# Balancing Adjustment Study Recommendations

Office of the Delaware River Master

August 16, 2023

# Flexible Flow Management Program (FFMP) 2017

…study and evaluate the River Master's balancing adjustment procedure…

# What is the Balancing Adjustment?

A correction for cumulative directed release error. Resets June 15 each year.

## Sources of forecast error in directed releases

- Powerplants
  - Rio
  - Wallenpaupack
- Runoff from rainfall
- Baseflow behavior

# Simplified example of river "owing" NYC reservoirs

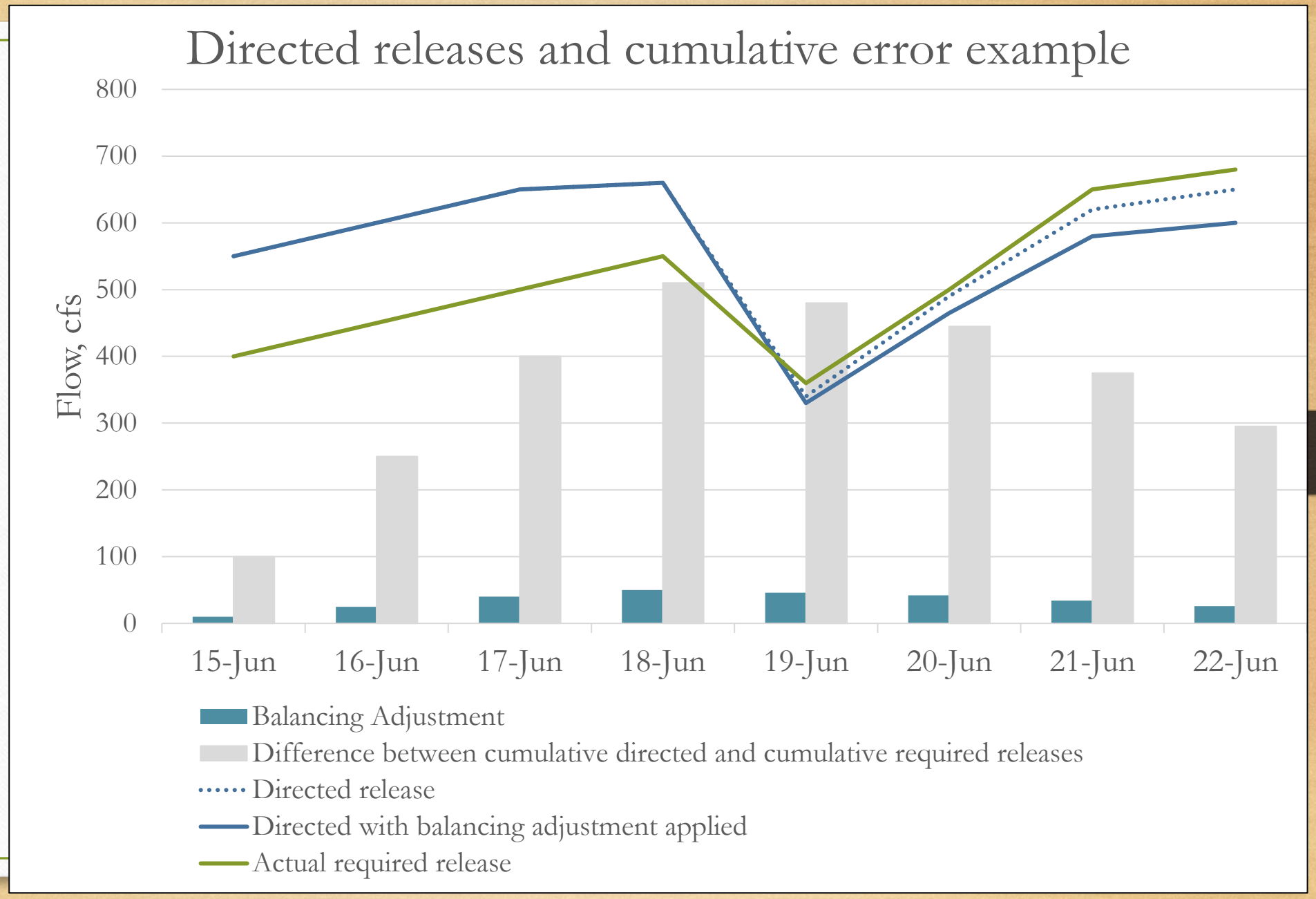
**Flow, cfs**

| Date | Directed release | Actual required release | Cumulative directed | Cumulative required | Difference between cumulative directed and cumulative required releases | Balancing Adjustment |
|---|---|---|---|---|---|---|
| 15-Jun | 550 | 400 | 550 | 400 | 150 | 15 |
| 16-Jun | 600 | 450 | 1150 | 850 | 300 | 30 |
| 17-Jun | 650 | 500 | 1800 | 1350 | 450 | 45 |
| 18-Jun | 660 | 550 | 2460 | 1900 | 560 | 56 |
| 19-Jun | 325 | 360 | 2785 | 2260 | 525 | 53 |
| 20-Jun | 460 | 500 | 3245 | 2760 | 485 | 49 |
| 21-Jun | 575 | 650 | 3820 | 3410 | 410 | 41 |
| 22-Jun | 594 | 680 | 4414 | 4090 | 324 | 32 |

10% of the cumulative error

(capped at +/-50)

Simplified example of river "owing" NYC reservoirs



# Some pre-existing criticisms of the balancing adjustment

- Not effective
- Overly complex
- Carries a balance for long periods of time

# Study overview and timeline

Statement of Work 2020

1. **Data collection and model development**

Workshop July 2021:

Data + model review, propose alternatives

2. **Scenario performance testing**

Workshop July 2022:

Review model output, collect feedback on alternatives

3. **Reporting and decision**

Implementation June 2023

RFAC presentation December 2021

# Proposed alternatives

- Five Categories
- Modeled, reviewed, and feedback received at 2nd workshop
- Resulted in several recommendations

