

Colorado Portion of URGWOM

Compact Methodology Review & AC Progress Update

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Approach Described

- Review Expression slot RPL and lookup tables: Do the tables match the Compact and is the logic sound?
- Historical simulation: Does the model replicate historical deliveries given historical data as input?
- Rulebased Simulation: Does the simulated Compact balance remain near zero?
- Both simulations ran using hydrologic data from 11/1/1981 to 10/31/2012
- Contained in CompactCalculation data object

- All the lookup tables match the Compact
- A few mistakes were found and corrected in expression slots
- Historical simulation performed.
 - Compact balance of the Rio Grande + Conejos was reasonable.
 - Should improve with calibration

Improvements

- Refined values in AssumedAverageLossGainRate-IndexGagesToDeliveryLocation to roughly calibrate curtailment calculation.
- Added logic to force the curtailment to 1 if total debit exceeded 100,000 acre-ft.
 - Max debit is split 60/40 between Rio Grande and Conejos, respectively
 - Is only used once in 1982 – 2011 simulation on Rio Grande
- Irrigation season curtailments start at April 1 – total lag for each basin.
 - This puts water in the allocatable supply chain for start of irrigation season

Improvements: Curtailing All Inflows U/S of Index Gages

```

IF ( @"t" >= @"March 27"
    AND @"t" <= @"October 31"
    AND CompactCalculations.RioGrandeCumulativeDeparture [@"t - 1"] <= ( 1.00000000
        - CompactCalculations.ClosedBasinProjectContributionToConejosDelivery [ ]
        * CompactCalculations.LimitsToCumulativeDepartureRioGrandeAndConejos [ "CumulativeDeparture", ]
    ) ) THEN
IF ( CompactCalculations.DesignatedPeriodForUpdatingCompactCurtailment [ "1=Daily,2=Weekly,3=Monthly", ] == 1.00000000
    OR ( CompactCalculations.DesignatedPeriodForUpdatingCompactCurtailment [ "1=Daily,2=Weekly,3=Monthly", ] == 2.00000000
        AND @"t" == @"Monday"
    OR ( CompactCalculations.DesignatedPeriodForUpdatingCompactCurtailment [ "1=Daily,2=Weekly,3=Monthly", ] == 3.00000000
        AND GetDayOfMonth (@"t") == 1.00000000 "day"
    ) ) ) THEN
Min ( Max ( CompactCalculations.RioGrandeCumulativeDeparture [ ]
    * ( 1.00000000
        - CompactCalculations.AssumedAverageLossGainRateIndexGagesToDeliveryLocation [ "LossRate", ]
        ) )
    , Max ( CompactCalculations.RioGrandeProjectedIndexFlowForRemainderOfYear [ ], )
    , 0.010000000 "acre-feet"
    , 0.00000000
    , 1.00000000
)
ELSE
    NaNToZero ( CompactCalculations.RioGrandeCompactCurtailmentPercentage [@"t - 1"] )
END IF
ELSE
    1.00000000
END IF

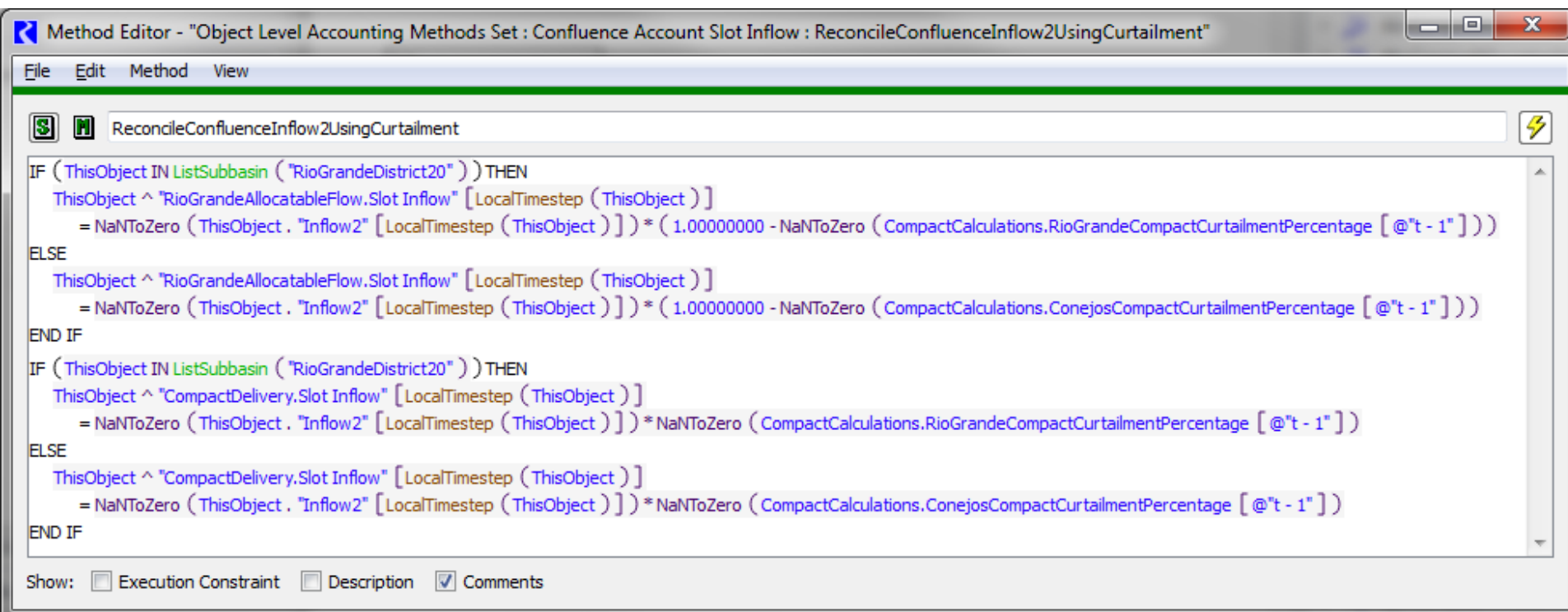
```

Calculated using **all** inflows U/S of index gages.

