BLACKFOOT CHALLENGE IRRIGATION SCHEDULING PROGRAM

ANNUAL REPORT 2017

Barry Dutton PSS

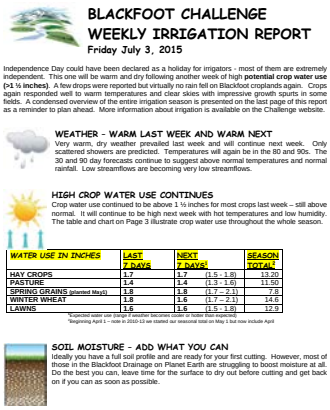
PROGRAM SUMMARY

For the past 8 years the Blackfoot Challenge Irrigation Scheduling Program has provided information to help irrigators apply the right amount of water at the right time to meet crop goals. We work with individual irrigators to monitor weather, crops, irrigation and soil moisture across the drainage. Weekly reports give participants detailed information specific to their fields while a more general report is circulated basin-wide to other irrigators and water managers. Both reports include irrigation tips, drought strategies, soil and crop management options and other information focused on water use and conservation. Reports are also provided on the Challenge website. Our work has identified an overall irrigation strategy that can provide both good crop production and adequate late-season stream flows during dry years.

PROGRAM COMPONENTS

Information is distributed to over 100 irrigators, water managers and interested parties throughout the drainage including:

- Weekly reports summarizing weather, crop water use, soil moisture conditions, crop management, drought strategies, and a calendar of recommendations for the entire season,
- Annual reports summarizing irrigation, drought and trends,
- The Blackfoot Challenge Web site which posts our weekly reports and irrigation guide specific to the Blackfoot drainage.



BLACKFOOT CHALLENGE
WEEKLY IRRIGATION REPORT
Friday July 3, 2015

Independence Day could have been declared as a holiday for irrigators - most of them are extremely independent. This one will be warm and dry following another week of high **potential crop water use (>1 ½ inches)**. A few drops were reported but virtually no rain fell on Blackfoot croplands again. Crops again responded well to warm temperatures and clear skies with impressive growth spurts in some fields. A condensed overview of the entire irrigation season is presented on the last page of this report as a reminder to plan ahead. More information about irrigation is available on the Challenge website.

WEATHER - WARM LAST WEEK AND WARM NEXT
Very warm, dry weather prevailed last week and will continue next week. Only scattered showers are predicted. Temperatures will again be in the 80 and 90s. The 30 and 90 day forecasts continue to suggest above normal temperatures and normal rainfall. Low streamflows are becoming very low streamflows.

HIGH CROP WATER USE CONTINUES
Crop water use continued to be above 1 ½ inches for most crops last week – still above normal. It will continue to be high next week with hot temperatures and low humidity. The table and chart on Page 3 illustrate crop water use throughout the whole season.

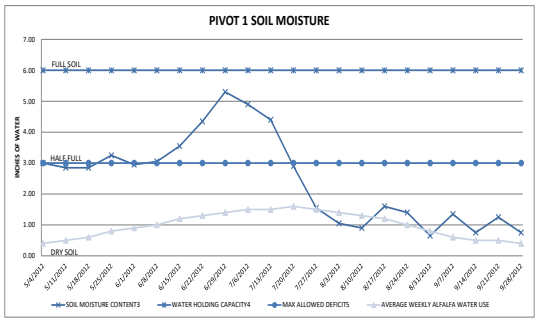
WATER USE IN INCHES	LAST 7 DAYS	NEXT 7 DAYS[1]		SEASON TOTAL[2]
HAY CROPS	1.7	1.7	(1.5 - 1.8)	13.20
PASTURE	1.4	1.4	(1.3 - 1.6)	11.50
SPRING GRAINS (planted May1)	1.8	1.8	(1.7 – 2.1)	7.8
WINTER WHEAT	1.8	1.6	(1.7 – 2.1)	14.6
LAWNS	1.6	1.6	(1.5 - 1.8)	12.9

[1]Expected water use (average if weather becomes similar as hotter than expected)
[2]Beginning April 1 – note in 2010-13 we started our seasonal total on May 1 but now include April

SOIL MOISTURE - ADD WHAT YOU CAN
Ideally you have a full soil profile and are ready for your first cutting. However, most of those in the Blackfoot Drainage on Planet Earth are struggling to boost moisture at all. Do the best you can, leave time for the surface to dry out before cutting and get back on if you can as soon as possible.

More detailed information is provided to individual irrigator including:

- Soil evaluations for texture and moisture holding capacity
- Soil moisture monitoring throughout the growing season
- Application and uniformity evaluations for each system
- Training in soil moisture evaluation
- Customized weekly reports with timely irrigation information, moisture chart and management options
- An annual report summarizing the season and future options



2017 PROGRAM HIGHLIGHTS

- 4-7 inches of rain fell on Blackfoot croplands during the 2017 growing season (average = 6-8 inches).
- Early season soil moisture was the best in many years.
- No rain fell from July 1 to September 15.
- 2017 potential crop water use in inches: hay = 29, pasture = 25, grains = 14-17 (all way above average)
- 2017 Alfalfa potential crop water use reported from the Deer Lodge Agrimet weather station was 30.5 inches, up significantly from 21.6 inches when the station was installed in 1999.

