TROA LESSONS LEARNED: THE 1ST 7-YEARS

2023 RiverWare User Group Meeting

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OUTLINE

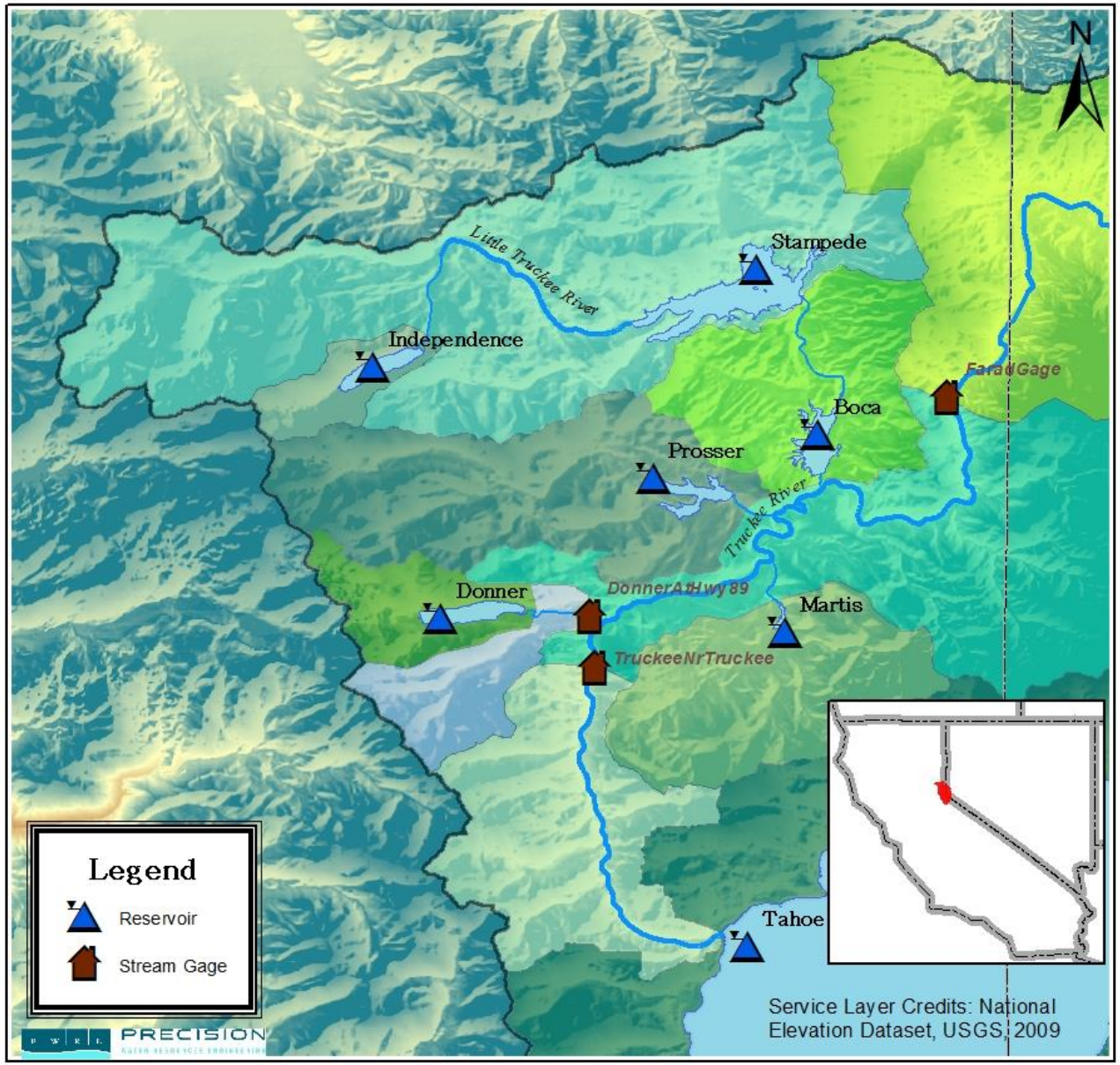
- TROA Overview
- Lessons Learned
  1. Multi-Purpose Model
  2. Fight for Consistency
  3. Be willing to change
  4. One SCT to Rule them all

Lake Tahoe March 2015, photo credit Caleb Erkman

TROA OVERVIEW

- Truckee River Operating Agreement (TROA)
  - Innovative agreement for collaborative operations of the Truckee River Reservoirs
  - Negotiated for nearly *30* years
  - Signed in 2008
  - Implemented December 1, 2015!
- Goals:
  - Improve operational flexibility
  - Improve efficiency of Truckee River Reservoirs
  - Improve instream flows
  - Satisfies water rights in conformance with existing decrees
- Several parties in the system have the ability to:
  - Establish credit water storage
  - Exchange credit water
  - Trade credit water
  - Release water for beneficial use

