

BLACKFOOT CHALLENGE

WEEKLY IRRIGATION REPORT

Friday August 25, 2023



Blackfoot watershed croplands had a little rain this week and much cooler temperatures. Next week will start sunny and hot then turn cooler with a mix of showers and sun. **Crop water use was about 1¼ inches last week for most crops and will be 1 to 1¼ inches next week.** Blackfoot River flows were below the drought trigger level of **600 CFS** this week and will likely be again next week with additional drought actions implemented (page 4). **Please think about what you can do to balance crop and livestock needs with fish and boating concerns.** Send us your ideas or questions about anything you want to hear about related to irrigation, soil health, water quality, or other subjects. We will respond and share them with everyone.

WEATHER - WARM AND SUNNY THEN SHOWERS

Most local croplands had about ½ inch of rain this week with a mix of sun, clouds and smoke. Rain reports ranged from ¼ to 1 inch. Temperatures were cooler, mostly in the 70s and 80s. The forecast next week starts with sunny skies and hot temperatures then turns cooler with showers and rain. Highs will begin in the high 80s then drop to the 70s. Lows will be in the 40s and 50s. The 30-day day forecast says above average rainfall and temperatures. The 90-day forecast says average rainfall and above average temperatures.



Your own rain gauge is always your best source of rainfall information!

CROP WATER USE - MODERATE LAST WEEK AND LOWER NEXT

Crop water use dropped this week with rain, humidity, and cooler temperatures to under 1½ inches for all crops. Next week most crops will use less water (1 to 1¼ inches) due to much cooler and wetter weather. Crop water use peaked for the season last month (well above average). The actual amount of water used by crops across the watershed has dropped due to the harvest of most small grains which require no further irrigation, the harvest of hay where no further irrigation is planned or available and due to the lower water use inherent to pastures.

| WATER USE IN INCHES | LAST 7 DAYS | NEXT 7 DAYS TOTAL¹ | NEXT 7 DAYS DAILY AVE² | SEASON TOTAL³ |
|--------------------------------|------------------------|--|--|-------------------------------------|
| HAY CROPS | 1.3 | 1.2 | .17 | 20.5 |
| PASTURE | 1.1 | 1.0 | .16 | 17.5 |
| SPRING GRAINS | 1.2 | 0.8 | .11 | 19.4 |
| WINTER WHEAT | 0.0 | 0.0 | .00 | 18.0 |
| LAWNS | 1.3 | 1.2 | .17 | 20.0 |

¹Expected water use over the next week (range if weather becomes cooler or hotter than expected)

²Expected average daily water use over the next week (compare this with your soil moisture content)

³Beginning April 1 – note in 2010-13 we started our seasonal total on May 1 but since include April

The table on Page 1 provides a quick summary of crop water use this last week and an estimate for next week. The table and chart below summarize the entire irrigation season and compare it with average, hot and cool conditions so you can plan ahead. This table and chart will be updated weekly all season.

BLACKFOOT 2023 GROWING SEASON WEEKLY RAINFALL & CROP WATER USE (INCHES OF WATER)

