



BLACKFOOT CHALLENGE

WEEKLY IRRIGATION REPORT

Friday May 1, 2015

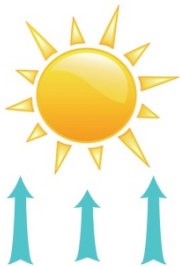
Welcome to the 2015 irrigation season! Please contact myself or Jennifer Schoonen (406-360-6445) the Blackfoot River Steward for more information on this and other Challenge programs. Once again we will provide weekly summaries of weather, crop water use and soil moisture conditions as well as tips for irrigation and production. These summaries are based on our monitoring of weather and soil moisture conditions for individual irrigators throughout the drainage. A condensed overview of the entire irrigation season is presented on the last page of this report.

2015 is looking a lot like 2013 when the growing season started a month early and drought conditions persisted. The good news is that irrigators who applied water early in 2013 still had excellent crops despite drought restrictions later in the season. The theme so far for 2015 is to irrigate early and well while water supplies last and growing conditions are good. Many systems are already operating.



WEATHER-WARM AND MOSTLY DRY, DROUGHT IS POSSIBLE

We begin this irrigation season dry and with the real possibility of drought conditions developing. Warm temperatures and little rain persisted throughout most of April and much of this spring. April rainfall was about half of normal. Next week the latest water supply forecast (May) should be available and we will include an update in this report. The peak river flow may be a month early this year and flows could fall rapidly unless we get lots of rain. Warm temperatures are expected this next week with the possibility of scattered rain later on. The 30 and 90 day forecasts indicate above normal temperatures and normal rainfall.



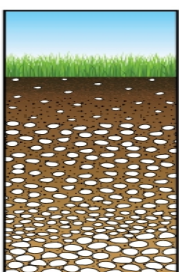
CROP WATER USE - MODERATE (HIGHER THAN NORMAL)

Crop water use was higher than normal this last week due to warm temperatures and dry conditions. It will be moderate next week with warm temperatures and possible showers. Crop water use was higher than average throughout April. The table and chart on Page 6 are updated each week to show water use throughout the season.

WATER USE IN INCHES	LAST 7 DAYS	NEXT 7 DAYS¹	SEASON TOTAL²
HAY CROPS	0.8	1.1 (0.7 - 1.2)	1.7
PASTURE	0.7	1.0 (0.7 - 1.1)	1.5
SPRING GRAINS	0.0	0.0 (0.0 - 0.0)	0.0
WINTER WHEAT	0.8	0.8 (0.7 - 0.9)	1.7
LAWNS	0.7	0.8 (0.7 - 0.9)	1.8

¹Expected water use (range if weather becomes cooler or hotter than expected)

²Beginning April 1 – note in 2010-13 we started our seasonal total on May 1 but now include April



SOIL MOISTURE - LOW TO START THE SEASON

This week most local soil moisture levels were only 25-50% of their moisture holding capacity. Most soils that have not yet been irrigated had only 1-2 inches of soil moisture. This is similar to conditions at the start of 2013, our last drought year. We

expect winter snowmelt and spring rains fill up our soils but there's a lot of soil moisture loss in March and April before the main growing season starts.

WEEKLY TIPS

Irrigation Information from the Blackfoot Challenge:

- Weekly irrigation reports for all basin irrigators – Available by email and on the Challenge website (you are reading an example now)
- Blackfoot Irrigation Guide – Available on the Challenge website
- Irrigation Information Handouts - Available on the Challenge website
- Irrigation Workshops
- Irrigation Consultant – Available by phone and email for irrigation questions

Use This Info To:

- Compare weekly crop water use with how much you irrigate
- Learn your soil water holding capacity – mostly 1 - 2 inches per foot
- Know your critical crop periods – June for most crops
- Know dry soil from moist
- Know how deeply your irrigation penetrates – 1 inch only goes $\frac{1}{2}$ to $\frac{3}{4}$ foot deep
- Identify options for drought years – especially irrigate early while its available
- Apply the right amount of water at the right time to achieve your goals.