- No over-irrigation was observed among irrigation participants – all applied less than the potential crop water use.
- 2017 was the 4th drought year out of the last 6.
- 2017 was the 6th year with above average crop water use since the program began 8 years ago.
- 2017 river flows again approached the lowest levels ever recorded triggering drought response plans.
- Despite the late-season drought, those who irrigated with enthusiasm early in the season had good yields from first cuttings and most reduced irrigation withdrawals when river flows became low.
- This season will be remembered for smoke from forest fires near Seeley Lake, Lolo Peak, Lincoln, Arlee and across the rest of the western US and Canada.
- Soil temperatures started out in the 40s F in April and peaked in the 60s and 70s in late July. Soil temps did not decrease with increased elevation but varied more by soil type and area.

2017 WEATHER

2017 was another strange year for weather and climate trends. It started out with above normal snowpack and streamflow. Significant rain events occurred in the early growing season dropping about 1 ½ inches in April, 1 ¼ inches in May and over 1 ½ inches in June. Only ¼ inch fell in the last half of June and none from July 1 to mid-September. After mid-June, temperatures were above normal, humidity was very low and there was no rain. As a result, the overall irrigation season was similar to 2016, 2015 and 2013 which were also drier than average. Total growing season rainfall in 2017 was below average for local croplands. Temperatures fell below average during the rainy periods in April, May and June but otherwise were well above average.

The other significant feature of the weather in 2017 was forest fire smoke. Fires burned for most of the summer near Seeley Lake, Lincoln, Arlee, Missoula and also upwind in Idaho, Washington, Oregon and Canada. The satellite image at the right shows smoke across western Montana and Idaho on September 4 (black dot is Ovando). The final strange twist to the 2017 growing season was a sudden drop in temperatures mid-September accompanied by rain and snow. This put an abrupt end to the fire season and crop water use fell dramatically.

2017 CROP WATER USE

Crop water use in 2017 and 2015 were the highest since our program started in 2010. 2017 would have been even higher if not for significant storms in May and June. Crop water use for hay this year was 29 inches compared with an average of 25 over the past 8 years and a range of 21–29 inches. This year saw the highest weekly crop water use recorded in the Blackfoot (almost 2 inches per week in late July).

Figure 1 lists potential crop water use for all crops in 2017. Hay used 29 inches, pasture 25 inches and small grains 14-17 inches.

FIGURE 1. POTENTIAL CROP WATER USE THROUGHOUT THE 2017 IRRIGATION SEASON

BLACKFOOT 2017 GROWING SEASON WEEKLY RAINFALL & CROP WATER USE (INCHES OF WATER)

	RAIN[1]	2017 WEEKLY POTENTIAL CROP WATER USE[2]						AVERAGE POTENTIAL CROP WATER USE[3]		
	RAIN	HAY CROPS[4]	PASTURE	SPRING GRAINS 5-1 START	SPRING GRAINS 5-15 START	WINTER WHEAT	LAWNS	LONGTERM AVERAGE HAY WATER USE	HOT WEEK HAY WATER USE	COOL WEEK HAY WATER USE
APRIL	1.50	0.70	0.60	0.10	0.10	0.90	0.80	1.00	1.50	0.50
5/5/2017	0.02	0.50	0.40	0.10	0.10	0.50	0.50	0.50	0.80	0.20
5/12/2017	0.25	0.60	0.70	0.10	0.10	0.90	0.70	0.80	1.00	0.50
5/19/2017	1.00	0.50	0.60	0.10	0.10	0.60	0.50	1.00	1.10	0.60
5/26/2017	0.00	1.10	1.00	0.20	0.10	1.10	1.10	1.20	1.30	0.80
6/2/2017	0.25	1.40	1.30	0.60	0.20	1.50	1.40	1.30	1.40	0.90
6/9/2017	0.50	1.55	1.35	1.00	0.30	1.60	1.45	1.40	1.50	1.00
6/16/2017	1.50	1.00	0.90	1.20	0.60	1.20	1.00	1.50	1.70	1.00
6/23/2017	0.00	1.30	1.20	1.40	0.80	1.40	1.30	1.50	1.90	1.10
6/30/2017	0.25	1.70	1.60	1.80	1.20	1.80	1.70	1.50	2.00	1.20
7/7/2017	0.00	1.75	1.55	1.80	1.80	1.25	1.70	1.60	2.10	1.30
7/14/2017	0.00	1.80	1.60	1.90	1.90	1.00	1.75	1.60	2.00	1.20
7/21/2017	0.00	1.90	1.60	2.00	2.00	1.00	1.80	1.50	2.00	1.20
7/28/2017	0.00	1.90	1.60	2.00	2.00	0.50	1.80	1.50	2.20	1.10
8/4/2017	0.00	1.80	1.50	1.00	1.80	0.00	1.70	1.40	1.70	1.00
8/11/2017	0.00	1.60	1.20	0.00	0.50	0.00	1.40	1.20	1.50	0.90
8/18/2017	0.00	1.40	1.10	0.00	0.00	0.00	1.30	1.00	1.30	0.70
8/25/2017	0.00	1.30	1.00	0.00	0.00	0.00	1.20	0.80	1.00	0.50
9/1/2017	0.00	1.40	1.10	0.00	0.00	0.00	1.20	0.60	0.80	0.40
9/8/2017	0.00	1.40	1.20	0.00	0.00	0.00	1.30	0.60	0.70	0.30
9/15/2017	0.30	1.00	0.80	0.00	0.00	0.00	0.90	0.50	0.70	0.30
9/22/2017	0.30	0.60	0.40	0.00	0.00	0.00	0.50	0.40	0.60	0.20
9/29/2017	0.10	0.50	0.30	0.00	0.00	0.00	0.40	0.40	0.60	0.20
TOTAL	**5.97**	**28.70**	**24.60**	**15.30**	**13.60**	**15.25**	**27.40**	**24.80**	**31.40**	**17.10**