Upper Truckee River Basin

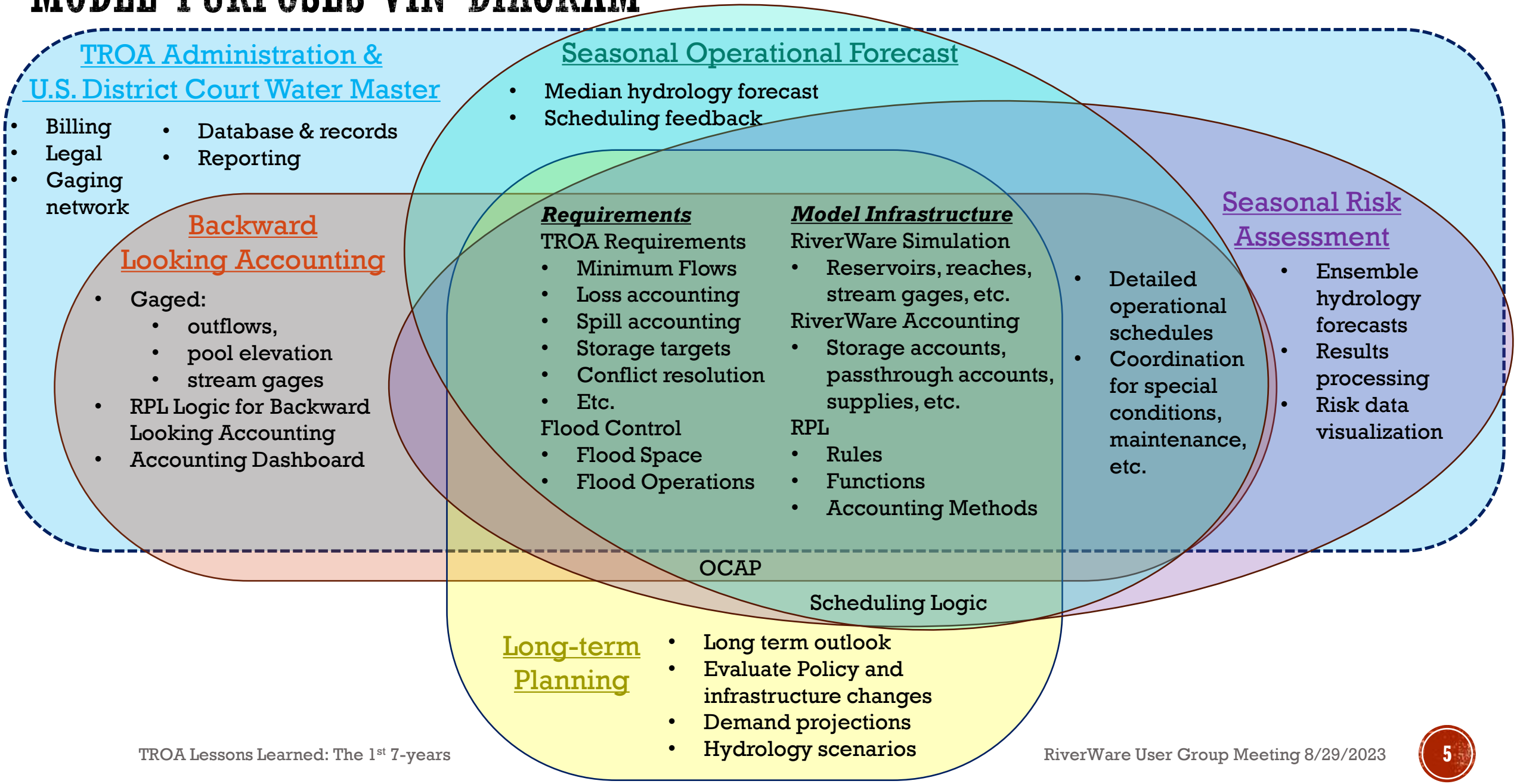


MULTI-PURPOSE MODEL

- Backward looking accounting
- TROA Administration
- Scheduling
- Operational Forecasts
  - Short-Term
  - Seasonal
- Seasonal Risk Assessment
- Long term planning *(in development)*

All done with the same RiverWare model!