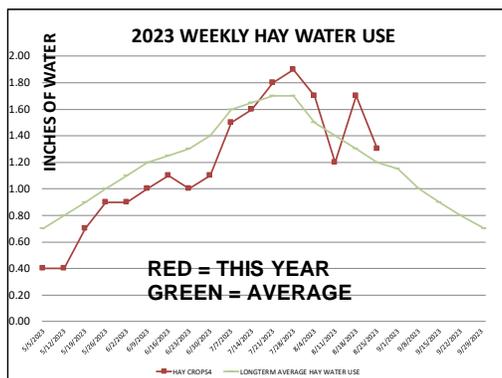
| WEEK ENDING | RAIN ¹ | 2023 WEEKLY POTENTIAL CROP WATER USE ² | | | | | | AVERAGE WEEKLY CROP WATER USE ³ | | |
|--------------|-------------------|---|--------------|-------------------------|--------------------------|--------------|--------------|--|------------------------|-------------------------|
| | 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 | 0.25 | 0.25 | 0.25 | 0.00 | 0.00 | 0.25 | 0.25 | | | |
| 5/5/2023 | 0.10 | 0.40 | 0.40 | 0.00 | 0.00 | 0.50 | 0.40 | 0.70 | 1.00 | 0.40 |
| 5/12/2023 | 1.50 | 0.40 | 0.50 | 0.20 | 0.00 | 0.60 | 0.50 | 0.80 | 1.10 | 0.60 |
| 5/19/2023 | 0.25 | 0.70 | 0.70 | 0.30 | 0.00 | 0.80 | 0.80 | 0.90 | 1.20 | 0.70 |
| 5/26/2023 | 0.75 | 0.90 | 0.80 | 0.50 | 0.30 | 1.00 | 1.00 | 1.00 | 1.30 | 0.70 |
| 6/2/2023 | 0.25 | 0.90 | 0.80 | 0.60 | 0.40 | 1.00 | 0.90 | 1.10 | 1.50 | 0.80 |
| 6/9/2023 | 0.25 | 1.00 | 0.90 | 0.80 | 0.60 | 1.10 | 1.00 | 1.20 | 1.70 | 0.80 |
| 6/16/2023 | 0.40 | 1.10 | 0.90 | 1.00 | 0.80 | 1.20 | 1.00 | 1.25 | 1.90 | 0.90 |
| 6/23/2023 | 0.25 | 1.00 | 0.80 | 1.00 | 0.90 | 1.10 | 0.90 | 1.30 | 2.00 | 1.00 |
| 6/30/2023 | 0.40 | 1.10 | 0.90 | 1.20 | 1.10 | 1.20 | 1.00 | 1.40 | 2.00 | 1.00 |
| 7/7/2023 | 0.01 | 1.50 | 1.20 | 1.70 | 1.60 | 1.70 | 1.40 | 1.60 | 2.10 | 1.10 |
| 7/14/2023 | 0.01 | 1.60 | 1.30 | 1.70 | 1.60 | 1.70 | 1.50 | 1.65 | 2.20 | 1.10 |
| 7/21/2023 | 0.01 | 1.80 | 1.50 | 2.00 | 2.00 | 1.80 | 1.70 | 1.70 | 2.20 | 1.10 |
| 7/28/2023 | 0.01 | 1.90 | 1.60 | 2.20 | 2.20 | 2.00 | 1.80 | 1.70 | 2.20 | 1.10 |
| 8/4/2023 | 0.10 | 1.70 | 1.50 | 2.10 | 2.10 | 1.25 | 1.70 | 1.50 | 2.20 | 1.00 |
| 8/11/2023 | 1.00 | 1.20 | 0.90 | 1.40 | 1.40 | 0.50 | 1.10 | 1.40 | 2.20 | 1.00 |
| 8/18/2023 | 0.01 | 1.70 | 1.40 | 1.50 | 1.50 | 0.25 | 1.60 | 1.30 | 2.00 | 0.90 |
| 8/25/2023 | 0.50 | 1.30 | 1.10 | 1.20 | 1.20 | 0.00 | 1.30 | 1.20 | 1.80 | 0.90 |
| 9/1/2023 | | | | | | | | 1.15 | 1.60 | 0.70 |
| 9/8/2023 | | | | | | | | 1.00 | 1.40 | 0.60 |
| 9/15/2023 | | | | | | | | 0.90 | 1.40 | 0.50 |
| 9/22/2023 | | | | | | | | 0.80 | 1.20 | 0.50 |
| 9/30/2023 | | | | | | | | 0.70 | 1.00 | 0.40 |
| TOTAL | 5.80 | 20.45 | 17.45 | 19.40 | 17.70 | 17.95 | 19.85 | 26.25 | 37.20 | 17.80 |

¹ Average across watershed (50-80% gets to the crop depending on irrigation method, weather, evaporation from crop and soil surfaces)

² This years potential water use by healthy crops that are well-fertilized and irrigated, disease and insect-free. Varies across watershed.

³ Longterm average water use for each crop each week based on long-term historic data.

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



SOIL MOISTURE FALLS 1¼ INCHES LAST WEEK, LESS NEXT WEEK

Well-irrigated local croplands saw soil moisture levels fall ½ to 1½ inches last week depending on how much rain fell. Next week, soils will lose even less as crops use less water due to lower temperatures, higher humidity, and potential rain. Soils lose less moisture where crops are stressed by low water content and where crops are maturing (small grains) or where recently cut or grazed. As always, check your soil with sensors, probes or shovels to be sure you add enough water. You can reduce evaporation loss by increasing ground cover after haying so less of the soil surface is exposed to high temperatures.



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Soil near 100% of its water holding forms a ball when squeezed and leaves the hand moist. Water is visible on the surface of the soil and the hand as a dark stain or shiny surface.