[1] Rainfall should be reduced to account for immediate evaporation from crop and soil surfaces (0.1-April,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] **Longterm average** water use for each crop each week based on long-term historic data.

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

The lower crop water use for small grains shows how putting a portion of your acreage into small grains can reduce your overall water use. Irrigation of small grains, especially winter wheat also can also end sooner which leaves water in the river during the critical low-flow period in August and September.

It is important to remember that these ***potential crop water use*** figures are for a dense, robust stand that is well-irrigated, well-fertilized and mostly disease/insect free. Crops not in such good condition use less water. Actual crop water use across the drainage varies dramatically due to water availability, fertilizer, stand quality, micro-climate, management style, and many other factors. Working with individual irrigators across the drainage allows us to re-calibrate regional crop water use information to the Blackfoot area. It also provides accurate information for these irrigators at specific fields throughout the season and a record of using water efficiently.

One of the most significant results of this program is that it continues to reveal that over-irrigation is not common among sprinkler irrigators. Most sprinkler irrigators in the drainage apply only 50-75% of the *potential* crop water use when you consider the entire irrigation season. However, if you just consider the period before cutting, many irrigators participating in this program apply 75-100% of the *potential* crop water demand. This suggests irrigators are smartly concentrating on their first cutting which is where the most production is and the biggest bang for the buck. They then may irrigate in a more relaxed manner to produce pasture, start a new crop or keep alfalfa happy. Many cease irrigating due to water availability, water rights, stream flows or other reasons (fishing?).

Crop yields this year were some of the best ever despite it being another drought year. This shows that it's all in the timing. 2017 had good initial moisture in April to start the season, then large rainstorms in April, May and June. Irrigation during the early season was very effective (more water went into the soil and less evaporated). Those who maintained good soil moisture through this period saw a great first cutting. Irrigation later in the season was much less effective and produced less crop since much more evaporated and crop use was higher.

You can't feel too bad when the hay won't all fit due to a great crop.

CROP WATER USE TRENDS

Crop water use was again above average for the 6th year in a row. You have to go back to cold, rainy 2011 to get a below average year. Figure 2 illustrates crop water use comparing recent warm and cool years with the average. When **all** of the last 6 years are above average, you have to ask if this trend will continue and if it confirms global warming. The black line in Figure 2 represents 2017. The two dips in May and June represent the large rain events. Without these rainy periods, crop water use would have been much higher for the year and broken the all-time record.

This trend of increasing crop water use is also reflected in the Deer Lodge Agrimet weather station data. Figure 3 illustrates annual hay water use since the station was installed in 1998. Crop water use for 2017 was 30% higher than in 1999 – the first full year of data. The last 6 years were all above average. This has serious implications for the future of local irrigation. Water rights adjudication and low flow restrictions on the Blackfoot river prevent future irrigation increases despite this apparent potential need for future adjustments. The only option for local irrigators will be to increase water use efficiency through irrigation management practices and crop selection. Drought management will likely be a routine instead of a rarity. NRCS irrigation guides suggest a similar increase in crop water use over the past 3 decades.

FIGURE 2. Weekly and Total Potential Crop Water for Hay (2017 = Black)