MODEL PURPOSES VIN DIAGRAM



FIGHT FOR CONSISTENCY

1st Rule of good programing:

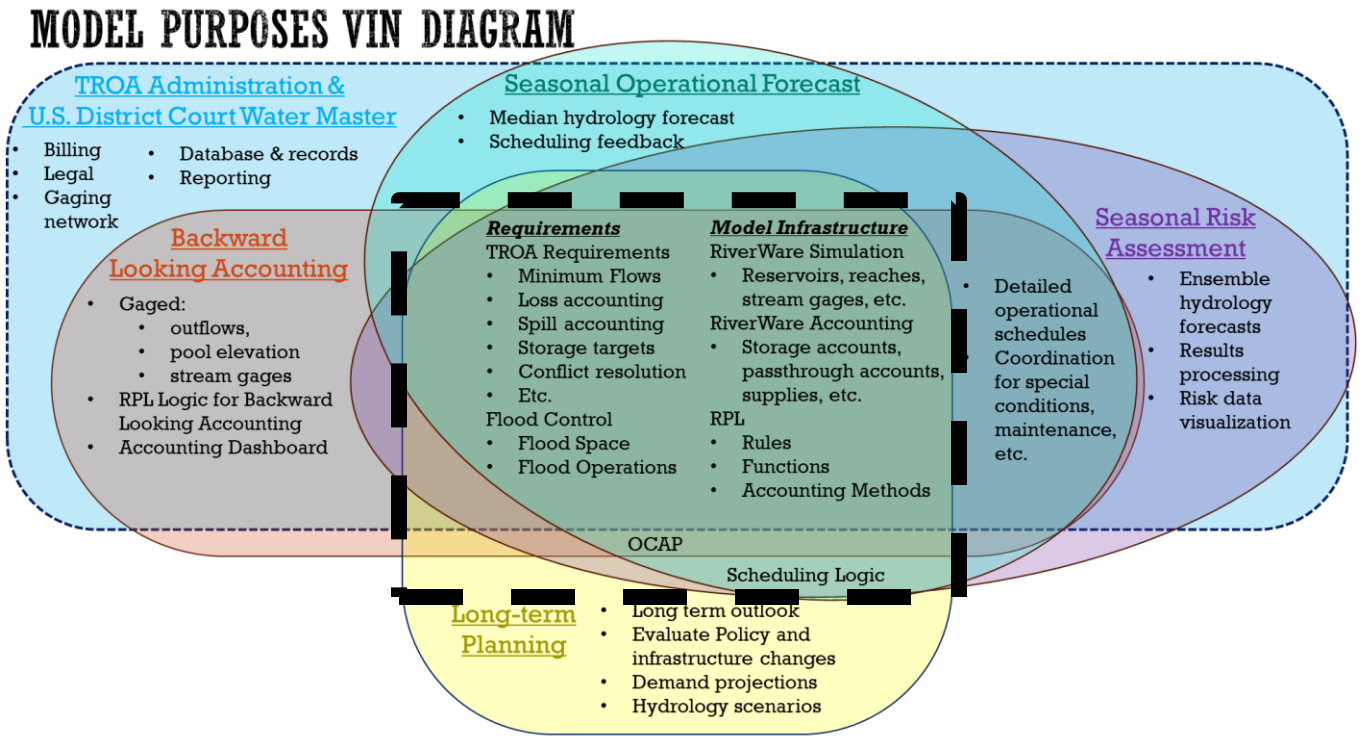
- Don't repeat yourself

2nd Rule of good programing:

- Don't repeat yourself

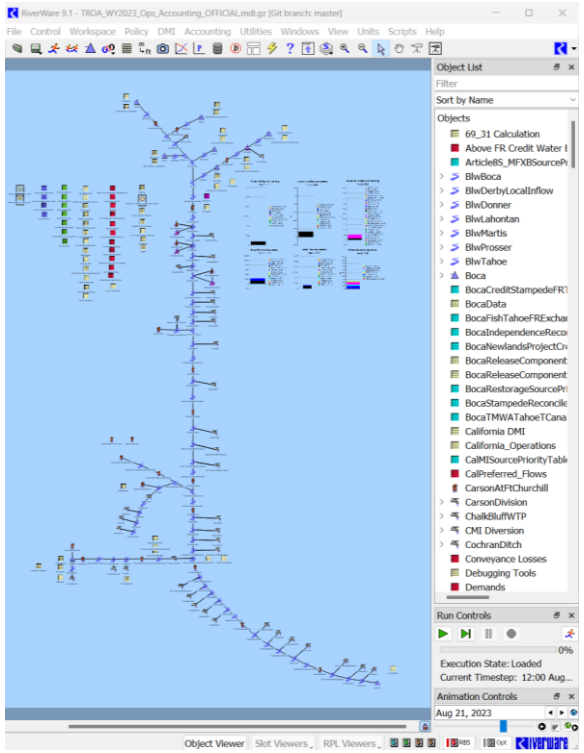
FIGHT FOR CONSISTENCY

- All the model purposes use the same workspace, ruleset, functions, objects, etc as much as possible
- Sometimes the same calculation needs to happen in multiple rules or multiple places within the same rule
  - **Use a Function!**
- Every year is different
  - The temptation is to customize logic for one condition that breaks, which then breaks another
  - **Regression testing!**



