BUREAU OF RECLAMATION

Shasta Tradeoff Analysis Using Position Analysis

Shasta Tradeoffs

- Higher Shasta Storage:
  - Increases Cold-Water Pool for temperature management
  - Increases the CVP's ability to meet the management season's demands
  - Increases the CVP's ability to meet the next water year's demands
- Maintaining High Storage:
  - Requires reducing Shasta releases by reducing the use of water
  - Increases the chance of spilling
- CVP Discretion:
  - CVP service contract allocations are already reduced in dry years, and there is limited relief in additional reductions
  - CVP storage is generally sufficient to meet demands in a single dry year.
  - In order to maintain sufficient carryover going into consecutive dry years, that water needs to come from elsewhere

Timeline of Operations - Shasta

Operation	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Hydrologic Forecast			*	x	x	x	x	x	x			
CVP Delivery Commitments					x	x	x	x	x			
Temperature Management Plan							*	x				
File for TUCP	x	x	x	x	x	x	x	x	x	x	x	x
Storage Fill												
Storage Drain												
Storage Target Considerations							By WYT					By WYT
D1641 MRDO, EC, & X2												
ESA Flow Actions	Fall Flow Stability						Spring Pulse					
ESA Temperature												
ESA Fall X2												AN & W

60 days

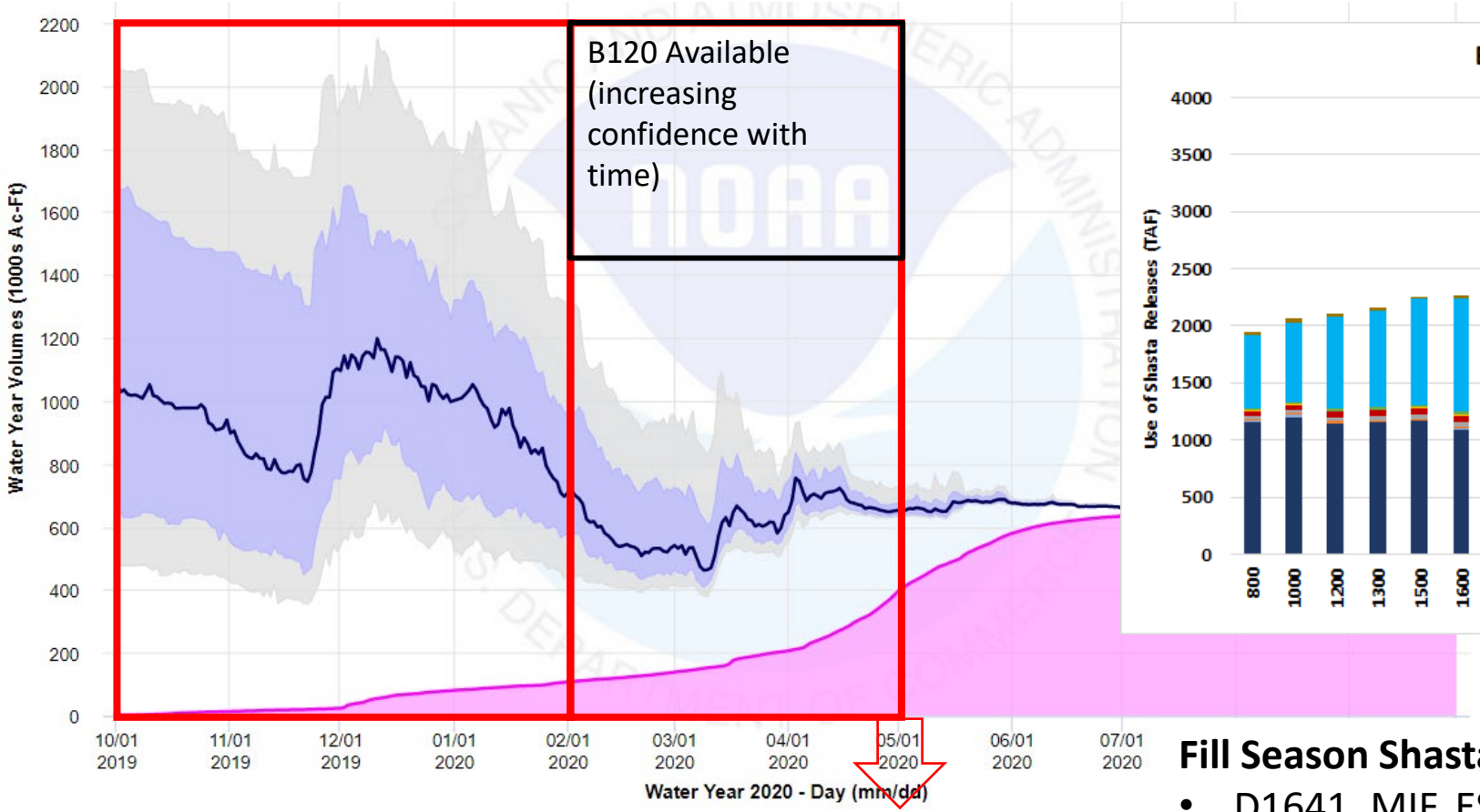
60 days

60 days

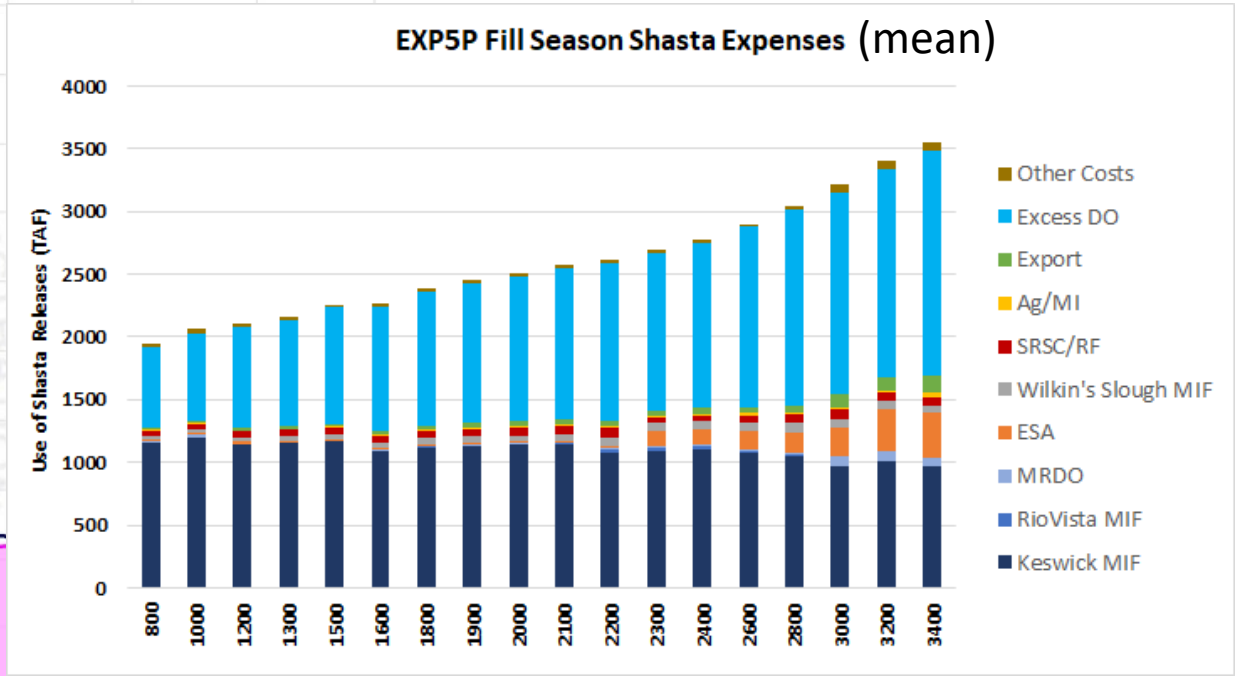
Take Home Messages -we will populate as we go

- Seasonal planning occurs early in the season
  - Limited, uncertain data
  - Water year type is not known

