

# Deep Creek Water Resource Management

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DIRECTOR, OPERATIONS  
MARCH 28, 2019

## One Team, Four Managers, 33 River Systems, 5 Reservoirs

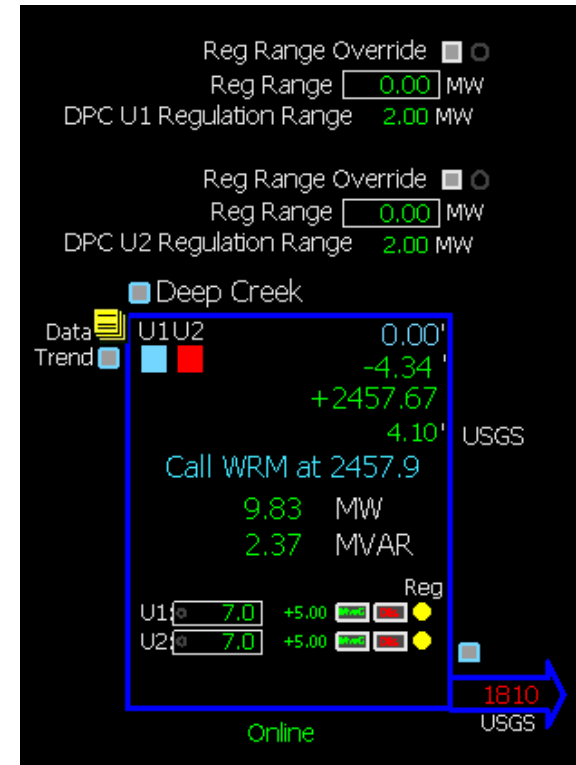
- 7-Day Coverage on all assets
- Extensive training and coordination
  - 41 years of combined experience
  - Training path is approximately 3-4 years

## One Team, Multiple Locations

- 24/7 Coverage of monitoring and operation
  - Remote control from NASCC
  - Local control, response, and maintenance
- Extensive communication and coordination
- Support team with highly integrated specialized functions
  - Employee Safety
  - Public Safety
  - Dam Safety
  - Compliance
  - Capital Projects
  - Stakeholder Relations

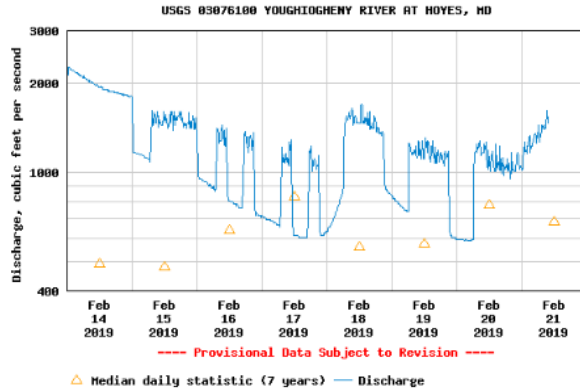
## Deep Creek – Daily Process

- Verify and update Outage Management System
  - Less than a .3% Forced Outage Rate over the last 6 years
    - This ensures units are available for WWR, TER, weather events, grid events
    - Outages are scheduled 1 Turbine in March and 1 turbine in November to avoid WWR, TER season.
- Verify current elevation and position the Rule Bands
- Local Report from Station on Rain Fall, Snowfall, and Elevation
- Gathering of Flow Information
  - USGS Cherry Creek (approximately 20 % of Watershed)
  - USGS Hoyes
  - USGS Oakland
  - USGS Friendsville
  - Perform Water Balance Calculation to retrieve actual Inflow and trend