BE WILLING TO CHANGE

- Any model approximates the real system, and always will.
- Know your approximations!
- Some key approximations in the TROA Model:
  - TROA
    - Not every nuance of every condition is modeled, and some may not be modeled completely.
    - Some conditions were omitted because they are unlikely to occur
  - The physical Truckee Basin
    - The numerical characterization of the reservoirs, reaches, etc. differs from the real-world in many ways known and unknown
  - Realtime stream gage record (e.g., daily average vs instantaneous)
- When one of these approximations becomes an issue, **Change**



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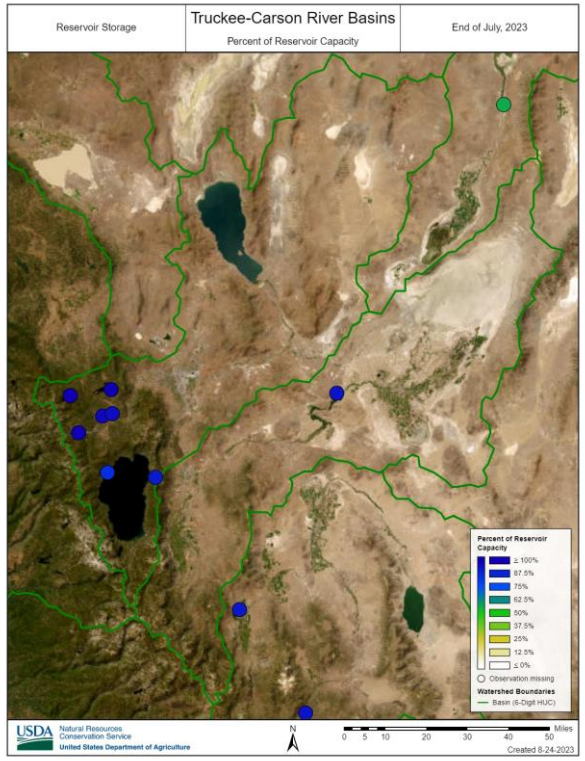
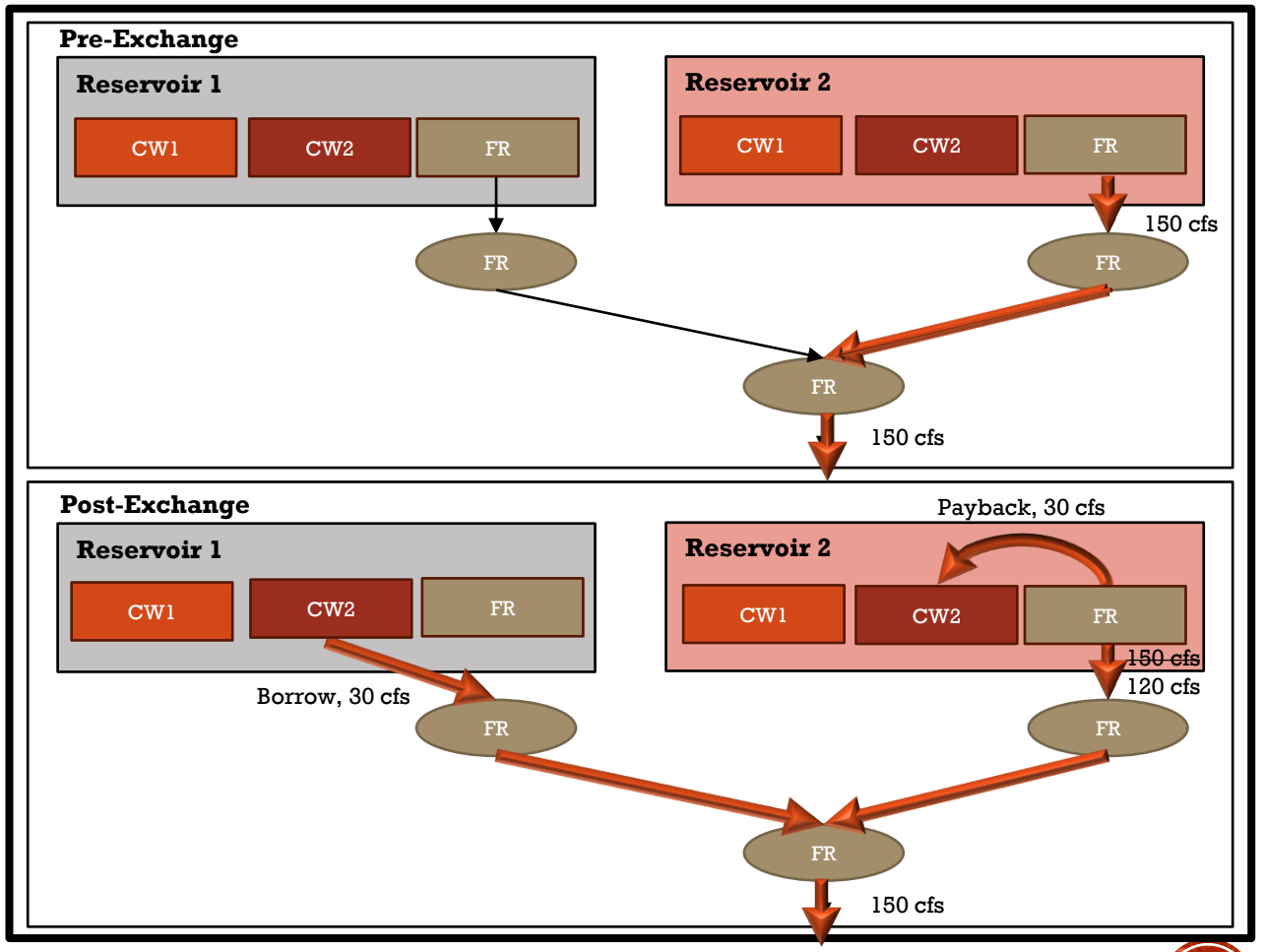