Timeline of Operations – Fill Season



End of April Storage

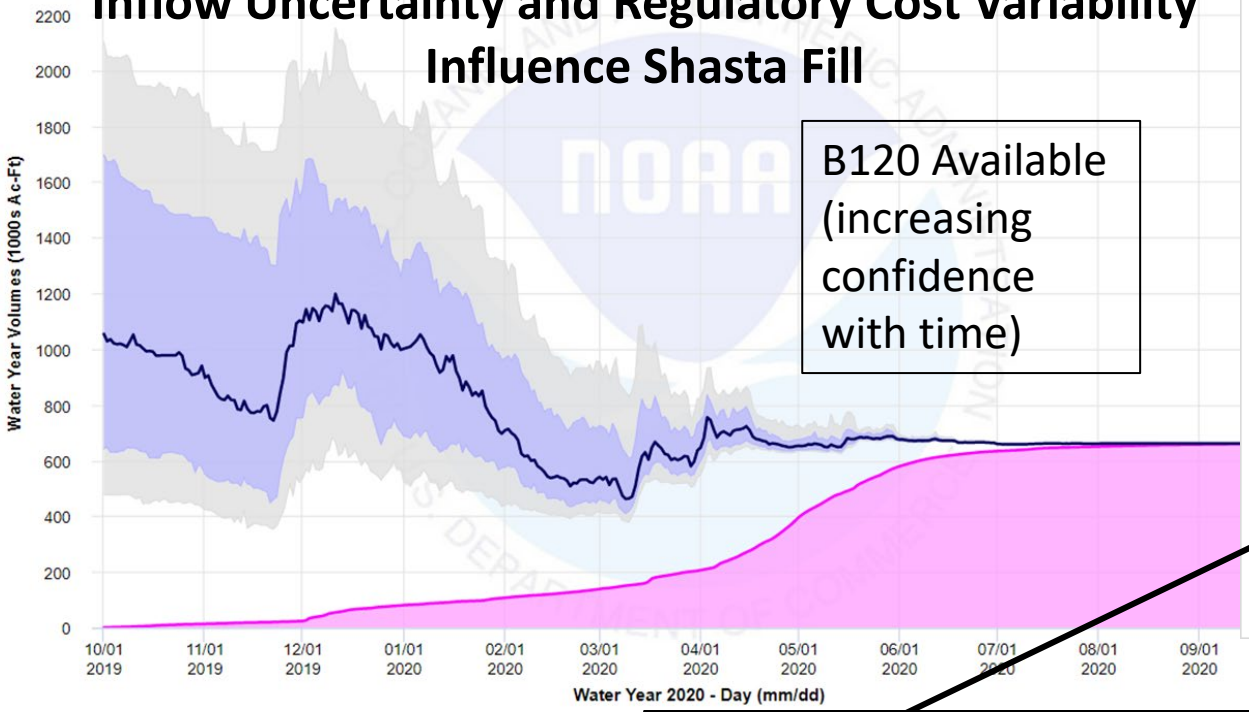


Fill Season Shasta Expenses Range: 25th and 75th percentile

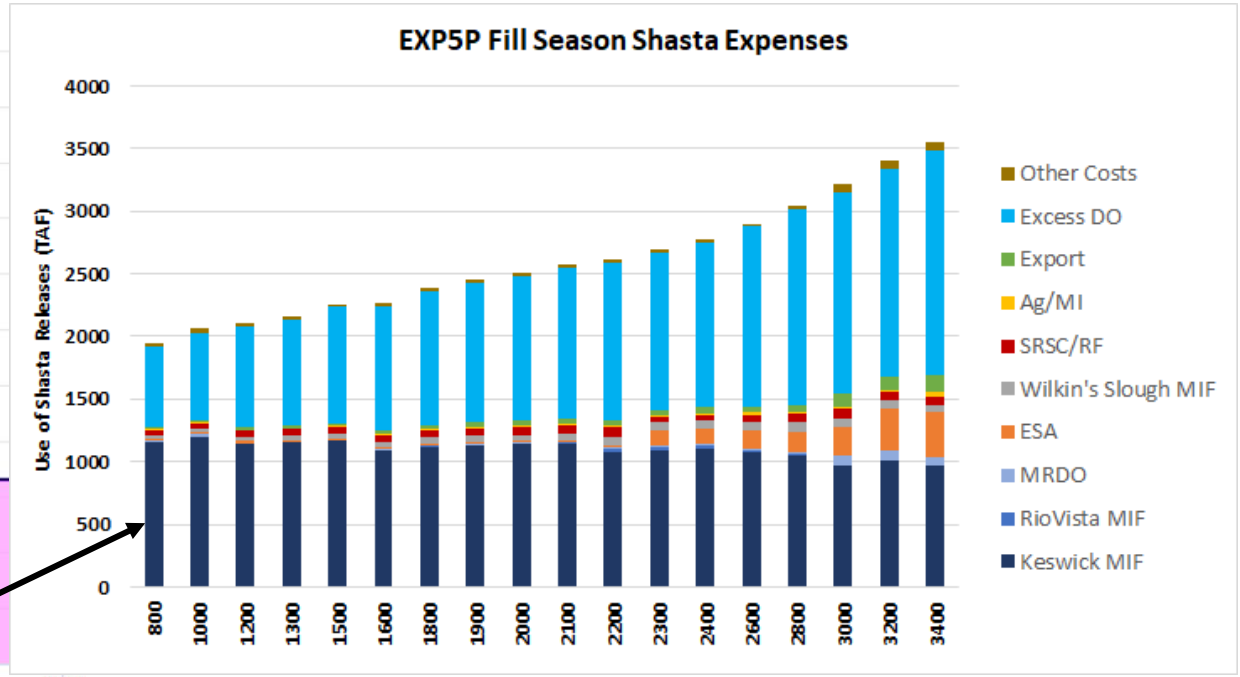
- D1641, MIF, ESA: 1,175 – 1,355 TAF
- SRSC/REF: 5 – 88 TAF
- Delivery & Export: 6 – 92 TAF
- Excess DO: 0 – 2,011 TAF
- Other Costs: 9 – 44 TAF

- Known: Carryover
- Estimate: Inflow (wide range)
- Knob: Releases (mostly regulatory)

Inflow Uncertainty and Regulatory Cost Variability Influence Shasta Fill

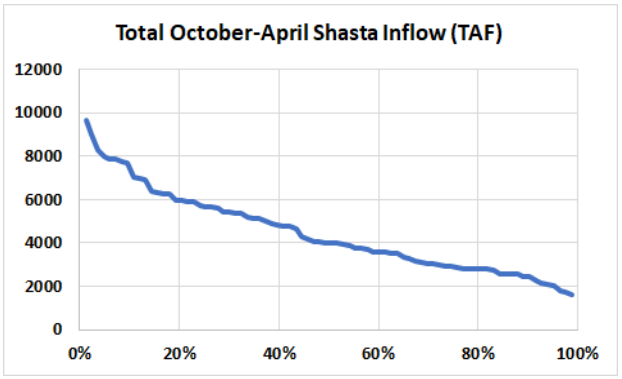


B120 Available (increasing confidence with time)



