

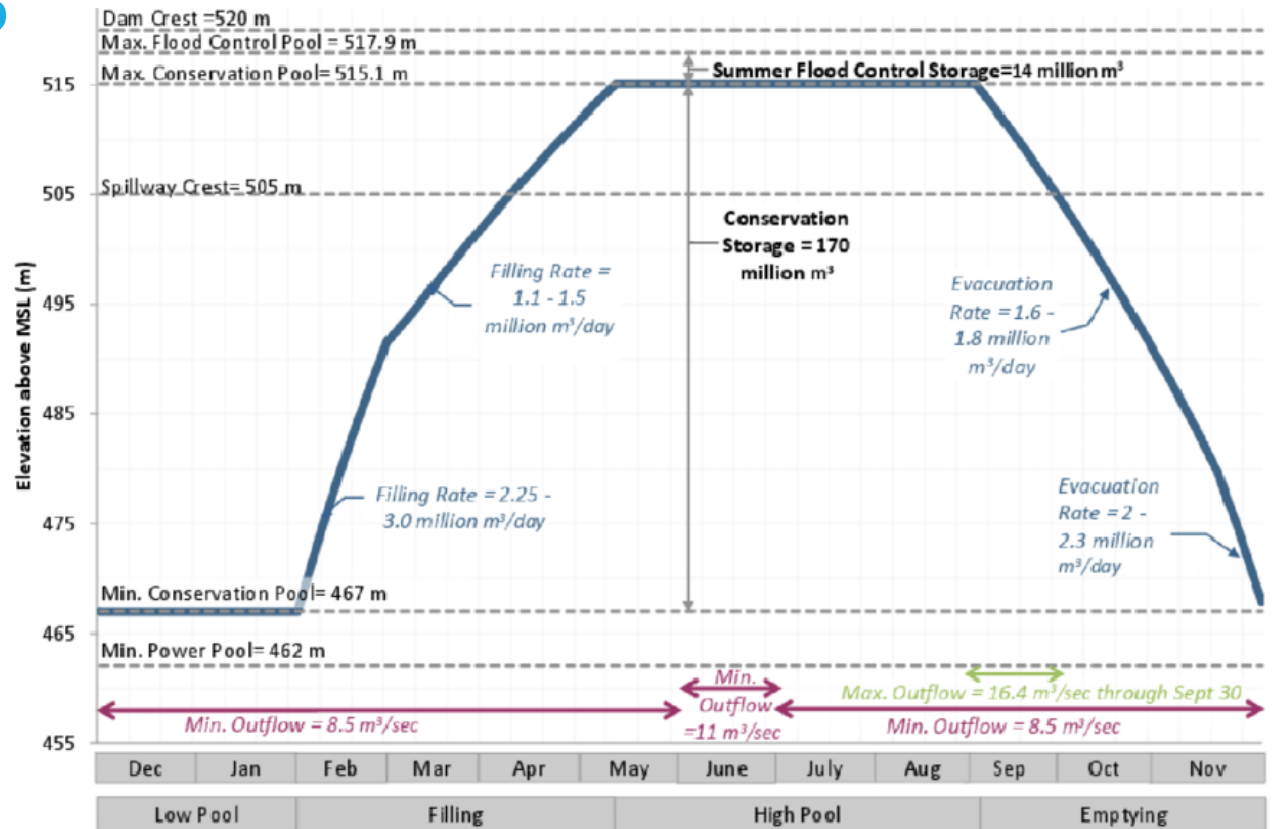
FILLING THE GAP: INCREASED OPERATIONAL DISCRETION?