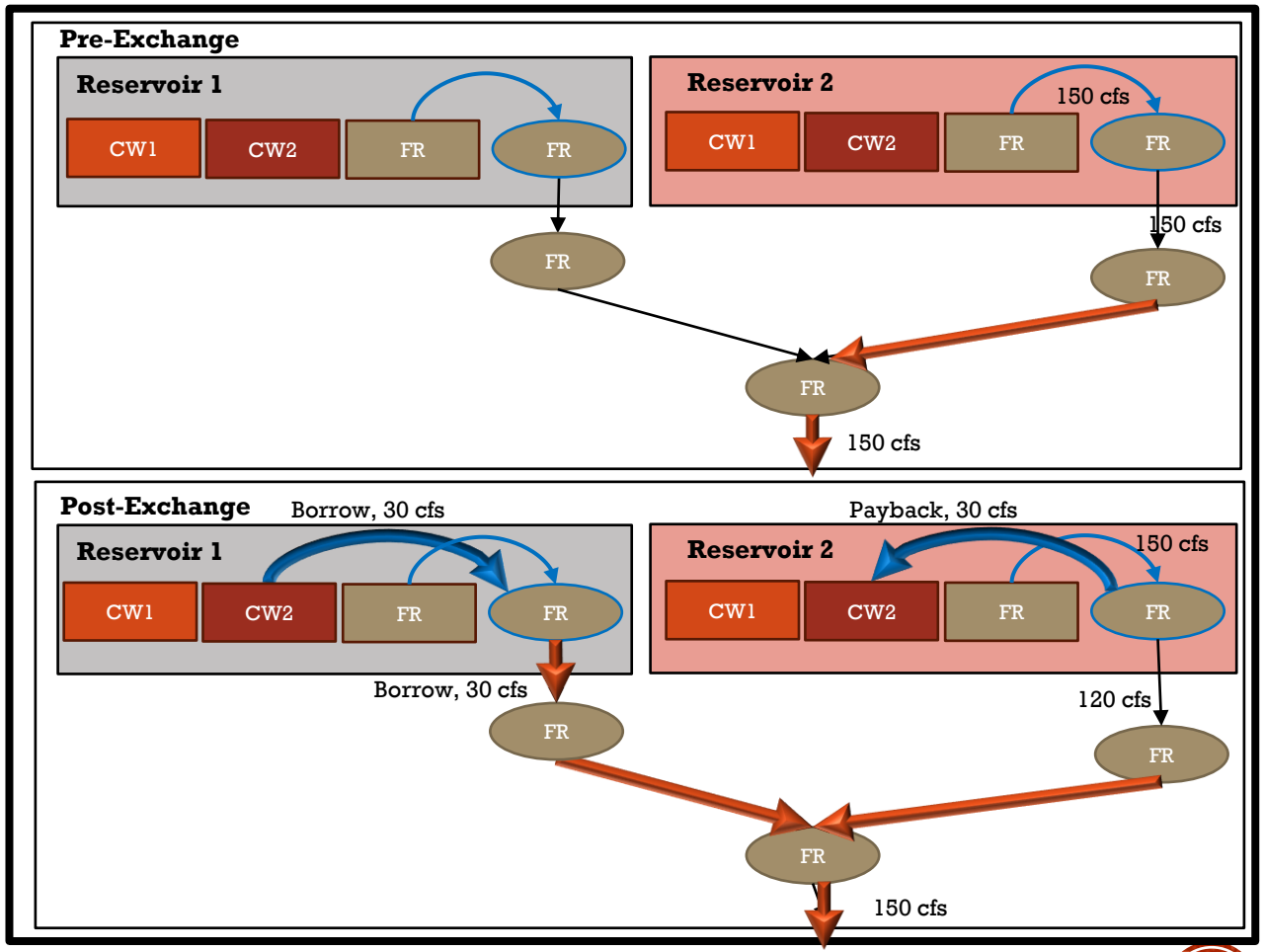
BE WILLING TO CHANGE: EXAMPLE

- TROA Policy Approximation
  - The TROA Model was initially configured with releases using outflow supplies
  - To do an exchange, the original outflow supply was changed, then a transfer was set to a like amount
- Difficulties
  - This required a transfer supply from each account that might make a release to each account that might be used for an exchange
  - If you want to layer exchanges, then you also need a supply from each destination account
  - The original value of the source supply is not preserved
  - Supplies are set by multiple rules, making it difficult to debug/decipher results