Time to Fill Up Your Soil and Keep Moisture Levels High. May is the easiest time to fill up your soil moisture holding capacity, before crop water use gets high. For the next few weeks, crop water use for hay and pasture will be 1 - 1 $\frac{1}{2}$ inches per week. Applying more than this amount will add to soil moisture storage.

A good soil (clay, silt, loam with few rocks) will hold 1 $\frac{1}{2}$ - 2 inches of water per foot or 4 - 6 inches in a three-foot root zone (depth managed for hay and pasture crops). If you have not yet irrigated, you only have about 2 inches so you need to add 2 – 4 inches to fill up your soil. Remember to also add what the crop uses while you irrigate (about 1 inch this coming week) to completely fill the soil.

A very sandy and rocky soil will hold about 1 inch of water per foot or 3 in a three-foot root zone (depth managed for hay and pasture crops). Most of these soils only showed about 1 inch of stored soil moisture this week so it would take 2 more inches to fill them up. Remember to also add what the crop uses while you irrigate (about 1 inch this coming week).

Not Sure How Much Water to Apply?

JUST LOOK! It's not rocket science, check your soil moisture with a soil probe or shovel until the soil is moist to a depth of 3 feet for hay and pasture crops or 2 feet for annual crops. If it looks and feels moist – you're good. If its dusty and dry – keep irrigating. Call for a guide to soil moisture estimating.

Roots

Irrigate deeply at the start of the irrigation season to promote deep root growth. If you allow the soil to dry out and then only apply 1 inch at a time, you will only moisten the top 6-8 inches. This means your crop is looking for all its moisture and nutrients in this thin soil layer. Irrigate new crops deeply after they are established to moisten the entire root zone and lead your roots to deeper depths.

Drought in 2015?

It appears that drought conditions are likely this year. Rainfall could increase significantly but this is not in the current predictions. Here are some options for reducing water use taken from our irrigation guide which is available on the Blackfoot Challenge website. Our weekly reports are not usually so long but we want you to have this extra drought information.

Some strategies can be used immediately and others require planning ahead and can be used in future years. Some of these practices can have negative consequences for irrigators (usually lower yield or loss of alfalfa plants).

Fill Up Your Soil at the Beginning of the Season and Try to Keep it Near Full

Fill up your soils Available Water Holding Capacity (AWHC) so when you get asked to cut back you can do so knowing you have plenty of crop water stored. Sandy soils can store 2-4 inches in a 3 foot root zone. Local silty, loamy and clayey soils can store 4-6 inches in a 3 foot root zone.

Rotate Irrigation Systems During Low River Flows

Streamflows can be increased by reducing the amount of diverted irrigation water. Reduce the number of pivots, wheel lines, hand lines or other systems operating at one time in order to leave more water in the stream for other users.

Save Water for Critical Growth Periods

Each crop has critical growth periods when yield is most affected by a lack of water. For hay crops, this is during stand establishment and immediately after cutting. For small grains, this is during stand establishment, boot, blossom and early head stage. You can also consider the main growth period as a critical period for crops since this is the time when you get most of your production, especially for hay crops. For hay crops in the Blackfoot drainage, this period is the month of June (with a little of May and July thrown in during some years). If you want to get good production you must try to match your irrigation with crop water use during this period.

Reduce Irrigated Acreage

You can produce a larger crop by irrigating a smaller area well than by irrigating a larger area poorly. If you reduce your acreage, you may also be able to reduce your costs for other inputs such as fertilizer, herbicides, seed, fuel and labor. This choice is tricky since it requires you to predict the future or take the work of weathermen.

Concentrate Your Efforts on the First Cutting

Most irrigators in the Blackfoot Drainage harvest one cutting on hay crops and then pasture the field or leave it to go dormant. Even if you manage to get a second cutting or some pasture, the first cutting is where most of your production comes from so make your best effort here. Begin irrigating in May if needed and make a real effort throughout June when most of your production occurs and when crop water use is lower than in July and August due to lower temperatures. Be sure to irrigate at least once after cutting to aid plant recovery from cutting stress.