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OBJECTIVES

- Background
- The Challenge
- Action
- Criterion
- Operational Discretion
- Advantages
- Disadvantages
- Conclusion



Cougar Dam Rule Curve, USACE 1964

BACKGROUND



Oroville Dam Overtopping, 2017

- Limited water resources – reliant on carryover storage
- Aging infrastructure, demanding environmental flow requirements, catastrophic flood events
- Multi-purposed reservoirs – storing or not storing water
- Currently formal documentation exists establishing operational guidelines - CFR, Title 33, Chapter 11, Part 208, Secion 208
- Regulations date back to dams' first construction

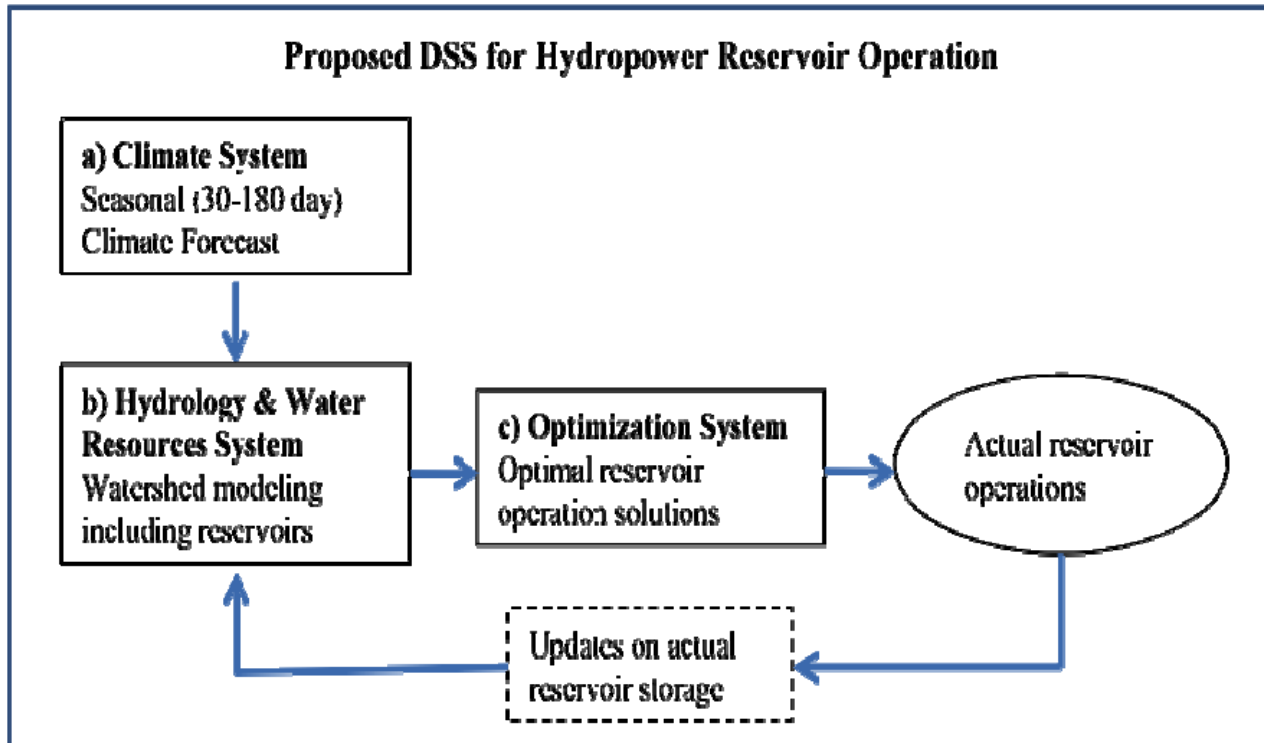
THE CHALLENGE

- The need to review, update, and approve new protocols
- Accepting not all 1,300+ dams will be updated quickly
- What if we know that current protocols are less than optimum?
- How should operators handle this challenge?
- Should they operator by the prescription, even if they have the knowledge to improve operation?



Folsom Dam

ACTION



Decision Support System (DSS) aimed at optimizing reservoir operations for hydropower production in Africa

- Straightforward solution, but with legal and institutional hurdles
- Flexibility vs Rigidity
- Use of the knowledge and experience of reservoir operators
- Seasoned operators exposed to uncharacteristic/extreme events – anecdotal database

CRITERION

- Who gets to practice flexible operation and who does not?
- *Informed discretion* - decisions made where sound data/information is available
 - Impeccable field data
 - Basin condition
 - Downstream conditions
 - 24-, 48-, and 72-hour forecasts
 - Snowpack conditions