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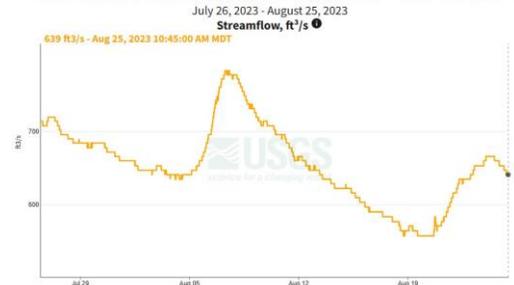
Soil near 50% of its water holding capacity may form a weak ball but leaves little moisture on the hand. Soil at 25% or less of its water holding capacity does not form a ball when squeezed. It feels and looks dry. If sandy or loamy, it crumbles easily, if high in clay it forms a hard lump. Call, text or email anytime if you have questions about evaluating your soil moisture content and irrigation options.

WEEKLY TIPS

STREAM FLOWS

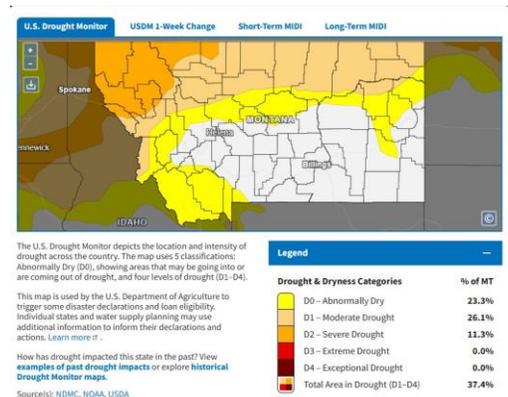
Stream flows throughout the watershed rebounded this week, before returning to a downward trend. Flow today at Bonner is **639 CFS** while the average for this date is 729 CFS. The highest flow was 1,630 CFS in 1899 and the lowest flow was 348 CFS in 1941. Flows are likely to drop back below the drought trigger level of 600 CFS this week. Flow peaked this year on May 7 at 10,400 CFS. Stream flows for the rest of the season are predicted to be below average.

Blackfoot River Near Bonner MT - 12340000



DROUGHT

This week the Drought Monitor again lists the lower Blackfoot watershed as in *Moderate Drought* while the remainder is *Abnormally Dry*. There has been little change to the map since last week. Blackfoot river stream flows have fluctuated around the 600 CFS trigger level and will likely drop below it again this week. Drought plan actions below 600 CFS are now in effect as listed on page 4. Please think about what you can do to balance crop and livestock needs with fish and boating concerns.



Drought Options - Things You Can Do Now

- Reduce Irrigated Acreage
- Rotate Irrigation Systems During Low River Flows
- Concentrate Your Efforts on the First Cutting and Then Rest
- Apply More Water During Each Application
- Shut off during peak afternoon heat when water just evaporates from crop leaves
- Irrigate at night and early morning when possible
- Stagger start times to alternate the area irrigated during peak afternoon heat
- Irrigate a smaller area well instead of a large area poorly for best yield
- Switch to pasture which uses less water compared with hayfields since animals constantly remove part of the crop (less crop leaves = less interception = less water use)
- Harvest your grain crop and cease irrigation until water is available again.
- Harvest your hay crop and cease irrigation - it will go dormant until you irrigate again or until next season. Irrigate once after cutting if you can, especially if you have alfalfa

DROUGHT PLAN ACTIONS WHEN FLOW FALLS BELOW 600 CFS

As flows at Bonner approach 600 cfs, the Committee will:

- Contact the roster of anglers and angling businesses to alert them of the potential need for angling restrictions if not already in place or of the need for additional angling restrictions.
- Implement outreach activities necessary to inform water users and the general public of drought conditions and the need for participation in the Drought Response.
- Re-confirm that junior water users are participating through response cards, email, personal communication and/or field checks, including notice to ALL juniors with an accepted drought plan that FWP is likely to make call if river conditions reach 500 cfs. If flows in the Blackfoot River at Bonner fall below 600 cfs and/or maximum daily water temperatures in the North Fork Blackfoot River below the falls and Monture Creek reach or exceed 65° F for three consecutive days:
 - MT FWP will issue partial (2:00 pm – midnight) or all day fishing restrictions on all critical bull trout streams. These may include Gold Creek, Belmont Creek, Cottonwood Creek, Monture Creek, North Fork Blackfoot River below the falls, Copper Creek, Landers Fork, and Morrell Creek.



As flows at Bonner approach 500 cfs, "all water users whose individual drought response involves a water trade in which there is less than a 1-to-1 exchange of senior water rights for junior water rights, that FWP will make call on their junior rights."