- In 2018 layering exchanges became necessary, not wanting to let the model be the limiting factor, we needed to find another solution.



BE WILLING TO CHANGE: EXAMPLE

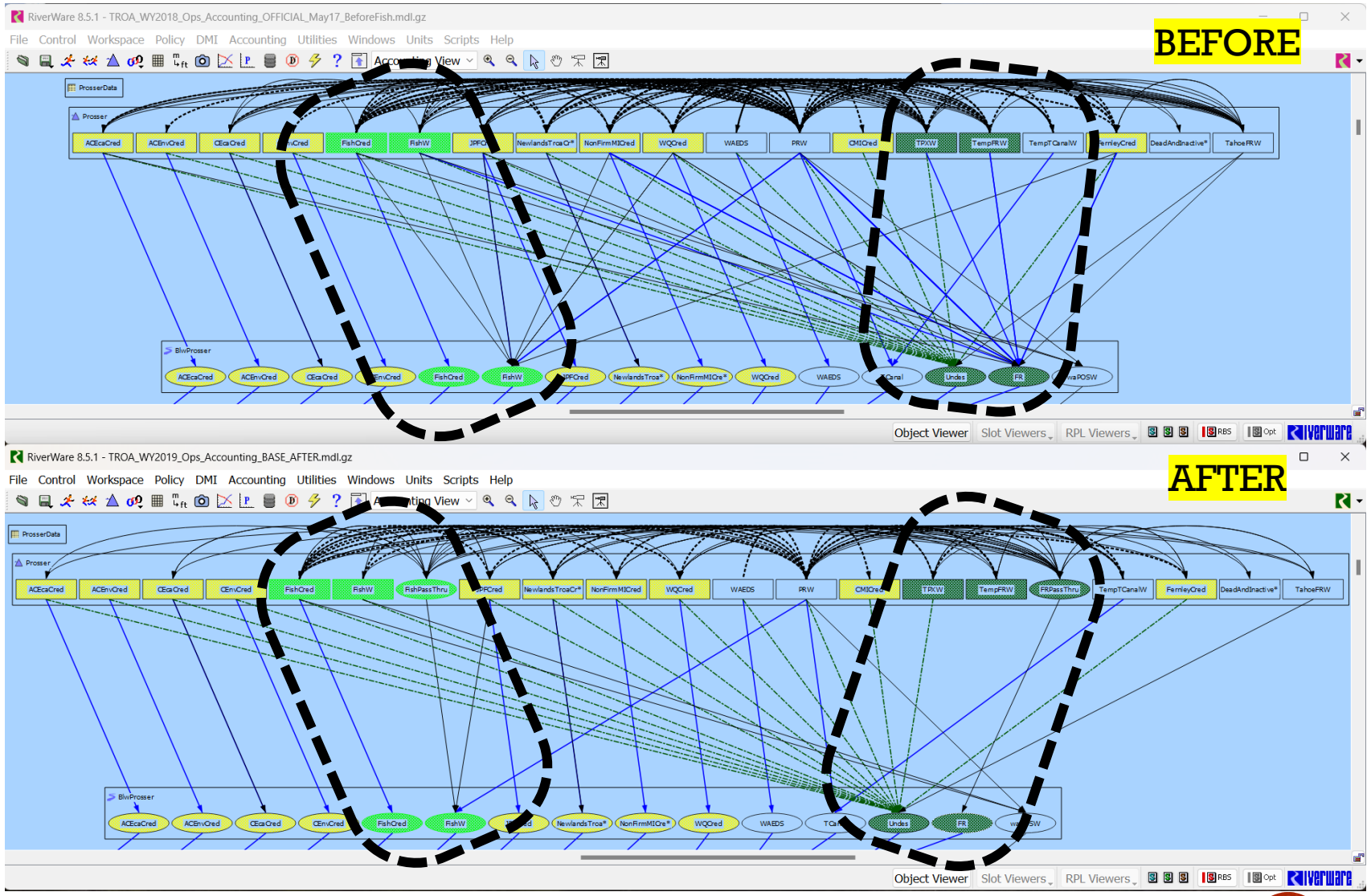
- Solution[1]:
  - Create a PassThrough account on the reservoir for each demand
  - Change all release supplies to transfer supplies to that account
  - Exchange releases are also transfer supplies to or from that account
- Cost
  - Releases are made with transfer supplies which is less intuitive
- Advantages
  - Original release supplies maintained
  - Can layer as many exchanges as necessary
  - No additional supplies to layer exchanges!
  - Significant reduction in number of supplies