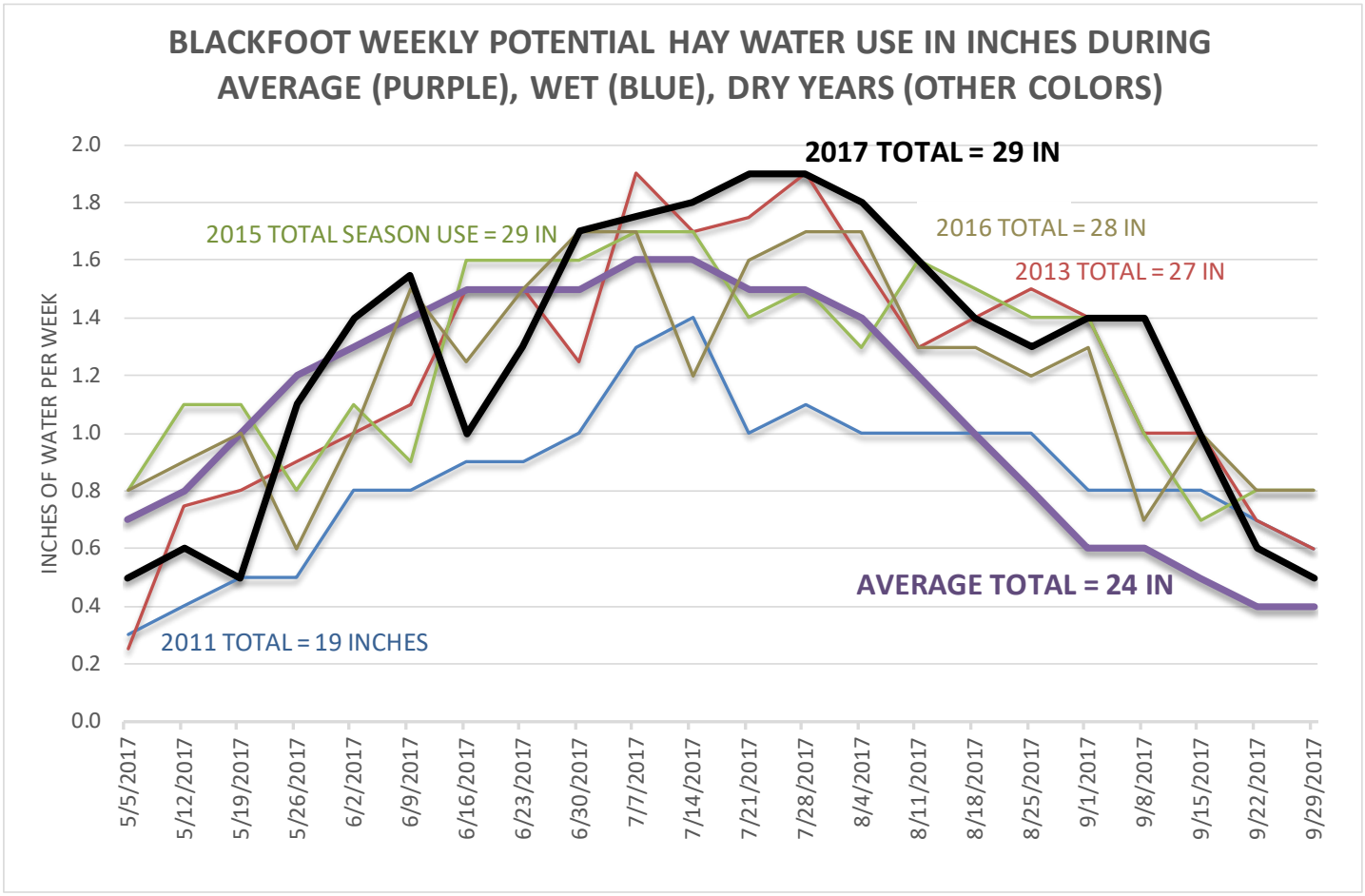
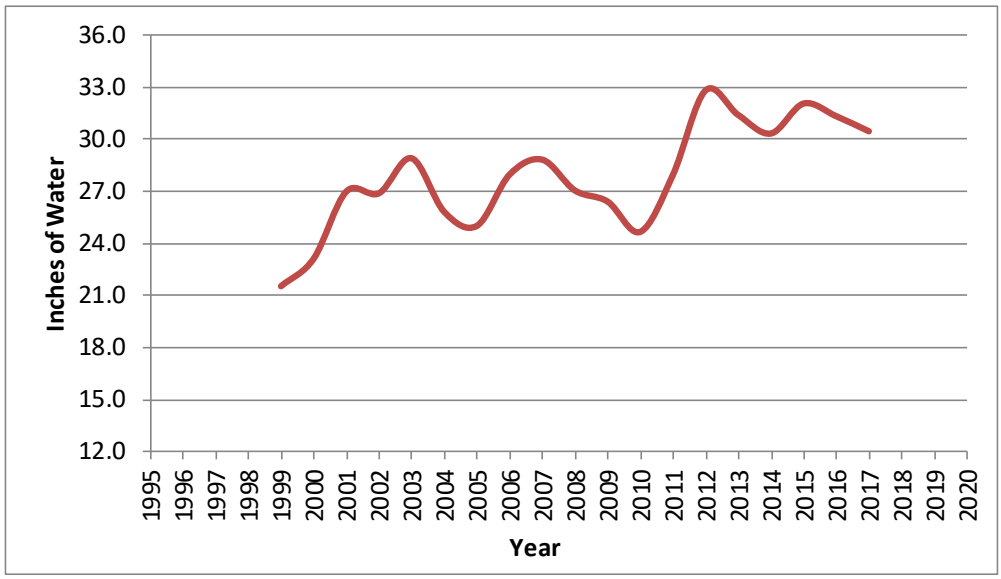


FIGURE 3. Annual Crop Water Use Trend for Hay from the Deer Lodge Agrimet Station