Basin
Conditions

Network of
field
observations

Down
Stream
Conditions

Snowpack
Conditions

Forecasts

OPERATIONAL DISCRETION

- Fill-up/drawdown based on snowpack contributions
 - High vs low snow year
- Rain on snow event
- Assessment of previous years' conditions
- Predictive measures taken for high magnitude storms

Folsom Lake – Temporal Differences



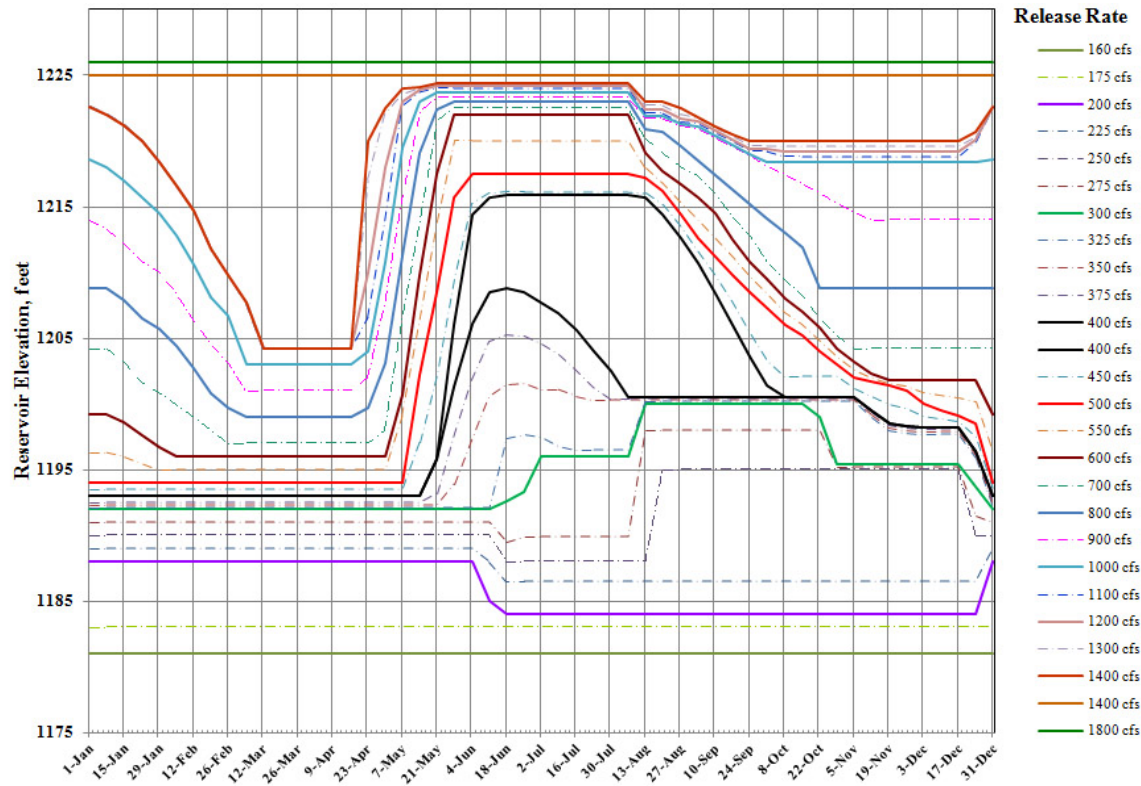
ADVANTAGES

- Flexibility
- Highly responsive operation – from passive to active
- Low cost
- Technology investment will be useful for future projects
- Trading of ideas between operators (community and spread of knowledge)
- In-house resources

DISADVANTAGES

- Accountability – legal jeopardy
- Do operators accept liability? If not, then who?
- Amnesty for operators
- Legal hurdles will determine success of program
- Do not want operators to resort to old practices because of potential retribution

CONCLUSION



- Dams face new hydrologic regimes with no way to tackle it
- Increased operational discretion to fill the gap between current protocols and updated ones
- If nothing changes, decisions still need to be made.
- Improved accuracy and data will enhance the likelihood of a successful program

**THANK YOU FOR YOUR
TIME.**