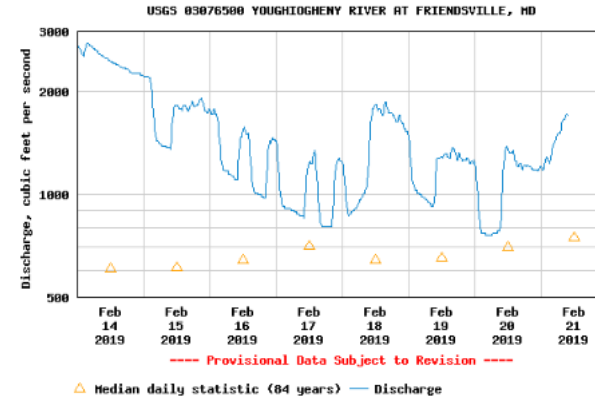
## Discharge, cubic feet per second

Most recent instantaneous value: 1470 02-21-2019 09:45 EST



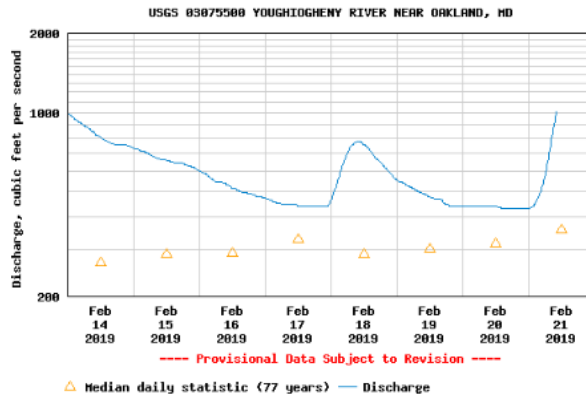
## Discharge, cubic feet per second

Most recent instantaneous value: 1810 02-21-2019 10:45 EST



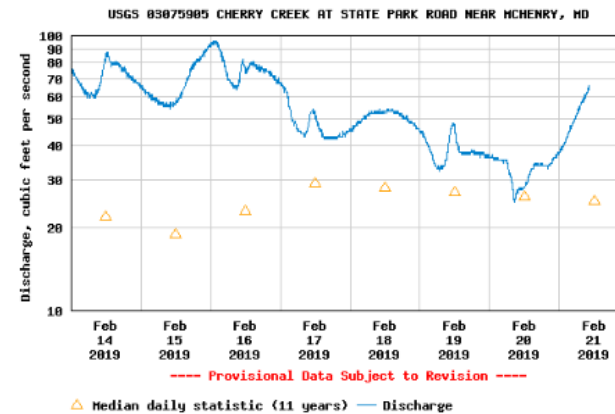
## Discharge, cubic feet per second

Most recent instantaneous value: 1010 02-21-2019 10:15 EST



## Discharge, cubic feet per second

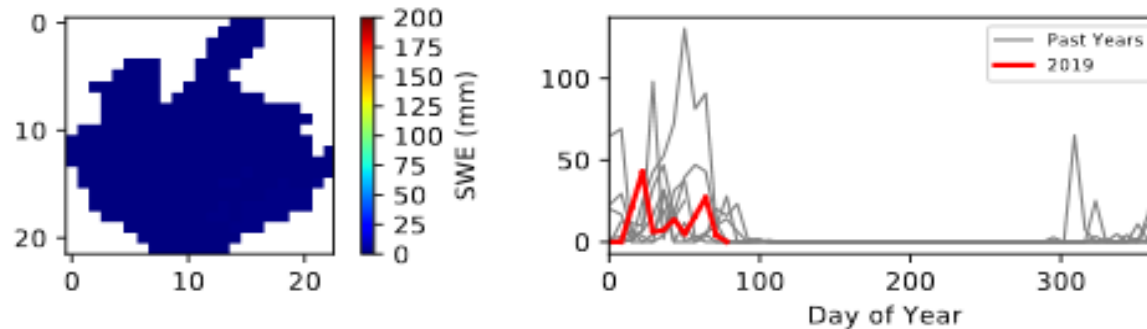
Most recent instantaneous value: 65.7 02-21-2019 10:15 EST