2017	30.5
2016	31.4
2015	32.1
2014	30.4
2013	31.4
2012	32.9
2011	28.0
2010	24.7
2009	26.4
2008	27.1
2007	28.9
2006	28.0
2005	25.0
2004	25.8
2003	28.9
2002	26.9
2001	27.0
2000	23.1
1999	21.6
AVERAGE	27.8

2017 SOIL MOISTURE

Early season soil moisture in 2017 was the best in years due to a good snowpack and spring rains. At the beginning of May most local root zones had soil moisture contents of ½ to ¾ their full water holding capacity. Cool, rainy periods in April, May and June helped irrigators keep soil moisture high due to lower than average crop water at these times. These high soil moisture contents translated into good crop yields. Soil moisture became much more difficult to maintain from late July into mid-September due to constant hot weather and no rain which made irrigations much less effective.

2017 IRRIGATION TIPS

Irrigation tips were provided each week according to crop stage, weather conditions and other factors. This year's tips concentrated on application rates, uniformity, above average crop water use due to warmer weather and critical crop watering periods. We emphasized early season water applications to promote growth and fill up soil root zones before stream flows dropped. Tips were expanded this year to include soil health concerns and to respond to irrigator questions.

2017 DROUGHT INFORMATION AND STRATEGIES

This year we started out with great soil moisture, snowpack and spring weather. We did not expect to talk much about drought for a change. However, things changed fast when all rain stopped on July 1 and didn't return until mid-September. This year illustrated how warmer-than-average temperatures and no rain can quickly turn a great early season into another drought year for river flows in August and September. Drought management plans were implemented and FWP made call on junior water rights. Observations throughout the drainage suggested that most irrigators again responded to low streamflow by cutting back on irrigation withdrawals during the critical low flow period in August and September. Drought strategies include irrigating earlier in the season, growing crops that use less water, keeping soil water holding capacities full and others.

2017 SOIL TEMPERATURE MEASUREMENTS

After years of trying to interpret weather and climate differences across the Blackfoot drainage, I decided to conduct a soil temperature survey this irrigation season. I measured soil temperatures at 2, 4 and 8 inches depth on or about the 1st and 15th of each month from April 15 to October 1. Temperature was measured using a *Thermoworks TempTest 1* thermometer with recent calibration certificate. The sites were irrigated fields near Potomac, Clearwater, Kleinschmidt, Highway 141 and Helmville. Figure 4 illustrates soil temperatures at 2 and 8 inches as averages for the entire drainage. Figure 5 illustrates 2-inch soil temperatures at all 9 sites across the drainage and also lists all temperature readings collected this year.

Here are a few observations about these measurements:

- Soil temperatures started out in the 40s in April and peaked in the 60s and 70s in August.
- Figure 4 shows that up until August, soil temperatures at 2 inches were higher than those at 8 inches then the pattern reversed for the rest of the season.
- Figure 5 shows that soil temperatures were as much as 20 degrees warmer on some sites than others (sandy, rocky soils).
- Applying 1 inch of water with a pivot immediately lowered soil temperature 1-3 degrees.

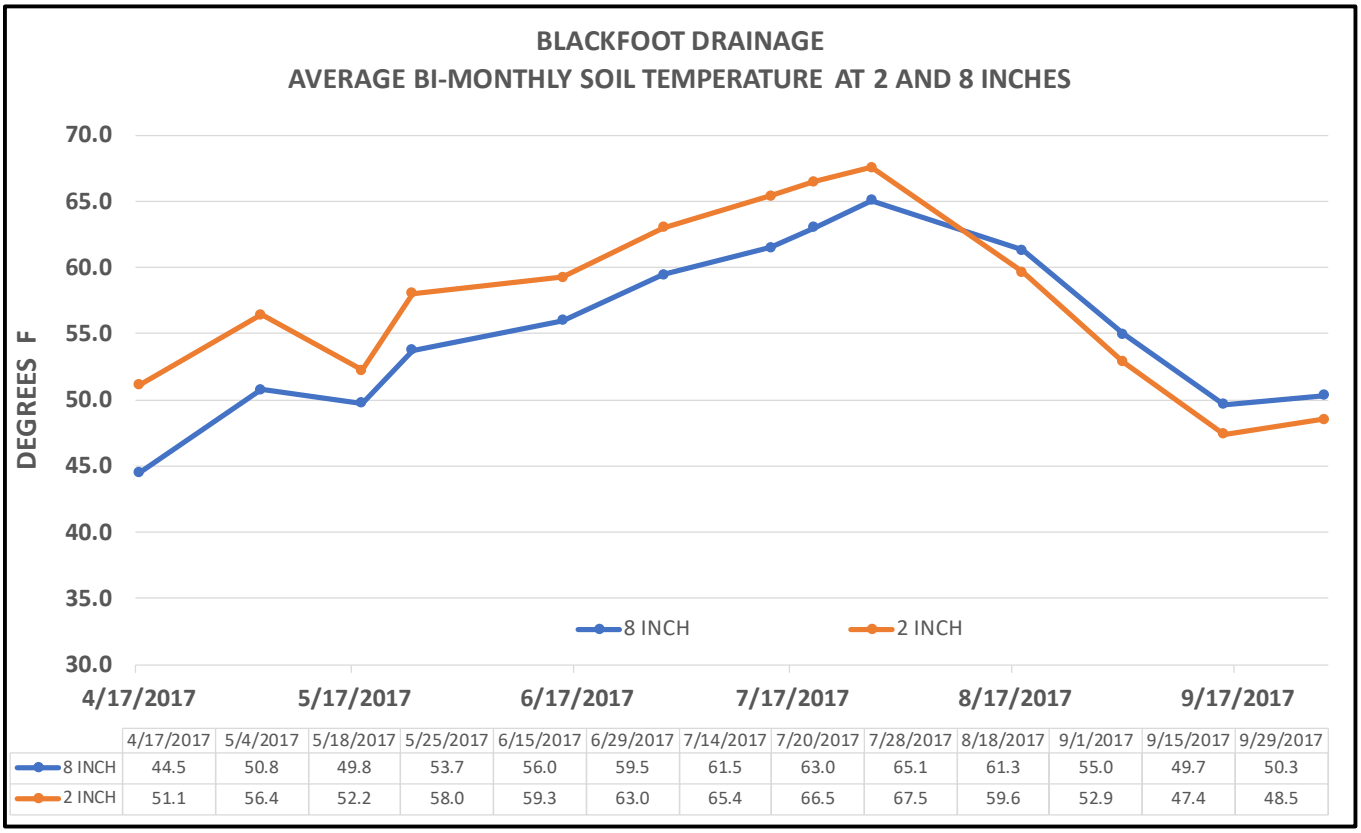
- Figure 4 shows that surface soil temperatures in the Blackfoot drainage are warm enough (>65F) to include warm season crop species in cover crop, hay and pasture mixes.

