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For: Annual Joint North Dakota Water Convention, December 7, 2023
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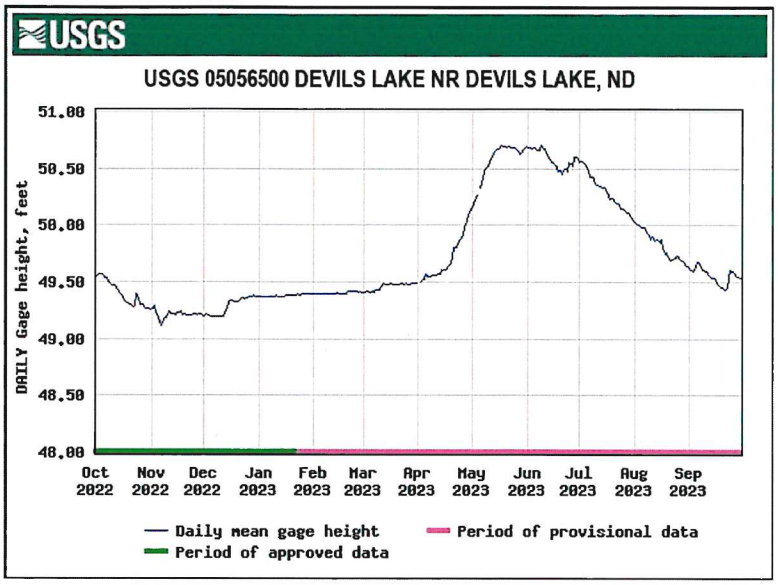
2023 Water Year Devils Lake Inflow—Coulees and Lakes Recap

- Despite a high snow-water equivalent (SWE) present in the Devils Lake Basin during the 2022-2023 winter, early snow cover protected an already dry soil from absorbing moisture and forming a deep frost layer, which allowed for infiltration of the eventual runoff. These conditions prevented substantial flooding and the observation of any Peaks of Record (POR) this spring (Akyüz, 2023; U.S. Geological Survey, 2023).
- Except for June, precipitation for the region remained well below average (National Weather Service Grand Forks, 2023a-e) and as a result inflows from the coulees receded throughout the summer. Five out of the six inflow coulees monitored by USGS streamgages receded to zero flow by the end of July and the sixth, Edmore Coulee Tributary near Webster (05056215), reached zero flow by mid-August. All the inflow coulees, except for Edmore Coulee Tributary, remained at zero flow for the remainder of the operational season (through Sept. 30), with Edmore Coulee Tributary rising above zero flow on September 24 and remaining above zero through September 30.
- On July 31, the gage height sensor at Little Coulee near Leeds (05056340) was buried during the replacement of the wooden bridge that spanned the coulee on 58th Ave NE with a corrugated culvert. The station was not able to be repaired until August 22, when a new bubbler gage height sensor was installed, as well as an outside staff plate for reference. As noted earlier, the temporary pause in gaging was during a period of zero flow at the station.
- USGS stations monitoring Morrison (05056222), Dry (05056241), Devils (05056500), and Stump (05056665) Lakes all recorded moderate rises from mid-April to a peak in mid-May and then declined throughout the summer from evaporation, pumping (North Dakota Department of Water Resources, 2023), and below normal precipitation (National Weather Service Grand Forks, 2023a-e).
    - Morrison Lake showed an increase of approximately 2.90 (feet) ft. from levels in March/April to the peak on May 10. Since May, the lake level has dropped and is currently at its lowest elevation since this time last year, by approximately 0.41 ft. Current lake level is available at: http://waterdata.usgs.gov/nwis/uv/?site_no=05056222.
    - Dry Lake rose approximately 1.42 ft. from its level in March to its peak on May 18. Since then, Dry Lake has declined 1.74 ft., just lower than at this time last year and still around 2.00 ft. higher than this time in 2021. Current lake level is available at: http://waterdata.usgs.gov/nwis/uv/?site_no=05056241.
    - Devils Lake level ranged from 49.2 ft. to 49.5 ft. between November 2022 and April 2023, rising by approximately 1.10 ft. beginning on April 14 and peaking on May 18, with a daily value peak of 50.71 ft. Since the daily peak on May 18, Devils Lake levels have dropped approximately 1.50 ft., with the current lake level at around 49.2 ft. Current lake level is available at: http://waterdata.usgs.gov/nwis/uv/?site_no=05056500 and the daily values hydrograph from the 2023 Water Year (WY, Oct 1, 2022-Sept 30, 2023) can be seen in the image below.

These data are preliminary or provisional and are subject to revision. They are being provided to meet the need for timely best science. The data have not received final approval by the U.S. Geological Survey (USGS) and are provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the data.