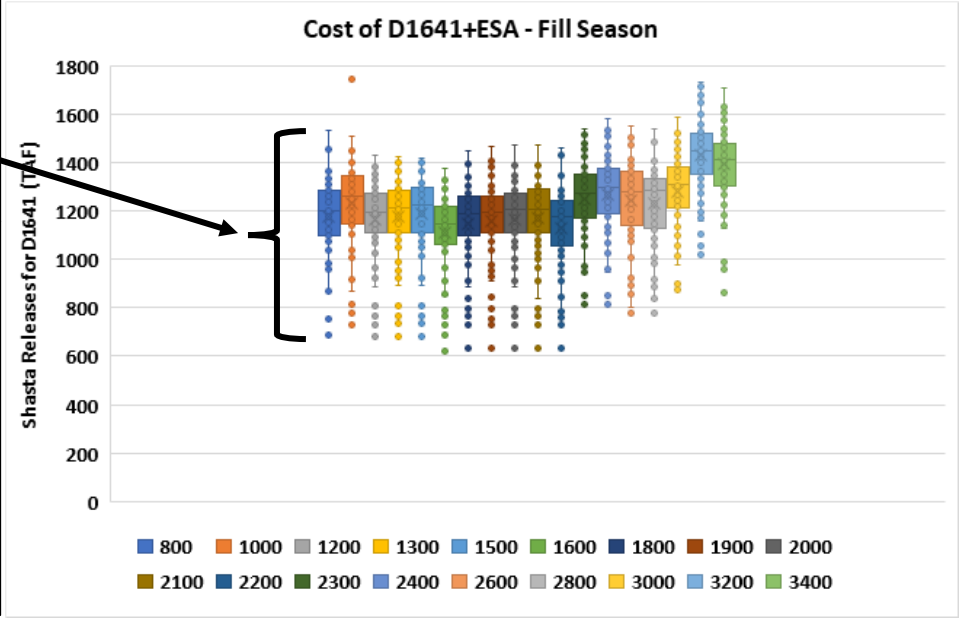
- Each bar is an average of 82 traces
- Averages mask broad variability of regulatory costs over 82 1-year simulations for each initial condition

Fill season inflow totals range from 1.6-9.6 MAF



25% and 75% Exceedance for Fill Season Shasta Expenses

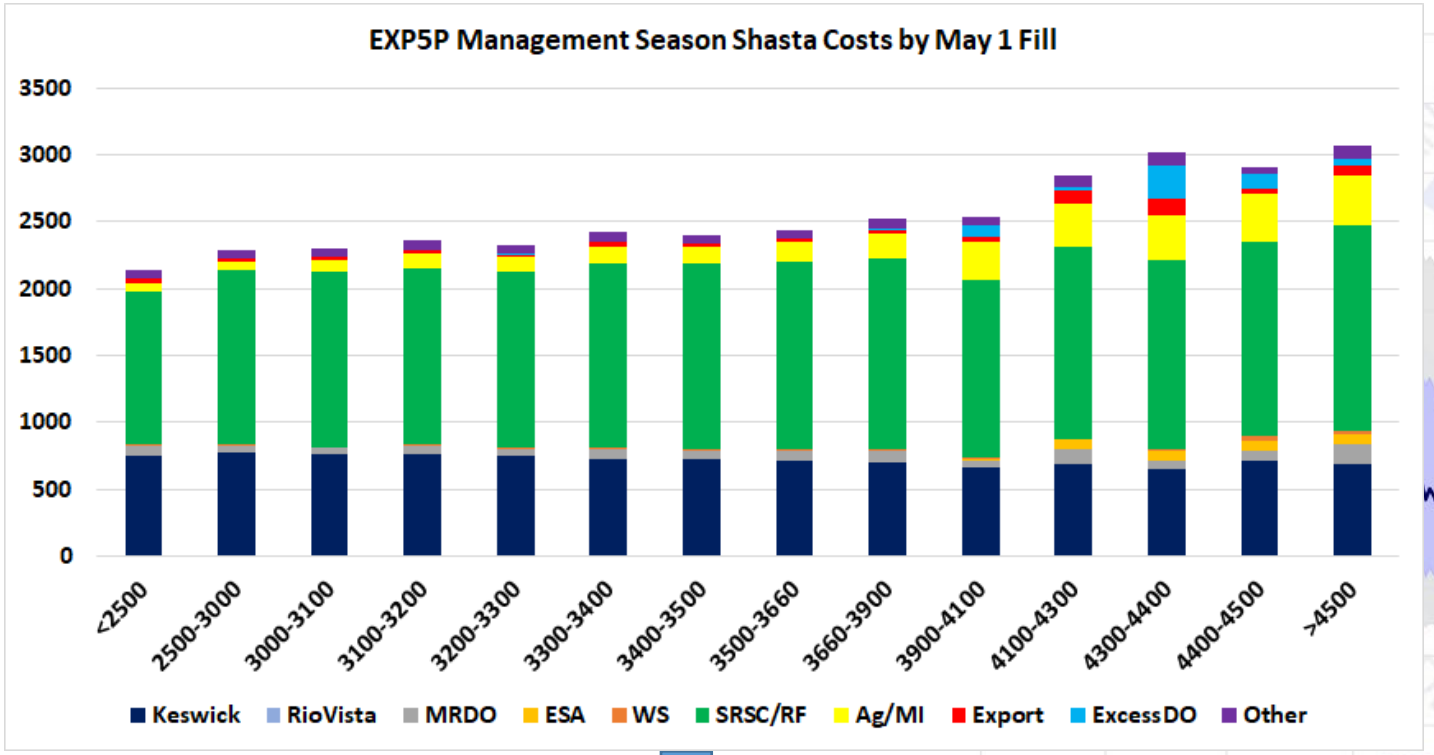
- D1641/MIF/ESA: 1,175 – 1,355 TAF
- SRSC/REF: 5 – 88 TAF
- Delivery+Export: 6 – 92 TAF
- Excess DO (flood ctrl): 0 – 2,011 TAF
- Other Costs: 9 – 44 TAF