Grow Your Crop During Cooler Periods

Plant annual crops early and harvest early before the hottest weather. For permanent crops, irrigate heavily during the most productive period for a first cutting (June). Reduce or stop irrigation during the hottest, driest period in July-August. Resume when crop water use is lower and more water is available.

Apply More Water At Each Application

Each time you irrigate you lose .10 - .25 inches of water from evaporation off crop leaves and the soil surface. The gross irrigation amount is how much comes out of the sprinklers. The net irrigation amount is how much makes it into the soil. If you apply ½ inches twice instead of 1 inch once, you lose twice as much to evaporation.

Pivots

Application rates can be increased by slowing the pivot speed on variable systems. Of course, it may not be possible to increase the application rate on soils with high clay contents and low infiltration rates. In this case you can just keep the pivot running at a lower application rate and make another application.

There is another concern for sandy soils with low water-holding capacity. This concern is whether you will slow down so much that the soil moisture or MAD is exhausted before you get back to that spot. For instance, if your pivot applies 1 inch at a time, and it's a hot, dry week in July, that 1 inch will only last 3-4 days. If your pivot takes longer than that to apply 1 inch you will exhaust your soil moisture before you apply more. In this case, it is better to run your pivot at higher speeds so soil moisture is not completely exhausted before more water is applied.

Wheel and Hand Lines

Application rates can be increased on some systems by increasing nozzle size or nozzle flow rating if the pump and piping components have sufficient capacity and runoff/erosion is not an issue.

Plant Crops That Use Less Water

Alfalfa and hay crops use the most water (22 inches average in the Blackfoot drainage). Pasture uses slightly less (18 inches) and small grains or other annual crops use the least (15 inches).

Practice Irrigation Scheduling

Keep track of your irrigation and compare it with crop water use to maintain good soil moisture levels. Observe your soil moisture at the season start and during the main irrigation period. Apply the right amount of water at the right time for maximum crop yield especially during June when you get the biggest bang for your buck. Know your critical crop water periods and concentrate your efforts then.

Improve Irrigation System Performance

Irrigation is most effective when the system works properly. Know how much your system applies per irrigation. Check for proper operating pressures and flow rates from pumps and sprinklers. Adjust the application rate if necessary by changing pumping pressure and nozzle sizes/flow rates. Improve irrigation uniformity by keeping nozzles clear, replacing work components, using flow control nozzles and pressure regulators, or by reducing sprinkler and lateral spacings.

Plan For a Lower Yield and Reduce Other Crop Inputs to Match

If irrigation water supplies are predicted to be low, then don't plan for a high yield crop. Choose a production target that is reasonable for the predicted water supply and adjust other crop inputs accordingly. Do not fertilize for a 100-bushel per acre grain crop if there will only be enough water to grow a 70-bushel per acre crop.

Be More Flexible With Changing Seasonal and Year-to-Year Conditions

It seems that each year, one part of the drainage has an extra storm with 2-3 inches of rainfall. If the timing is good this helps, if not it runs off too quickly or ruins harvest. Another important lesson from this program has been the dramatic difference between one year and the next. It seems increasingly

important for irrigators to pay attention to spring conditions and weather predictions. Whether this is the same old story or a product of climate change is unknown but we seem to be getting warmer and more variable conditions. In the past few years the active part of the growing season has started anywhere from late-April to mid-June. This is when there is enough sun and warm temperatures to stimulate the crops full growing potential. This variation in the peak growing season can hurt production unless growers can be equally flexible. In 2011 when cool, cloudy, rainy conditions persisted into June, those who cut on their regular schedule had a smaller crop. Those who waited an extra week or two saw dramatic increases in production due to that wait. By comparison, this year when warm, dry weather began in late April and persisted through June, those who irrigated early and took advantage of this period had much better crops than those who waited until their normal irrigation startup in late May or early June. The lesson is to look ahead and be more flexible.