## SWE Report for Mar 19, 2019

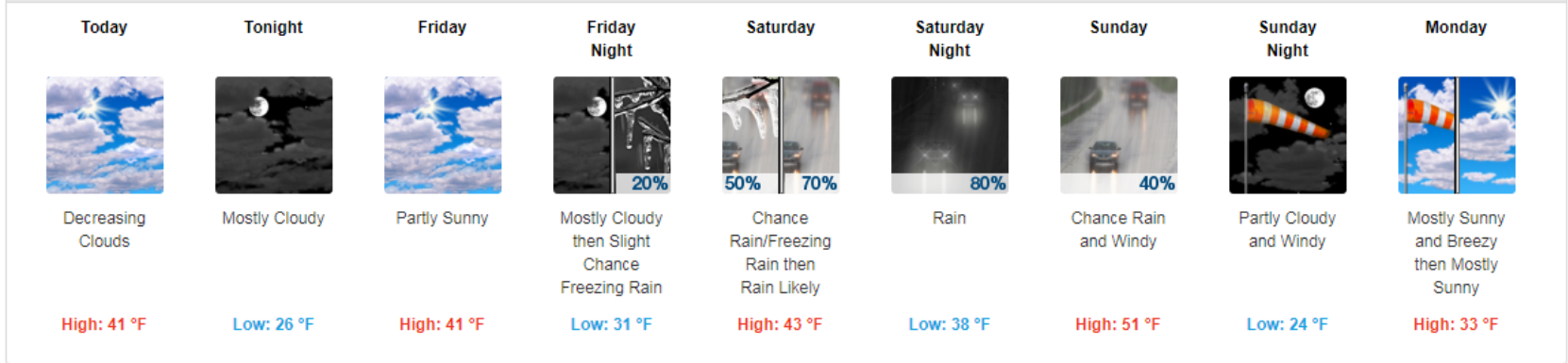
Snow water equivalent is calculated using the SNODAS database produced by the National Ocean and Atmospheric Administration (NOAA).

Deep Creek Mar 19, 2019 - SWE 0 mm (0.0 in)