[1]Thanks to Todd Vandegrift for this idea!

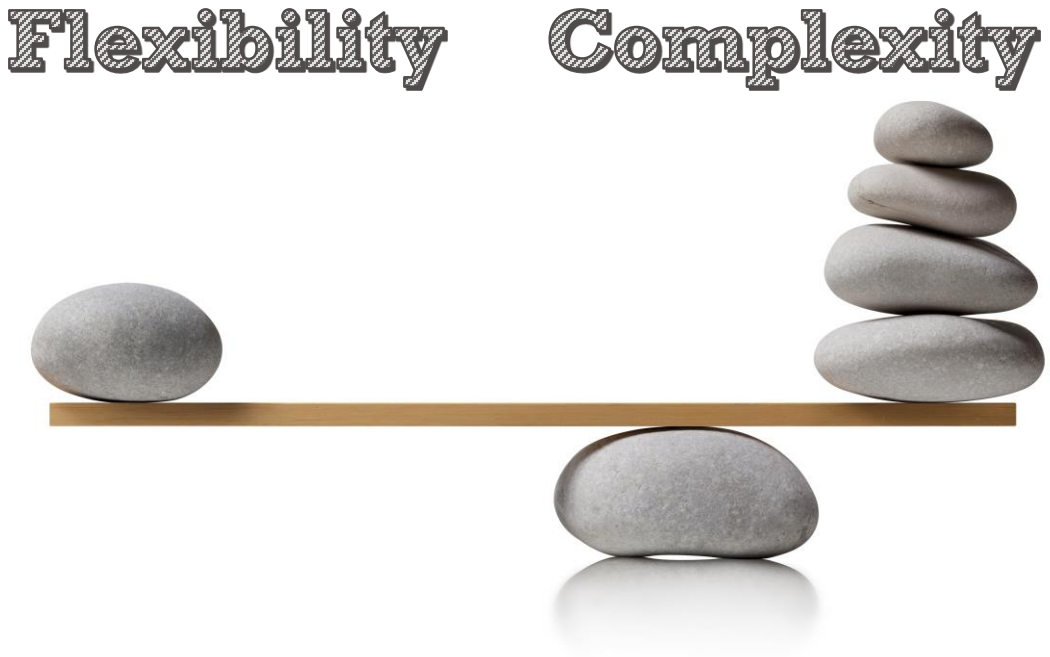
BE WILLING TO CHANGE: EXAMPLE

- TROA RiverWare Accounting Workspace before and after
  - Note this was done in two stages over 6 months
  - Prosser is one of the simpler reservoirs
- Changes
  - New Accounts on Prosser
    - FRPassThru
    - FishPassThru
  - Transfer supplies routed through new accounts
    - Fewer transfer supplies (less dense cloud)
  - Fewer inflow supplies to FR and FishW on BlwProsser
  - Total Supplies in Model:
    - Before: 2406
    - After: 1922
    - **Change: -484, 20%!**