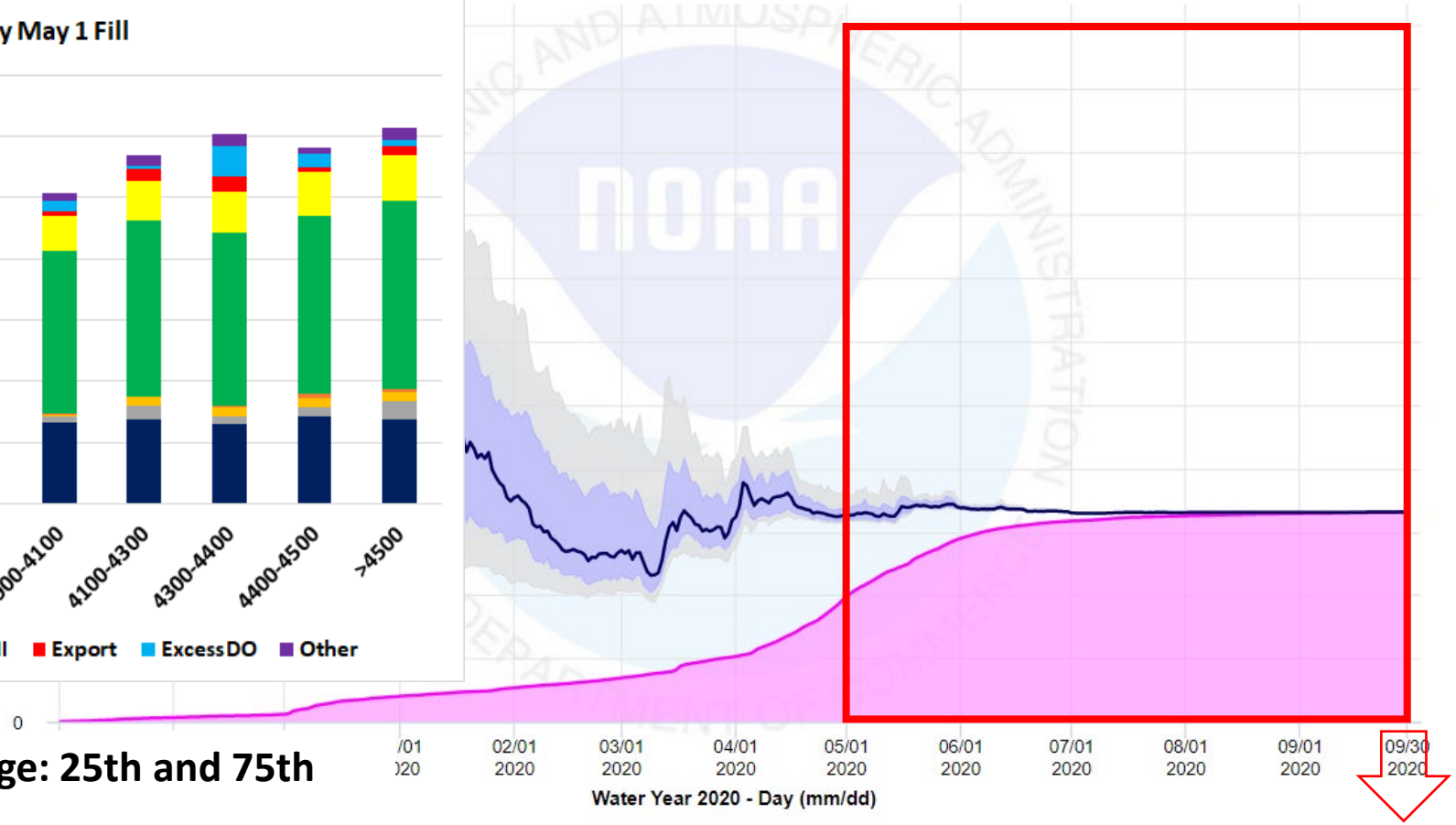


Take Home Messages

- Seasonal planning occurs early in the season
  - Limited, uncertain data
  - Water year type is not known
- Fill Season:
  - Carryover from previous year and historical monthly inflow data (forecast hydrology available later on) are the only available information and reducing regulatory releases is the only knob to meet an end-of-April target.
  - Water year type is still not known – construct goals that are based on the available information