- Figure 5 shows that elevations ranged from 3700 feet near Potomac to 4445 feet near Helmville (745 feet difference). There was not the expected decrease in soil temperature with increasing elevation. Elevation had less effect than soil type, landscape position or geographic area. Potomac had the lowest elevation **and** coolest soil temperatures. It is a cold air sink and also has a cool, shallow groundwater table under the entire lower valley area. Soil temperature is more likely related to the overall size of each sub-drainage, the amount of cold air drainage above, the amount of south aspects nearby and other factors.

- Soil type had more of an effect on temperature than location or elevation with sandy and rocky soils usually 5-10 degrees warmer than silty and clayey soils. Sandy and rocky soils hold less water which has a very high specific heat and takes a lot of solar radiation to warm.

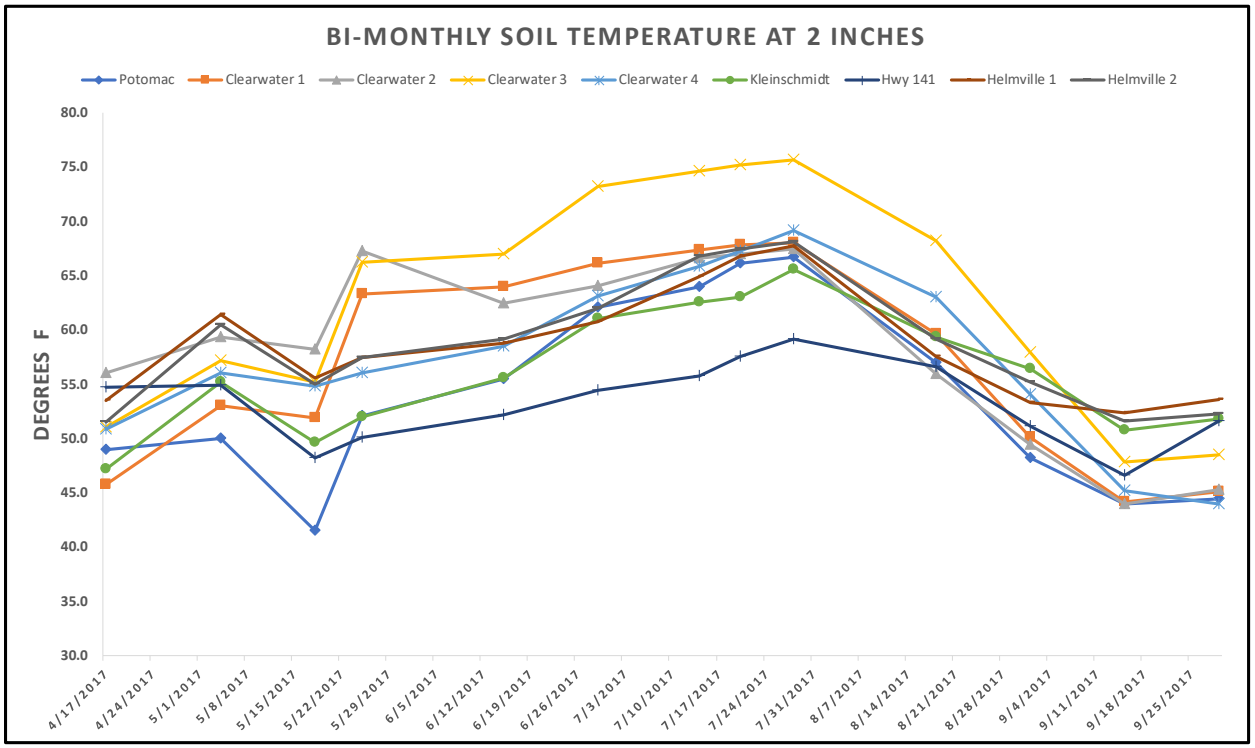
- Landscape position had more of an effect on temperature than elevation with sites on the valley bottoms (floodplain and first terrace) usually 1-3 degrees cooler than hillside or upper terrace levels.