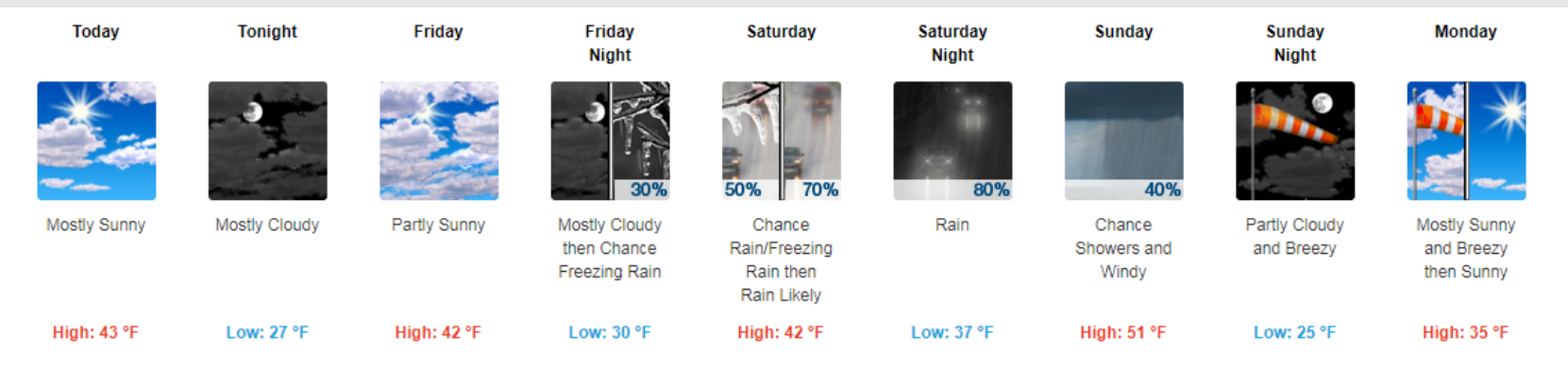


# Review Weather Forecast

## Extended Forecast for Mc Henry MD



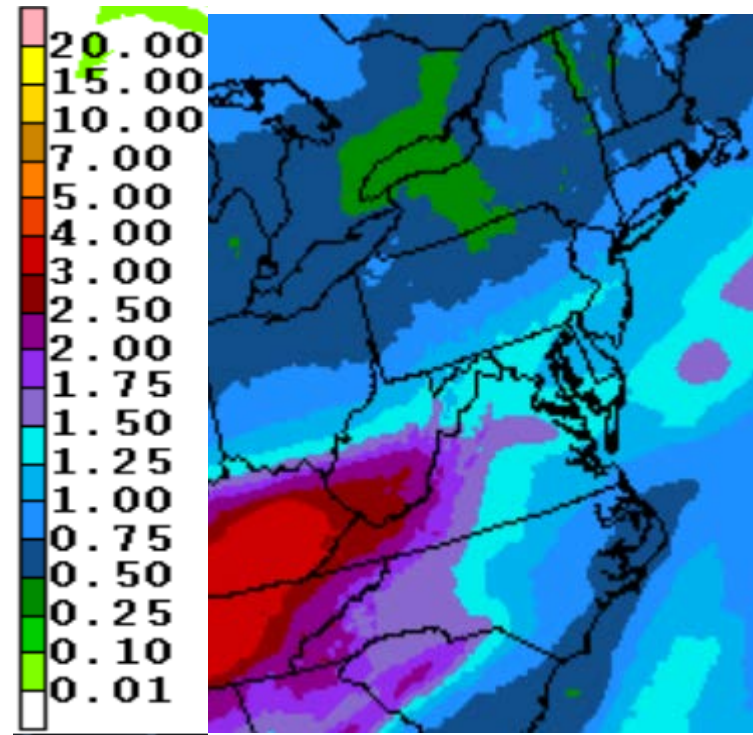
## Extended Forecast for Swanton MD



## Detailed Forecast

<b>Today</b>	Mostly cloudy, then gradually becoming sunny, with a high near 41. West wind around 16 mph, with gusts as high as 26 mph.
<b>Tonight</b>	Mostly cloudy, with a low around 26. West wind 8 to 13 mph, with gusts as high as 23 mph.
<b>Friday</b>	Partly sunny, with a high near 41. Northwest wind around 5 mph becoming calm in the morning.
<b>Friday Night</b>	A slight chance of freezing rain after 4am. Mostly cloudy, with a low around 31. Southeast wind 5 to 8 mph. Chance of precipitation is 20%.
<b>Saturday</b>	A chance of freezing rain before 8am, then rain likely. Cloudy, with a high near 43. Southeast wind 9 to 11 mph. Chance of precipitation is 70%. New precipitation amounts between a quarter and half of an inch possible.
<b>Saturday Night</b>	Rain. Low around 38. Chance of precipitation is 80%. New precipitation amounts between a half and three quarters of an inch possible.
<b>Sunday</b>	A chance of rain before 7am, then a chance of showers between 7am and 5pm. Mostly cloudy, with a high near 51. Windy. Chance of precipitation is 40%.
<b>Sunday Night</b>	Partly cloudy, with a low around 24. Windy.
<b>Monday</b>	Mostly sunny, with a high near 33. Breezy.
<b>Monday Night</b>	Mostly clear, with a low around 21.
<b>Tuesday</b>	Mostly sunny, with a high near 40.
<b>Tuesday Night</b>	A chance of snow. Mostly cloudy, with a low around 28. Chance of precipitation is 30%.
<b>Wednesday</b>	A chance of rain and snow. Mostly cloudy, with a high near 37. Chance of precipitation is 40%.