ONE SCT TO RULE THEM ALL

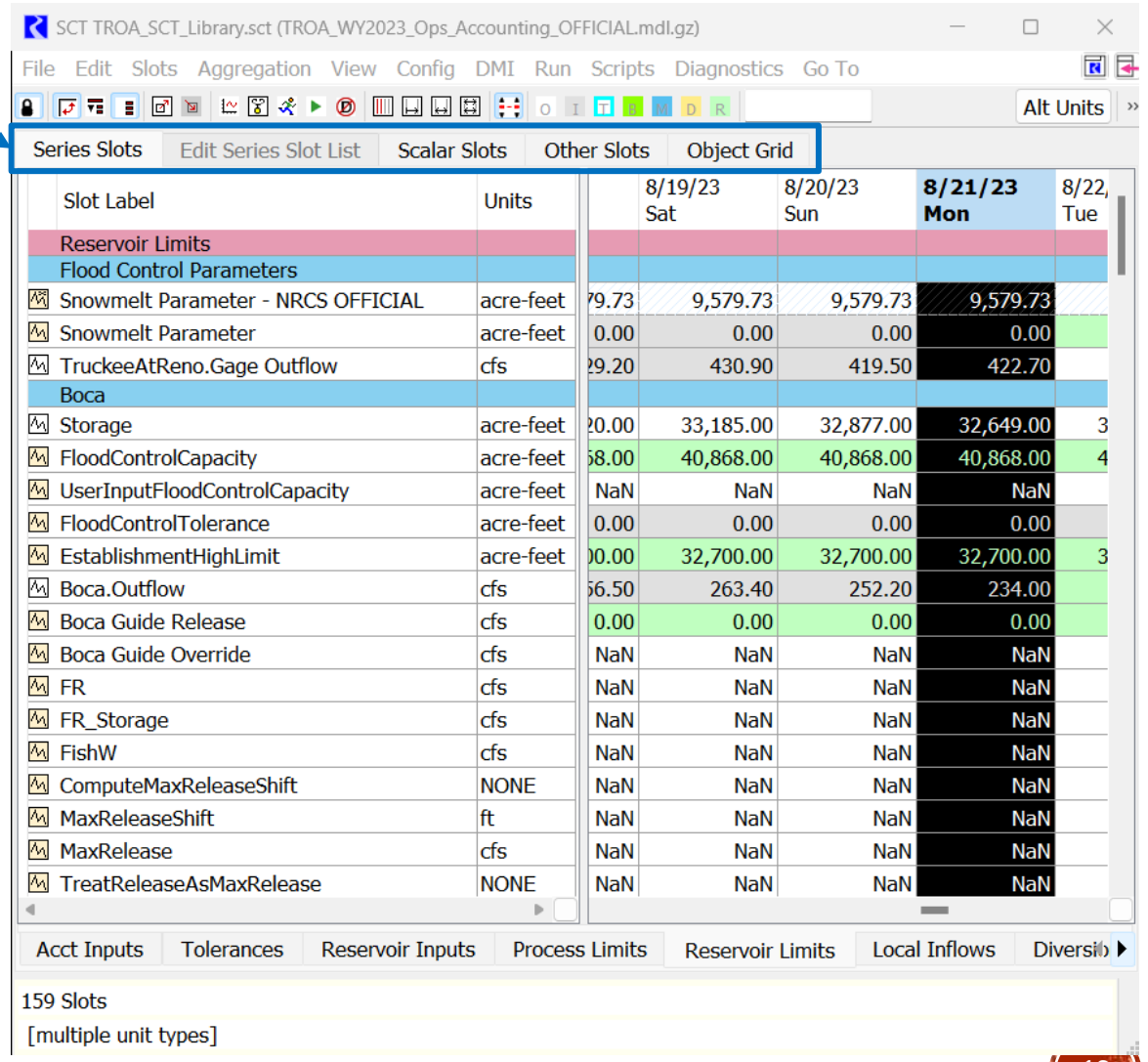
- For an operations model there is an exception to every rule
- Building in a systematic way to override the strict rules is key to success
- Delicate balance between optional inputs and required inputs.
- Reduce required inputs as much as possible
- Organization is critical



ONE SCT TO RULE THEM ALL

- The TROA SCT Library has been configured to organize most of the common Scheduling Inputs to the TROA model
- The SCT summarizes various kinds of slots on different Tabs
- The tabs used in the "TROA_SCT_Library" are:
  - Series Slots
    - 26-summary tabs
    - 1944 slots included, including duplicates
  - Other Slots
    - Periodic "Source Priority Tables" slots
    - 138 total
  - Object Grid
    - List of Data Objects that have common inputs
    - 20 objects

* Note: All of the inputs summarized on the TROA_SCT_Library can also be edited directly from the RiverWare interface



QUESTIONS?

- A special thank you to the following people whose tireless efforts made the modeling TROA possible!
  - Jeff Boyer
  - Shane Coors
  - Tony Powell
  - Pat Fritchel
  - Tom Scott
  - Jeff Rieker
  - TROA Stakeholders
    - USBR, TMWA, PLPT, CA DWR, Reno, Sparks, Washoe County, State of Nevada

Lake Tahoe Dam winter 2017, photo credit Paul Larson