- USGS gage on Eastern Stump Lake recorded a rise of approximately 1.09 ft., March-June. With relatively dry conditions and the east-end outlet operating again this year, from June 6-September 15 (National Weather Service Grand Forks, 2023a-e; North Dakota Department of Water Resources, 2023), Stump Lake levels dropped approximately 1.36 ft. from the peak at the end of June to now. Lake level for Eastern Stump Lake is available at: http://waterdata.usgs.gov/nwis/uv/?site_no=05056665.
- Both east and west-end outlets were operated by the State this year. Pumping began out of the west-end outlet on May 16 and out of the east-end outlet on June 6. Pumping during the 2023 WY was fairly consistent and stable all year, continuing until September 15 for the east-end outlet and until October 24 for the west-end outlet (North Dakota Department of Water Resources, 2023). As a result of the east-end outlet operation, USGS streamgage on Tolna Coulee (05056678) recorded a maximum flow of 260 cubic feet per second (cfs) for several days in June. Flows dropped to zero twice during the period when the outlet was operational, once in mid-July and once in mid-August. Flows dropped back down to zero after September 15, when the east-end outlet was shut down for the season (North Dakota Department of Water Resources, 2023).

2023 Water Year Upper Sheyenne River Recap

- Station 05055300, Sheyenne River near Flora peaked from snow melt/runoff on April 20 this year. This peak was ice affected and the peak flow is therefore an estimate with a provisional value of 1,260 cfs. As was the case with the inflow coulees, below normal precipitation after April saw flows drop below 50 cfs by mid-June and remain there through late fall (North Dakota Department of Water Resources, 2023). The last streamflow measurement made on October 13, measured 5.82 cfs and there is little indication that flow has increased much since then (U.S. Geological Survey, 2023).
- Station 05055400, Sheyenne River near Bremen, located below the west end outlet experienced similar flows to Flora. Bremen's ice-affected peak of a provisional 1,320 cfs occurred shortly after Flora's, on April 22, and was caused by snowmelt runoff. After pumping on the west-end outlet began and June 6, Bremen flows were heavily influenced by pumping until the pumps were shut down on October 24 (North Dakota Department of Water Resources, 2023). The 2023 WY peak, however, was not caused by pumping.
- Station 05056000, Sheyenne River near Warwick peaked at a provisional 1,490 cfs at a stage of 6.12 ft. on April 25, 2023. Because of the weir control at this station, this peak was not ice affected.
- Station 05056770, Sheyenne River on County Road 20 near Kloten began operation March 1, 2021, and has now been in operation for almost three years. This gage is operated year -round, providing

real-time discharge during open-water. The provisional 2023 WY peak was 2,120 cfs at a stage of 39.84 ft on April 29 and was an open-water peak.

Data Retrieval Tools

- Data and tools are available at:
  - http://waterdata.usgs.gov/nwis - USGS Water Data for the Nation.
  - https://dashboard.waterdata.usgs.gov/app/nwd/en/?aoi=default – USGS National Water Dashboard, combines water data with weather conditions and different base map layers including topographical, satellite imagery and street view.
  - https://accounts.waterdata.usgs.gov/wateralert/ – USGS WaterAlert allows users to sign up for notifications for changes in water conditions at USGS streamgages.
  - https://streamstats.usgs.gov/ss/ - USGS StreamStats allows users to delineate the Basins and obtain basin characteristics.
  - https://pubs.usgs.gov/ - USGS Publications Warehouse includes all USGS Reports that have studied the Devils Lake Basin.

Akyüz, A., 2023, From the State Climatologist: North Dakota Quarterly Climate Bulletin, v. 17, no. 1, 14 p., accessed November 28, 2023, at https://www.ndsu.edu/fileadmin/ndsco/ndsco/bulletin/winter23.pdf.

National Weather Service Grand Forks, 2023a, Weather & Climate Review: May-June 2023, accessed November 28, 2023, at https://www.weather.gov/media/fgf/climate/2023_MayJun_ClimateNewsletter.pdf

National Weather Service Grand Forks, 2023b, Weather & Climate Review: June-July 2023, accessed November 28, 2023, at https://www.weather.gov/media/fgf/climate/2023_JunJul_ClimateNewsletter.pdf

National Weather Service Grand Forks, 2023c, Weather & Climate Review: July-August 2023, accessed November 28, 2023, at https://www.weather.gov/media/fgf/climate/2023_JulAug_ClimateNewsletter.pdf

National Weather Service Grand Forks, 2023d, Weather & Climate Review: August-September 2023, accessed November 28, 2023, at https://www.weather.gov/media/fgf/climate/2023_AugSep_ClimateNewsletter.pdf

National Weather Service Grand Forks, 2023e, Weather & Climate Review: September-October 2023, accessed November 28, 2023, at https://www.weather.gov/media/fgf/climate/2023_SepOct_ClimateNewsletter.pdf

North Dakota Department of Water Resources, 2023, Discharge monitoring reports, accessed November 28, 2023, at https://www.swc.nd.gov/basins/devils_lake/outlets/discharge_monitoring/.