**Caps -** None, 50, 100, 200, 400, variable

**Distribution** - 10, none

**Reset** - January 1, on spill, >5,000

**Removal** - Error tracking only

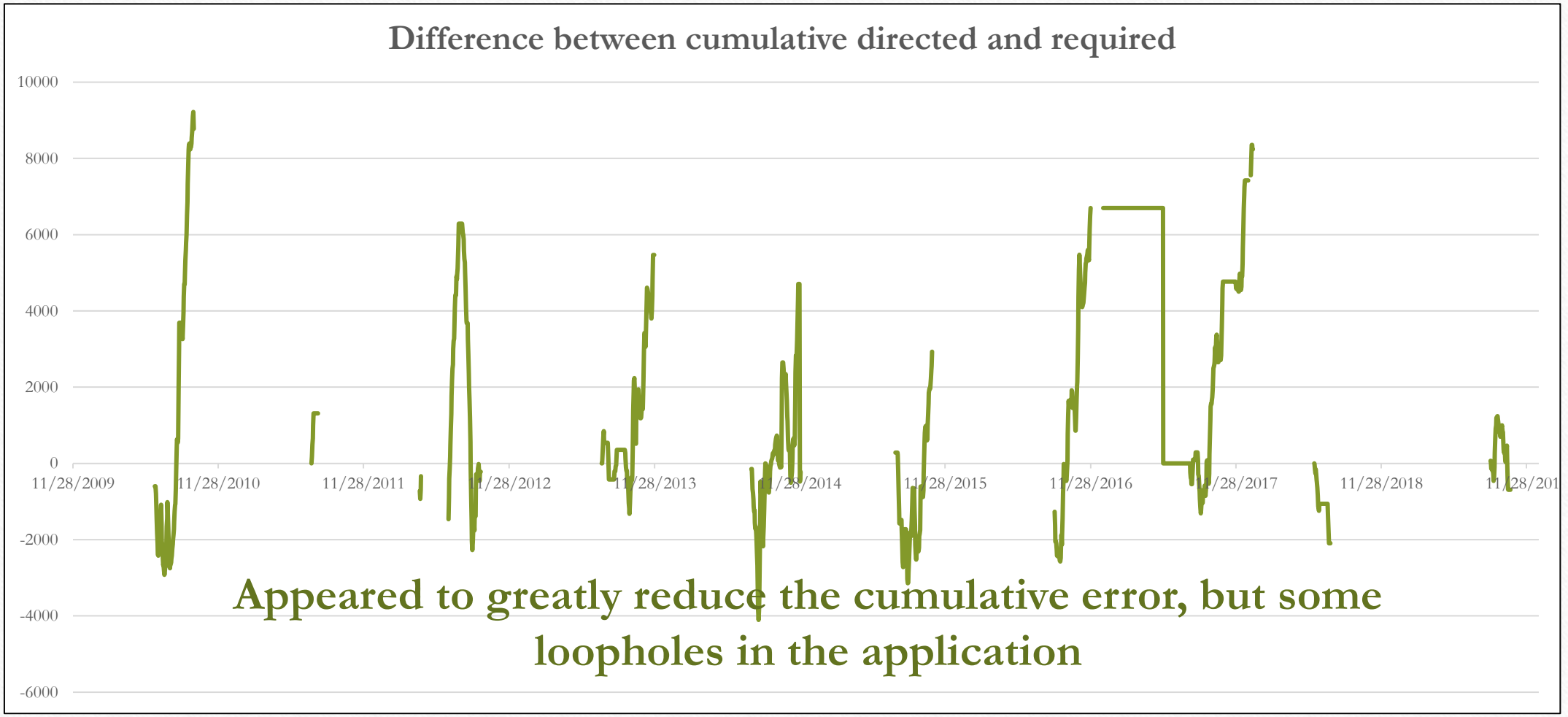
**Misc.** –DR>CR (when to apply); target minus Montague (instead of supply exclusive)

# Recommendations

## Simplify and increase effectiveness

- ✓Remove the 10% distribution and rely only on a maximum value (cap) for the balancing adjustment value.
- ✓Increase the cap from 50 to 100 cfs.
- ✓Change reset date from June 15 to June 1 to align with banks, diversion calculations, etc.