Timeline of Operations – Management Season



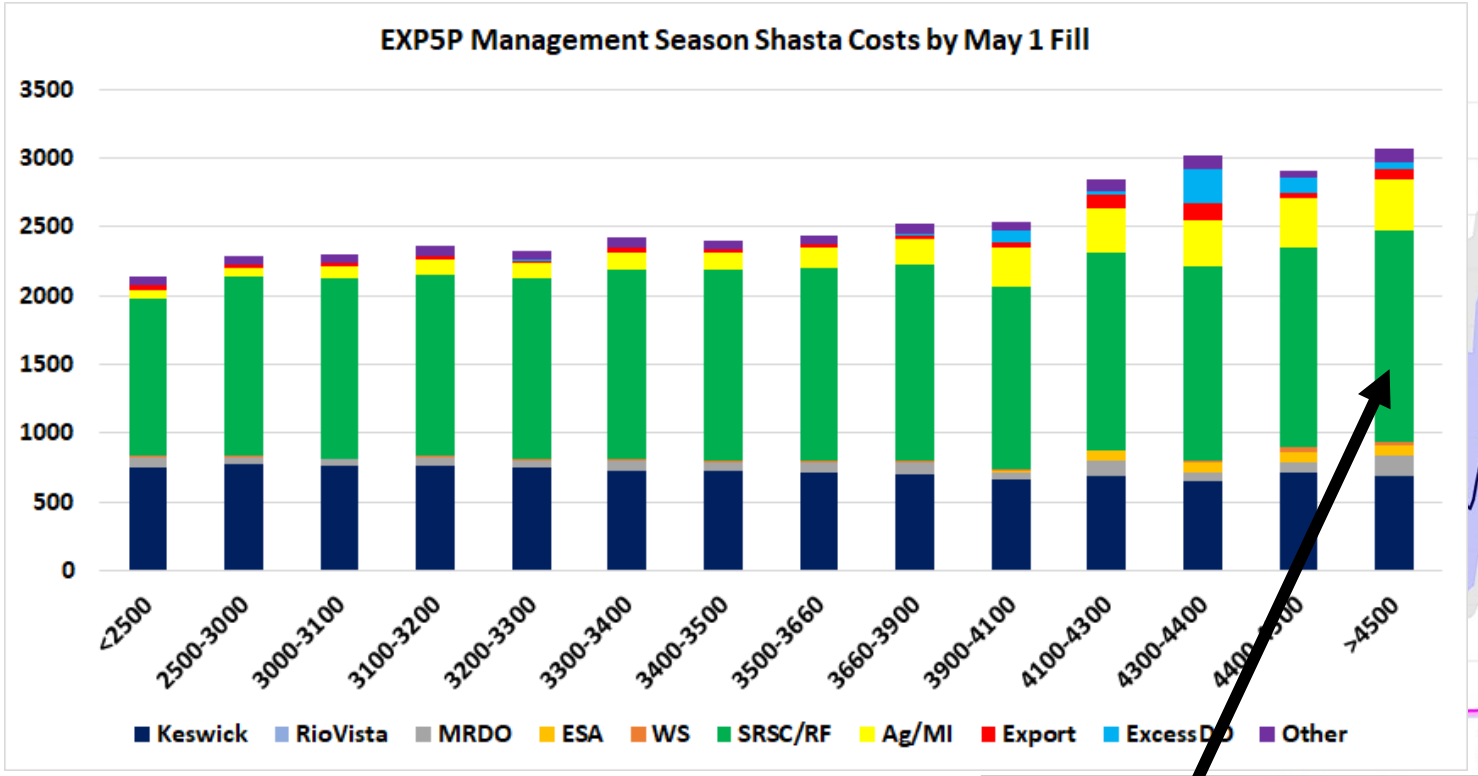


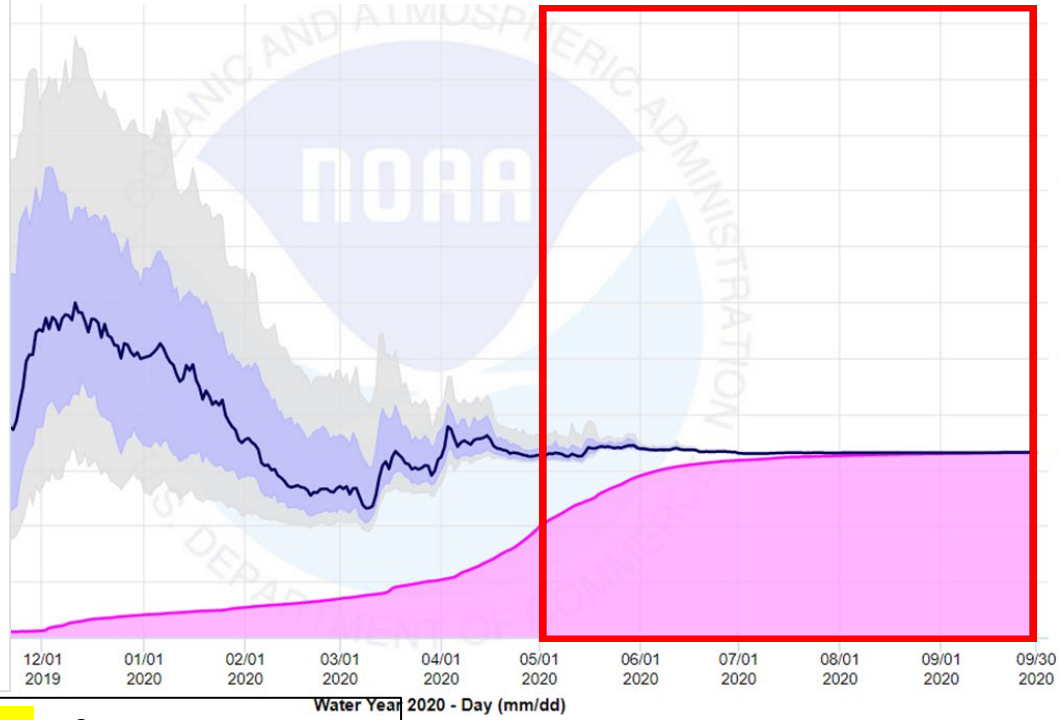
End of September Storage

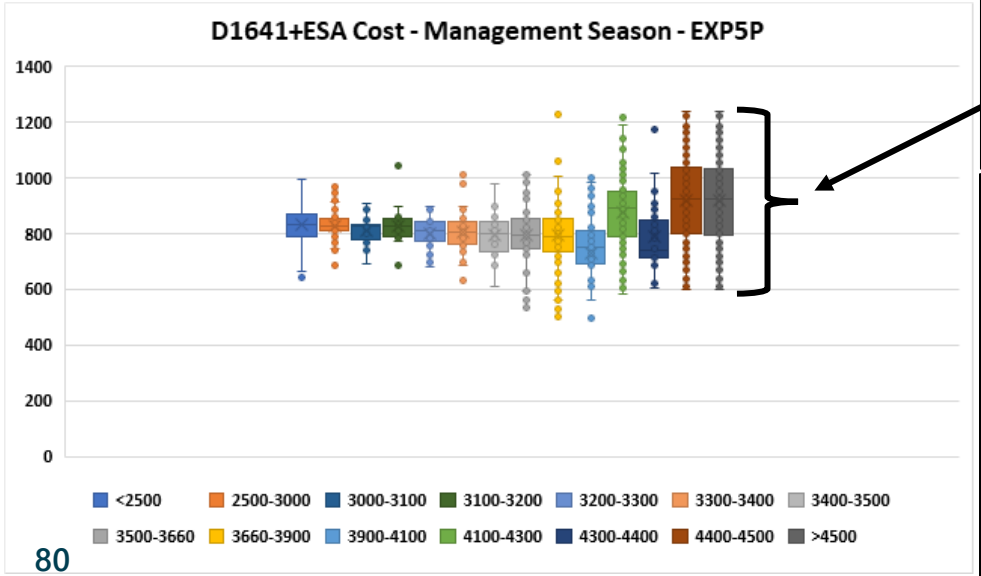
Management Season Shasta Expenses Range: 25th and 75th percentile

- D1641, MIF, ESA: 785 – 929 TAF
- SRSC/REF: 1,293 – 1,551 TAF
- Delivery+Export: 175 – 438 TAF
- Excess DO: 0 – 15 TAF
- Other Costs: 33 – 107 TAF

- Known: Fill
- Estimate: Inflow (high confidence)
- Knob: Deliveries and regulatory releases





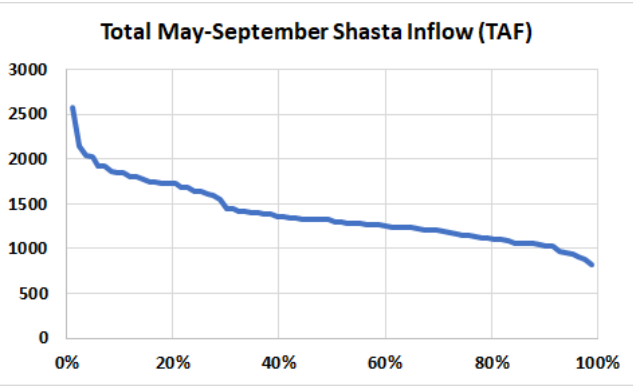


- Each bar is an average of 82 traces
- 82 1-year simulations have broad variability for any May 1 fill status