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 2015 GROWING SEASON WEEKLY RAINFALL & CROP WATER USE (INCHES OF WATER)

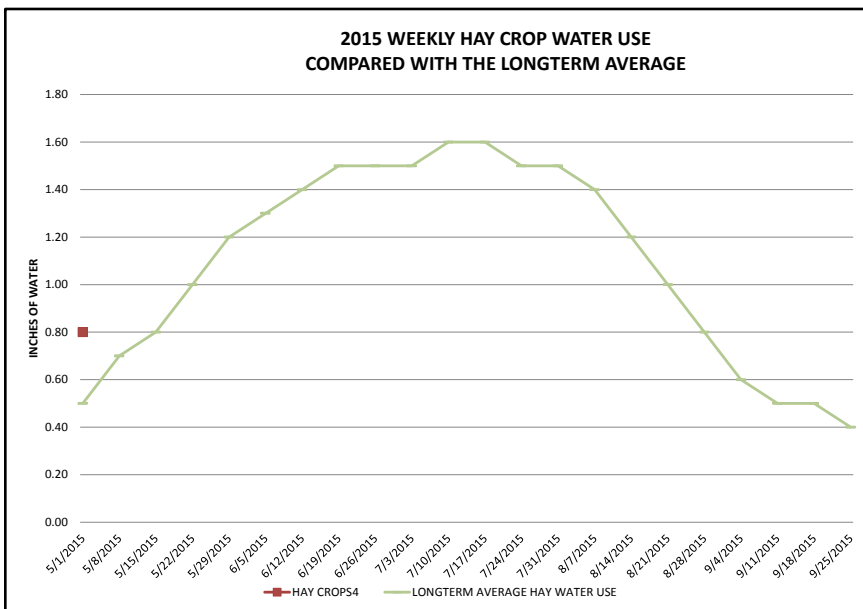
	RAIN ¹	2015 WEEKLY POTENTIAL CROP WATER USE ²						AVERAGE POTENTIAL CROP WATER USE ³		
	RAIN	HAY CROPS ⁴	PASTURE	SPRING GRAINS 5-15 START	SPRING GRAINS 5-30 START	WINTER WHEAT	LAWNS	LONGTERM AVERAGE HAY WATER USE	HOT WEEK HAY WATER USE	COOL WEEK HAY WATER USE
April	0.50	1.70	1.50	0.00	0.00	1.70	1.80	0.50	0.80	0.20
5/1/2015	0.01	0.80	0.70	0.00	0.00	0.80	0.80	0.50	0.80	0.20
5/8/2015								0.70	0.90	0.30
5/15/2015								0.80	1.00	0.50
5/22/2015								1.00	1.10	0.70
5/29/2015								1.20	1.20	0.80
6/5/2015								1.30	1.30	0.90
6/12/2015								1.40	1.50	1.00
6/19/2015								1.50	1.70	1.10
6/26/2015								1.50	1.90	1.10
7/3/2015								1.50	2.00	1.20
7/10/2015								1.60	2.10	1.30
7/17/2015								1.60	2.00	1.20
7/24/2015								1.50	1.90	1.10
7/31/2015								1.50	2.20	1.10
8/7/2015								1.40	1.70	1.00
8/14/2015								1.20	1.50	0.90
8/21/2015								1.00	1.30	0.70
8/28/2015								0.80	1.00	0.50
9/4/2015								0.60	0.80	0.40
9/11/2015								0.50	0.70	0.30
9/18/2015								0.50	0.70	0.30
9/25/2015								0.40	0.60	0.20
9/30/2015								0.40	0.60	0.20
TOTAL	0.51	2.50	2.20	0.00	0.00	2.50	2.60	24.90	31.30	17.20

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 across the drainage.

³ Average water use for each crop each week based on long-term 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.



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.