FIGURE 4. 2017 Blackfoot Drainage Average Soil Temperatures at 2 and 8 inches.



	4/17/2017	5/4/2017	5/18/2017	5/25/2017	6/15/2017	6/29/2017	7/14/2017	7/20/2017	7/28/2017	8/18/2017	9/1/2017	9/15/2017	9/29/2017
8 INCH	44.5	50.8	49.8	53.7	56.0	59.5	61.5	63.0	65.1	61.3	55.0	49.7	50.3
2 INCH	51.1	56.4	52.2	58.0	59.3	63.0	65.4	66.5	67.5	59.6	52.9	47.4	48.5

FIGURE 5. 2017 Blackfoot Drainage Soil Temperatures



BLACKFOOT DRAINAGE CROPLAND SOIL TEMPERATURES 2017 - All Values are Degrees Fahrenheit																												
LOCATION	**POTOMAC 1**			**CLEARWATER 1**			**CLEARWATER 2**			**CLEARWATER 3**			**CLEARWATER 4**			**KLEINSCHMIDT**			**HWY 141 NORTH**			**HELMVILLE 1**			**HELMVILLE 2**		
ELEVATION	3700 FEET			3750 FEET			3835 FEET			3820 FEET			3840			4240			4330			4385			4445		
SOIL	LOAMY/ROCKY SOIL			SILTY/CLAYEY			SANDY/ROCKY			SANDY/ROCKY			LOAMY/SANDY			SANDY/ROCKY			SANDY/ROCKY			SILTY/CLAY			LOAMY/ROCKY		
	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN	2 IN	4 IN	8 IN
4/17/2017	49.0	45.0	43.0	45.8	43.7	43.5	56.1	48.4	43.7	51.1	47.5	45.3	50.9	47.7	44.2	47.2	44.0	41.7	54.7	53.0	44.6	53.5	47.5	43.4	51.5	47.2	43.1
5/4/2017	50.0	48.0	48.0	53.0	50.8	50.8	59.4	53.8	52.7	57.2	53.6	52.0	56.1	54.5	52.3	55.2	49.7	45.9	54.9	54.1	51.5	61.4	53.3	49.7	60.5	52.2	48.5
5/18/2017	41.5	42.0	43.0	51.9	50.0	48.9	58.2	52.7	52.0	55.2	52.1	51.7	54.8	53.1	51.5	49.6	47.7	47.1	48.2	48.9	50.2	55.6	53.7	52.5	55.0	53.1	50.0
5/25/2017	52.1	49.9	50.3	63.3	59.2	57.7	67.3	60.3	60.0	66.2	61.7	58.4	56.1	55.8	54.0	52.0	50.8	50.7	50.1	50.0	49.5	57.5	54.1	55.0	57.5	53.4	51.5
6/15/2017	55.5	53.1	54.0	64.0	62.0	57.8	62.5	61.0	57.9	67.0	65.0	63.0	58.5	59.1	55.4	55.6	55.5	55.8	52.2	51.3	50.7	58.8	57.3	56.8	59.2	57.0	55.7
6/29/2017	62.1	58.0	57.8	66.1	65.0	61.0	64.1	62.0	59.0	73.2	72.3	67.2	63.1	62.5	62.1	61.1	60.0	60.0	54.5	54.2	54.0	60.8	59.3	58.2	62.0	59.9	59.0
7/14/2017	64.0	61.1	59.0	67.4	66.0	62.1	66.6	64.9	63.8	74.6	73.8	68.5	65.9	63.6	63.0	62.6	62.0	62.0	55.8	55.2	54.9	64.9	62.8	60.0	66.8	63.5	62.4
7/20/2017	66.1	64.4	60.0	67.8	66.2	63.7	67.0	66.9	66.0	75.2	74.9	69.9	67.3	64.0	63.6	63.0	63.8	63.8	57.6	57.2	56.1	66.8	64.6	62.0	67.5	66.0	64.1
7/28/2017	66.7	66.0	65.2	68.0	67.7	65.3	67.5	67.2	67.0	75.7	75.4	70.6	69.2	66.9	65.1	65.6	64.3	64.0	59.2	59.0	58.8	67.7	67.0	66.2	68.1	67.3	66.7
8/18/2017	57.0	58.9	60.2	59.6	60.3	63.2	56.0	57.6	58.0	68.2	69.3	70.2	63.0	62.7	63.7	59.4	59.1	60.7	56.6	56.5	57.1	57.6	59.0	60.1	59.2	60.1	62.0
9/1/2017	48.2	50.1	51.8	50.1	51.3	54.8	49.5	51.0	53.5	57.9	58.2	60.4	54.1	55.2	56.0	56.4	56.8	57.0	51.2	51.7	53.0	53.3	54.3	55.0	55.2	56.4	57.1
9/15/2017	44.0	45.8	47.2	44.2	45.8	47.5	44.0	45.8	46.8	47.9	51.9	52.2	45.2	45.6	47.7	50.8	51.7	53.5	46.6	47.3	49.8	52.4	52.9	53.0	51.6	52.8	55.0
9/29/2017	44.5	46.4	48.9	45.1	46.9	49.1	45.3	47.0	49.8	48.5	52.0	53.0	44.0	46.0	49.0	51.8	52.0	53.1	51.6	49.0	50.1	53.6	53.5	53.9	52.3	53.2	54.9
Annual Average	***53.9***	***53.0***	***53.0***	***57.4***	***56.5***	***55.8***	***58.7***	***56.8***	***56.2***	***62.9***	***62.1***	***60.2***	***57.6***	***56.7***	***56.0***	***56.2***	***55.2***	***55.0***	***53.3***	***52.9***	***52.3***	***58.8***	***56.9***	***55.8***	***59.0***	***57.1***	***56.2***