## NWS 7-Day Quantitative Precipitation Forecast





- Deep Creek Day Ahead Scheduling
  - Verify upcoming WWR and the frequency of Temp Releases (Average 12 per month June, July, and August)
  - Verify Friendsville flow and determine if flows/weather forecast will require generation adjustments in the schedule
    - Flows 600 cfs – 1300 cfs requires one turbine maximum operation, Flows 1300 cfs – 2500 cfs requires turbines to be offline.
  - Use predictive model to determine water available for discretionary generation (WBM/similar)
  - If there is generation available other than WWR's
    - May 1<sup>st</sup> thru Oct 31<sup>st</sup> ensure not exceeding URB >21 days
    - Utilize market demands to submit a Generation Schedule
  - Ensure that Safe Waters and the Deep Creek Hotline are updated for the upcoming release
  - Inform Precision Rafting of the upcoming Schedule

## SHORT-TERM SCHEDULE

START DATE	START TIME	END DATE	END TIME	CFS
2/20/19	6:00 AM	2/21/19	8:59 PM	620
2/21/19	9:00 PM	2/21/19	11:59 PM	0

- Deep Creek Same Day Schedule Adjustments (Real Time)
  - Verify Position on the Rule Bands. Make adjustments based on position if required
  - Verify if it is a WWR day
  - Verify Friendsville flow and modify today's WWR Schedule if it has not already been forecasted.
  - Inform the NASCC to update generation schedule, the Safe Waters website, and the Deep Creek Hotline
  - Inform Precision Rafting of change.