# Consider conservation release, beginning in 2018

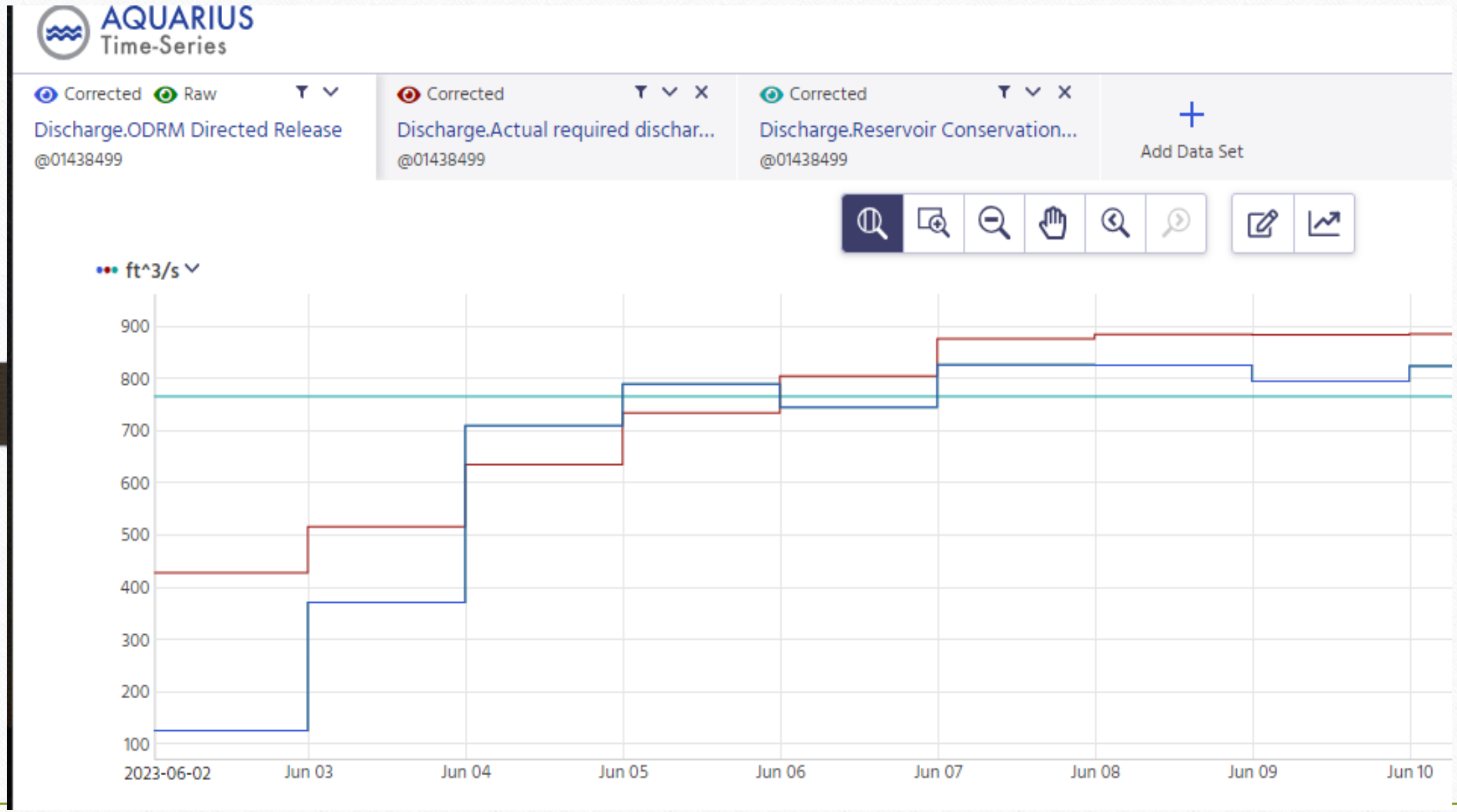



**Appeared to greatly reduce the cumulative error, but some loopholes in the application**

# Recommendations

## Correct loopholes in algorithm

- ✓ Apply the Balancing Adjustment for **any directed release value**, not just when greater than conservation release.
- ✓ Accumulate error not only when directed releases are greater than conservation releases, but also when the **actual required** release is **greater than the conservation** release.
- ✓ When directed and actual required release values span the conservation release value, **only the portion of error above the conservation release** value is accumulated.


AQUARIUS
Time-Series
Corrected
Raw
Discharge.ODRM Directed Release
@01438499
Corrected
Discharge.Actual required dischar...
@01438499
Corrected
Discharge.Reservoir Conservation...
@01438499
Add Data Set
ft^3/s
900
800
700
600
500
400
300
200
100
2023-06-02
Jun 03
Jun 04
Jun 05
Jun 06
Jun 07
Jun 08
Jun 09
Jun 10

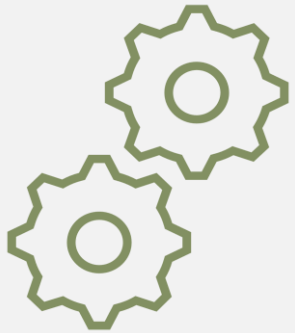
# Recommendations

## Continue to track performance and reassess

- ✓ Review past ODRM reports to build a history of the Balancing Adjustment. For example, it was not always capped at 50 cfs.
- ✓ The current ODRM 5-year plan includes an ODRM data retrospective, which can include a focus on the Balancing Adjustment Procedure.

**June 15, 2023**

# Implementation



Used the current “reset date” to implement changes. Reset date will move to Jun 1 next year.

# Documentation

Detailed documentation is being compiled into a singular **report**, which will serve to memorialize the study structure, findings, workshop input, and recommendations.

Will also include a detailed section in the 2023 ODRM Annual Report

# Questions