IRRIGATION INCREASES WORLDWIDE AS CLIMATE GETS HOTTER

70% of the water used in the world is used for irrigation on 840 million acres of cropland. The amount of water used is about 600 cubic miles or 2 billion gallons each year. This is equivalent to the flow from all the rivers on earth all year. With climate change these numbers are expected to increase as areas no longer get enough rain to sustain crops. Most of this increase will come from groundwater but groundwater resources are in serious decline worldwide. Many areas, including in the US, are “mining” groundwater left over from the melting of ice-age glaciers. These aquifers are not being recharged requiring deeper and deeper wells until the water is gone.

Area equipped for irrigation - global estimate

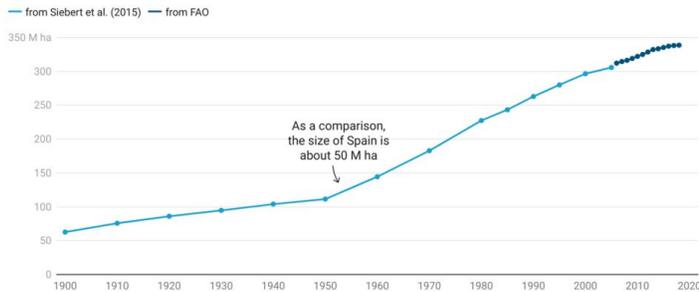


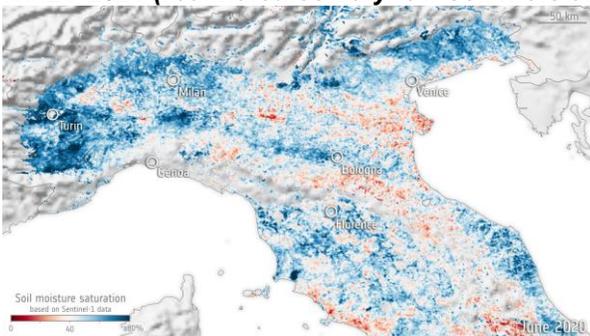
Chart: ESA • Source: McDermid, S., Nocco, M., Lawston-Parker, P. et al. (2023) • Created with Datawrapper



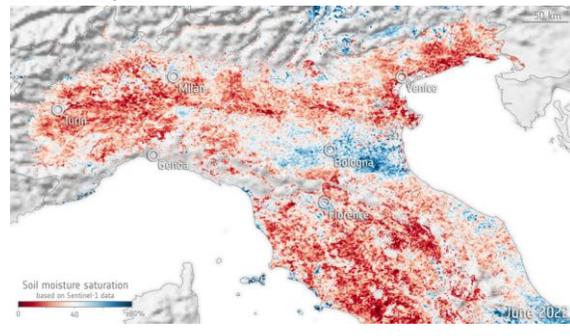
SATELLITES ARE USED TO EVALUATE DROUGHT WORLDWIDE

The same satellite techniques we use in the US to monitor drought are now used worldwide by scientists, planners, politicians and irrigators. If machines take over the world from humans, irrigators may be the first “victims” as pivots become controlled by computers linked to satellites. It will be interesting to see if SKYNET does a better job of irrigating or has a conscience to leave water in the river for other users.

ITALY 2021 (red indicates very low soil moisture)



ITALY 2022



For further information contact Clancy Jandreau, Blackfoot Challenge Water Steward, 406-304-5423 or Barry Dutton, Professional Soil Scientist, 406-240-7798 barry@landandwaterconsulting.net

THE BLACKFOOT WATERSHED IRRIGATION SEASON IN BRIEF

This is a summary of general activities and recommendations for the whole season (more detail in the irrigation guide).

APRIL – GET READY AND PLAN YOUR IRRIGATION STRATEGY!

- Get your irrigation system ready – perform maintenance and test system.
- Evaluate soil moisture conditions and weather predictions then plan for irrigation and 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 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. Small grains harvested for seed are usually irrigated up to the milk to soft dough stage but be sure soil moisture remains to prevent kernel shriveling. Small grains for forage are often harvested earlier when plants are less dry and seeds soft.

AUGUST- IRRIGATE ONCE AFTER CUTTING IF POSSIBLE AND 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 at a lower rate following hay cutting. Irrigate according to how much pasture you seek and with consideration for other water needs in the watershed, especially in drought years.
- Reduce river withdrawals by rotating systems and reducing the amount of irrigation at one time. **Stop irrigating if you can in drought years.**



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.
- Apply fall irrigations where appropriate after stream flows recover.