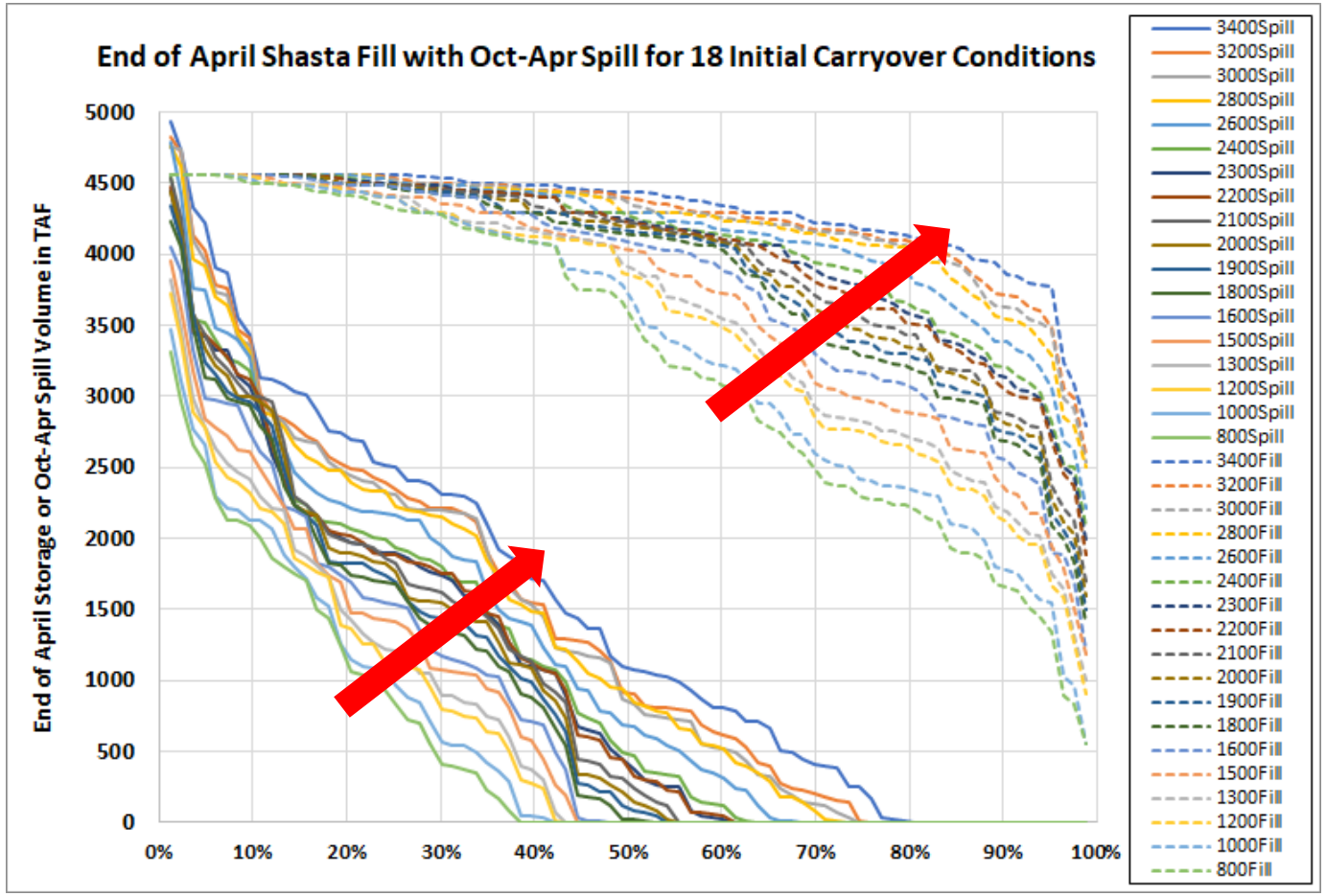
25% and 75% Exceedance for Mgmt Season Shasta Expenses

- D1641, MIF, ESA: 785 – 929 TAF
- SRSC/REF: 1,293 – 1,551 TAF
- Delivery+Export: 175 – 438 TAF
- Excess DO: 0 – 15 TAF
- Other Costs: 33 – 107 TAF

May-Sep inflow totals range from 0.8-2.6 MAF



Carryover/Fill/Spill Tradeoffs



Fill is desirable:

1) For water supply
2) To support cold water pool for river temperature control
3) To provide flow for other environmental needs: D1641/ESA in the management season

The higher the carryover:

1) The more likely to fill to a higher storage
2) The more we spill (some of those spills could have been avoided by deliveries in previous year)
3) The less water supply to work with in the preceding management season to meet water supply and environmental demands

- 18 initial conditions (end of September carryover from previous year)
- 82 1-year traces for each initial condition
- 2035 CT hydrology

Operation	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Hydrologic Forecast			*	x	x	x	x	x	x						*	x	x	x	x
CVP Delivery Commitments					x	x	x	x	x								x	x	x
Temperature Management Plan							*	x											*
File for TUCP	x	x	x	60 days	x	x	x	x	x	x	x	x	x	x	x	60 days	x	x	x
Storage Fill																			
Storage Drain																			
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- Seasonal planning occurs early in the season
  - Limited, uncertain data
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- Fill Season:
  - Carryover from previous year and historical monthly inflow data (forecast hydrology available later on) are the only available information and reducing regulatory releases is the only knob to meet an end-of-April target.
  - Water year type is still not known – construct goals that are based on the available information
- Management Season:
  - Reservoir releases needed to meet regulatory criteria still have uncertainty in the management season.
  - The higher end of September target, the higher the fill next year, the less water we have for seasonal management; the more water supply loss including spills in the next winter