**Deep Creek**  
Near Oakland, MD

Thu February 21 01:46PM EST  
Headwater Elevation Outside

**2457.68** ft

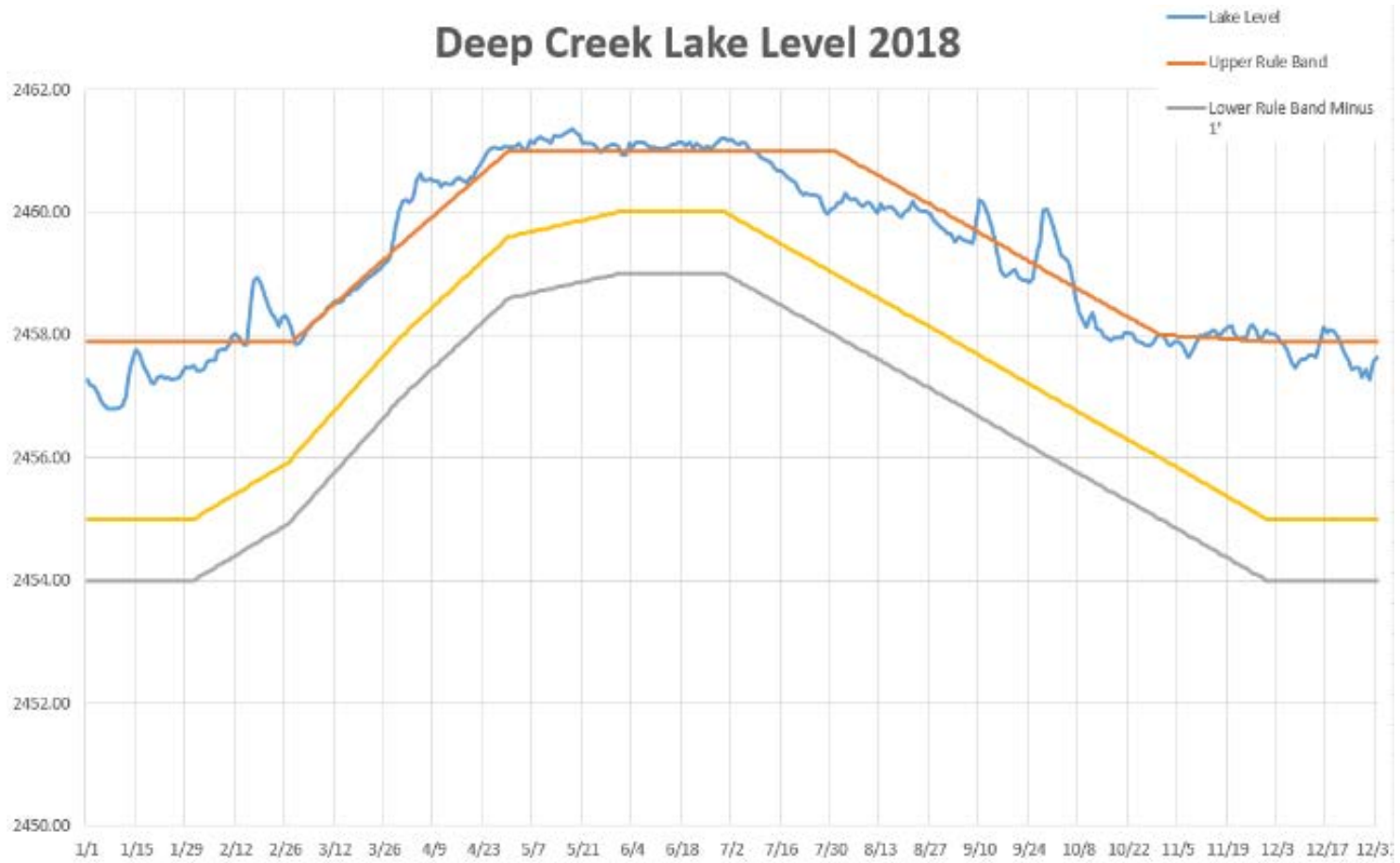
Number of Turbines Generating

**2**

- Daily Mid/South Atlantic Report
  - Distributed across line management, NASCC, and Marketing
  - Visibility from local operators to US Vice President

<b>Deep Creek</b>		Midnight Elevation: 2458.92	Rule Band Position:	URB	-0.55
		Current Elevation: 2458.95		LRB	1.98
Current Deep Creek Inflow:	214	Previous Day Average Inflow:	219	LRB-1	2.98
Next Required WWR (Dependent on Elevation):	Complete for 2018	Prev Day Scheduled Gen (MWH):		0.00	
		Actual Previous Day Gen (MWH):		0.00	
Current Friendsville Flow:	851	Today's Scheduled Gen (MWH):		0.00	
Regulation Today:	None	Discretionary Gen Approved:		6 hours	
<b>NOTES</b>					
1. Call WRM at 2459.3'					
2. Unit #1: 3/4/19 @ 0800 - 3/14/19 @ 1600, annual inspection.					
3. URB in rising.					

- January 1<sup>st</sup> to May 1<sup>st</sup>
    - Utilize generation to achieve approximately 1.0' to 1.5' below the URB in preparations for the Spring Freshet.
    - The plan is to reach the URB and follow it up and achieve a 2461.0' elevation by May 1<sup>st</sup>
    - During the refill to 2461.0' we may exceed the URB capturing rain event/melt and allowing the URB to catch up. This is to ensure that we capture Spring rains.
      - An example would be that a months LTA rainfall occurs in the first 2 weeks of month and then dries up.
  - May 1<sup>st</sup> thru August 1<sup>st</sup>
    - Utilize generation to accomplish all WWR's and Temp Releases per the Water Appropriation Permit
    - The Scheduling tool (predictive model) is always looking 30 Days out and accounting all WWR requirements and the estimated 12 Temp Releases per month. (Temp Releases will be adjusted based on the current trend)
    - We try to maintain the Reservoir near the URB running only the required releases as LTA flows are minimal in summer months.
    - We utilize the .3' above the URB for 21 days to capture rain events during these months. That water is expended by WWR/Temp Releases or discretionary if the 21 days is approaching.
  - August 1<sup>st</sup> thru November 1<sup>st</sup>
    - The plan is to run only the required flows to achieve the URB draw rate.
  - November 1<sup>st</sup> thru January 1<sup>st</sup>
    - The plan is to run generation to maintain reservoir level between the URB and LRB
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- Water Budget Model, like our predictive model, is by necessity only one piece of the lake management process
- Water Budget Model in it's current state is less sophisticated than our current predictive model and requires additional fine tuning to maximize its effectiveness
  - This is to be expected, as reservoir management is a highly specialized and complex field requiring extensive training and experience
- Conversation and coordination around WBM has opened up dialog between Brookfield and Deep Creek stakeholders and has lent transparency and third party validation to our management of the reservoir