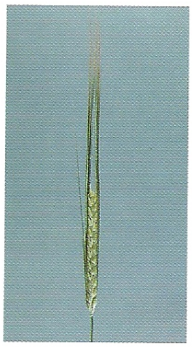


Fig. 51. Soft dough two-row barley head.

Fig. 52. Hard dough wheat kernel.

Fig. 53. Hard dough barley kernel.

Hard Dough Stage

The kernel reaches physiological maturity at the end of this stage (Fig. 52-53). At physiological maturity, the glumes and peduncle are no longer green and little green coloring remains in the plant. Kernel water concentration decreases from a level of 40 to 30 percent. The main reductions in yield beyond this stage result from harvest losses, and environmental injuries, such as hail and sprouting.

Fig. 54. Kernel hard wheat kernel.

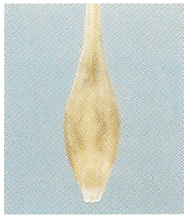


Fig. 55. Kernel hard barley kernel.

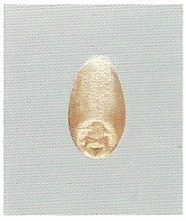


Fig. 56. Harvest ripe wheat kernel.

Fig. 57. Harvest ripe barley kernel.

Kernel Hard Stage

The plant has become completely yellow and the kernel has become firm (Fig. 54-55). The kernel is difficult to physically divide by thumbnail but the surface of the grain can be dented with the edge of the thumbnail. Kernel water concentration is 20 to 25 percent. Unless drying facilities are available, the crop must be swathed and windrowed at this stage because the grain water concentration is too high for safe storage.

Harvest Ripe Stage

The plant has become dry and brittle and the kernel is hard (Fig. 56-58). The kernel cannot be crushed between thumbnails and is difficult to dent its surface with the edge of the thumbnail. If the kernel is crushed by other means, it fragments. When the kernel water concentration has decreased to 13 to 14 percent the grain is ready for direct combining and storage.

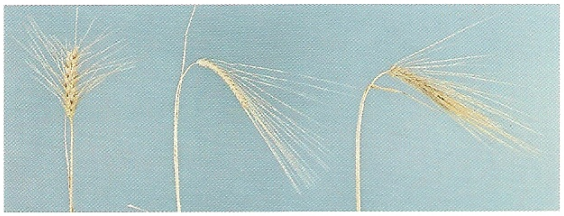


Fig. 58. Harvest ripe wheat, (left) and two- and six-row barley heads.

Dry Matter Accumulation

Dry matter accumulation in the aerial parts of wheat and barley change with plant development stage (Fig. 59). From emergence to about the two-leaf stage, all of the aerial dry matter is in leaves. From that stage forward, dry matter begins accumulating rapidly in the stems. The developing head, which is initiated at about the four-leaf stage, is regarded as part of the stem until heading. By the flag-leaf stage about 30 percent of the total aerial dry matter is accumulated and it is almost equally distributed between leaves and stems. About 55 percent of the total aerial dry matter is accumulated by the time the heads are completely emerged. Dry matter accumulation in the stems declines after heading and all additional dry matter is accumulated in the kernels. By kernel hard stage dry matter is distributed essentially between stems and heads.

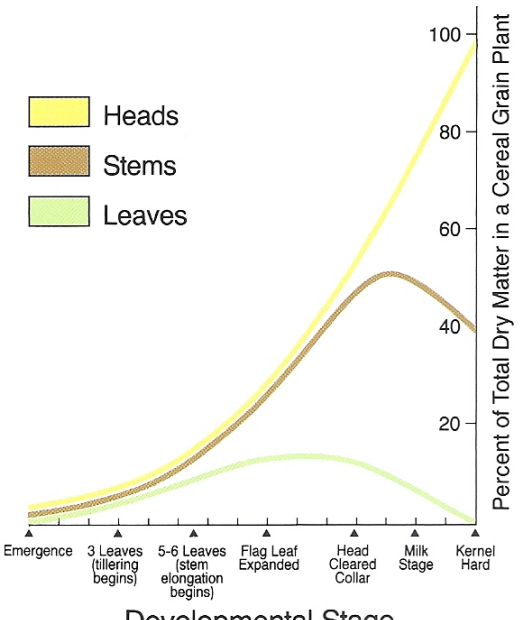


Fig. 59. Dry matter accumulation in a cereal grain plant.

THE BLACKFOOT DRAINAGE IRRIGATION SEASON IN BRIEF

This is a summary of general activities and recommendations with more detail provided throughout our irrigation guide.

APRIL – GET READY AND PLAN YOUR IRRIGATION STRATEGY!

- Get your irrigation system ready – perform maintenance and test system.
- Evaluate weather conditions and predictions then plan for drought if needed.

MAY – CHECK SOIL MOISTURE & BE READY FOR UNUSUAL HEAT OR COLD!

- Check the soil moisture content at the start of growing season (May 1) and fill up the soil to its water holding capacity during early irrigations (2-4 inches).
- Watch for dry soil conditions, especially with new plantings and apply water to ensure good germination and emergence.
- Irrigate deeply at least once early in the season to promote deep root growth.
- Apply 2-5 inches of irrigation to hay and pasture crops in May depending on weather. Apply 0-2 inches to spring grains and new plantings as needed based on weather and growth. Apply extra water to fill up the soil (2-4 in).

JUNE – THIS IS THE TIME TO MAKE YOUR BIGGEST EFFORT SO POUR IT ON!

- Apply 6-8 inches of irrigation in June to hay and pasture crops and winter wheat depending on weather. Apply 5-8 inches to spring grains and new plantings as needed based on weather and growth.
- Consider irrigating deeply to fill up soil root zone and promote deep root growth.
- Be sure small grains are irrigated well during their critical periods of boot, bloom and early heading.

JULY – POUR IT ON UNTIL HARVEST AND RETURN QUICKLY

- Apply 1 - 2 ½ inches of irrigation per week in July to all crops - depending on weather.
- Cutting is a critical stress period for hay crops, especially alfalfa so irrigate deeply to fill up the root zone before cutting then get back across the field quickly after cutting. Crop water use declines when hay is cut so this is a good opportunity to fill up the soil again. Irrigate at least once after cutting.
- Stop irrigating small grains at the milk to soft dough stage but be sure there are 1- 2 inches of soil moisture left at this stage to prevent kernels from shrinking.

AUGUST- KEEP IRRIGATING SMALL GRAINS UNTIL KERNELS MATURE, BE DROUGHT AWARE!

- Apply 1 - 2 inches of irrigation per week in August to hay and pasture crops for full production depending on weather. Irrigate new plantings as needed.
- Many folks irrigate for pasture following their one hay cutting. Irrigate according to how much pasture you seek and with consideration for other water needs in the drainage, especially in drought years.
- Reduce river withdrawals by rotating systems and reducing the amount of irrigation at one time.

SEPTEMBER – APPLY AS NEEDED/AVAILABLE & GET READY FOR SPRING!

- Apply ½ - 1 ½ inches of irrigation per week in September to hay and pasture crops for full production depending on weather. Irrigate new plantings as needed. Prepare the system for winter and an early start next spring.