A concern in the past was whether to *"fine-tune"* irrigation scheduling recommendations for each geographic area of the Blackfoot drainage. I decided over time that crop water use did not vary enough in a consistent manner to make multiple recommendations worth the effort. It seemed that management, soils, landscape position and other factors had greater influence on crop water use. These soil temperature measurements seem to support providing a single crop water use estimate for the entire drainage. We will continue to point out each week those crop, soil, elevation, geographic or other factors that affect this average water use estimate. Yes, we all recognize that things are different *just down the road* or *over the hill* or *up the valley* but next week they will get less rain instead of more and next year it will be different still. I suggest folks use our weekly crop water use estimates as a guide and fine-tune their own irrigation based on the nature and management of their individual fields.

SOIL HEALTH

Soil health interest continues to increase especially as it relates to irrigation, fertility and animal nutrition. Soil temperatures this year suggest that cover crops in the Blackfoot drainage can include warm-season plants that need about 65 degrees to plant. The Lake County NRCS office has coordinated and reported on a series of great trials to evaluate alternative cover crops, legume inter-seedings and planting choices for hay and pasture use. We will continue keep Blackfoot irrigators informed about field days and results from these trials. Thanks Lake County NRCS for your excellent work and willingness to share. Thanks to Foust Farms for their hospitality and experiments with corn, collards, radishes, turnips, sunflower, millet and others new crop choices.

We invite everyone interested in Soil Health to join the Soil Health listserv and receive announcements about this important topic. Anyone who wants to sign up can email (jennifer@blackfootchallenge.org) or Brad (brad@ blackfootchallenge.org).

A BEST-MANAGEMENT STRATEGY FOR BLACKFOOT IRRIGATORS?

This program was designed to help individual irrigators which in turn might help water management across the entire drainage. We have combined experience from the best local irrigators with our own knowledge and with results from monitoring to fine-tune recommendations. We have spread this wealth of information as Irrigation Tips in our weekly reports and irrigation guide. This strategy is condensed into our irrigation calendar (page 8). Our work in 2017 continues to confirm the validity and value of this strategy.

Our individual recommendations have come together in an overall strategy for irrigation that can ***provide both good crop production and late-season stream flows*** for fish and recreationists. This might be considered a best management practice for irrigation in the Blackfoot drainage and a landscape-scale solution for water resources. The main points of this practice are:

- early evaluation of the coming irrigation season in April,
- heavy irrigation early in the season to fill up the soil water holding capacity,
- heavy irrigation throughout June and up to cutting in early-mid July
- reduced irrigation or no irrigation during low water flows in late July and August

Despite the very dry year, irrigators who applied water early and kept pouring it on up until haying in mid-July had excellent crops. This same thing happened in 2013, 2015 and 2016 when warm temperatures gave us an extra month of very active growing season on the front end (April-May).

Irrigators who recognized the early year took advantage of it and had some of the best crops ever, then felt good about reducing irrigation during the low flow period.

There is little doubt that the future will only get more challenging for Blackfoot irrigators. However, with this challenge will likely come opportunities to influence critical water decisions and participate in future water markets from here to the Pacific Ocean. All while living and irrigating in a great place!

SOME VIEWS OF 2017

Smoky Skies Dominated the Summer.

¼ To ½ Inch Of Water Can Evaporate From Crop Leaves

New Planting of Meadow Brome and 3 Other Grasses

A Good Sign of a Healthy Soil

A Full Hay Shed, a Great View, Happy Cows

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, evaluate spring soil moisture and weather to determine start date.
- Evaluate season weather 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.