...but not all inflows U/S of index gage got curtailed. Some always went 100% to allocatable flow.

Curtailing All Inflows U/S of Index Gages (Cont.)

- Object Level Accounting Methods used to curtail all local and tributary inflows upstream of index gages.
- Methods can be set under Accounting Methods



Method Editor - "Object Level Accounting Methods Set : Confluence Account Slot Inflow : ReconcileConfluenceInflow2UsingCurtailment"

```

File Edit Method View

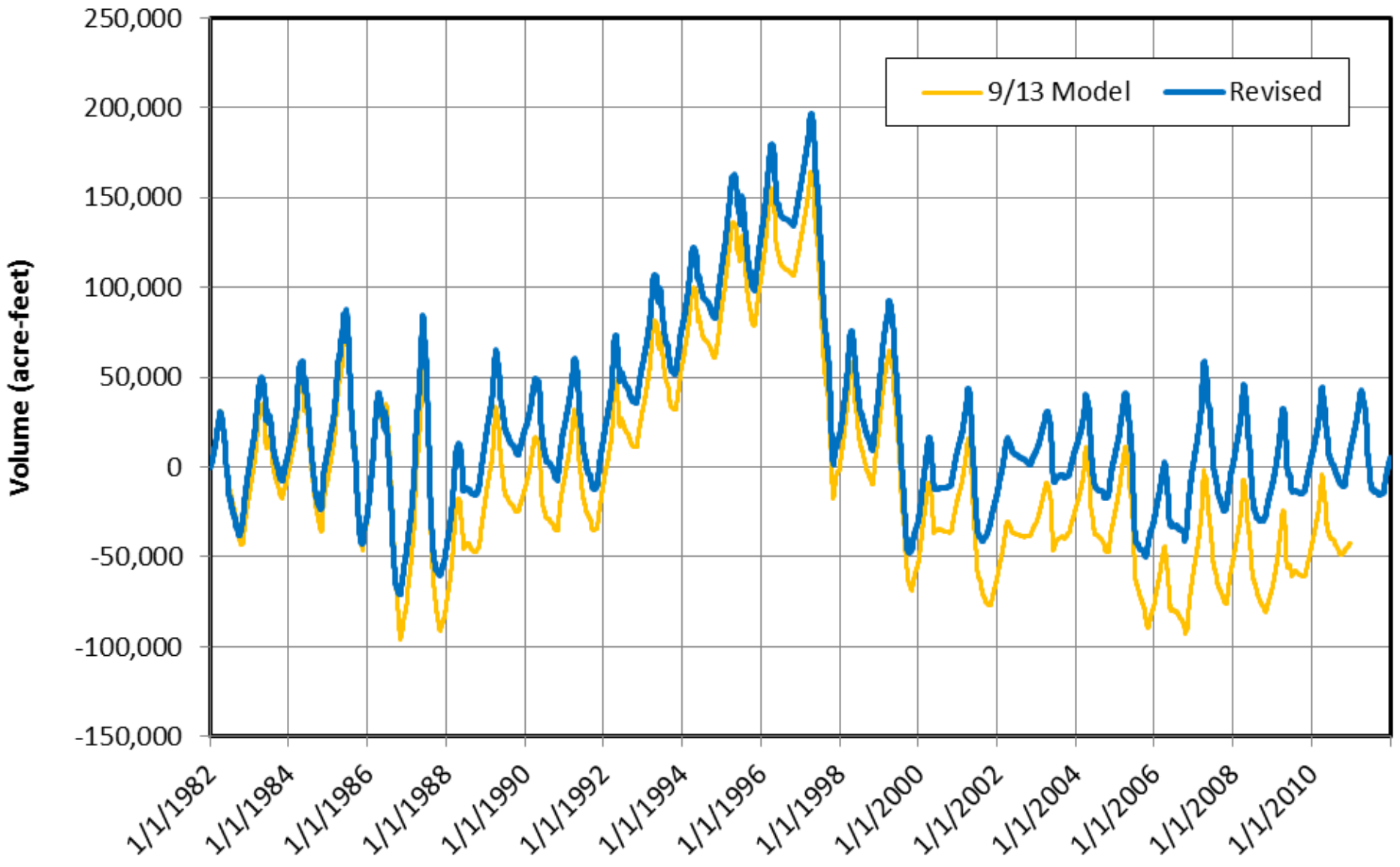
ReconcileConfluenceInflow2UsingCurtailment

IF ( ThisObject IN ListSubbasin ( "RioGrandeDistrict20" ) ) THEN
  ThisObject ^ "RioGrandeAllocatableFlow.Slot Inflow" [ LocalTimestep ( ThisObject ) ]
    = NaNToZero ( ThisObject . "Inflow2" [ LocalTimestep ( ThisObject ) ] ) * ( 1.00000000 - NaNToZero ( CompactCalculations.RioGrandeCompactCurtailmentPercentage [ @"t - 1" ] ) )
ELSE
  ThisObject ^ "RioGrandeAllocatableFlow.Slot Inflow" [ LocalTimestep ( ThisObject ) ]
    = NaNToZero ( ThisObject . "Inflow2" [ LocalTimestep ( ThisObject ) ] ) * ( 1.00000000 - NaNToZero ( CompactCalculations.ConejosCompactCurtailmentPercentage [ @"t - 1" ] ) )
END IF

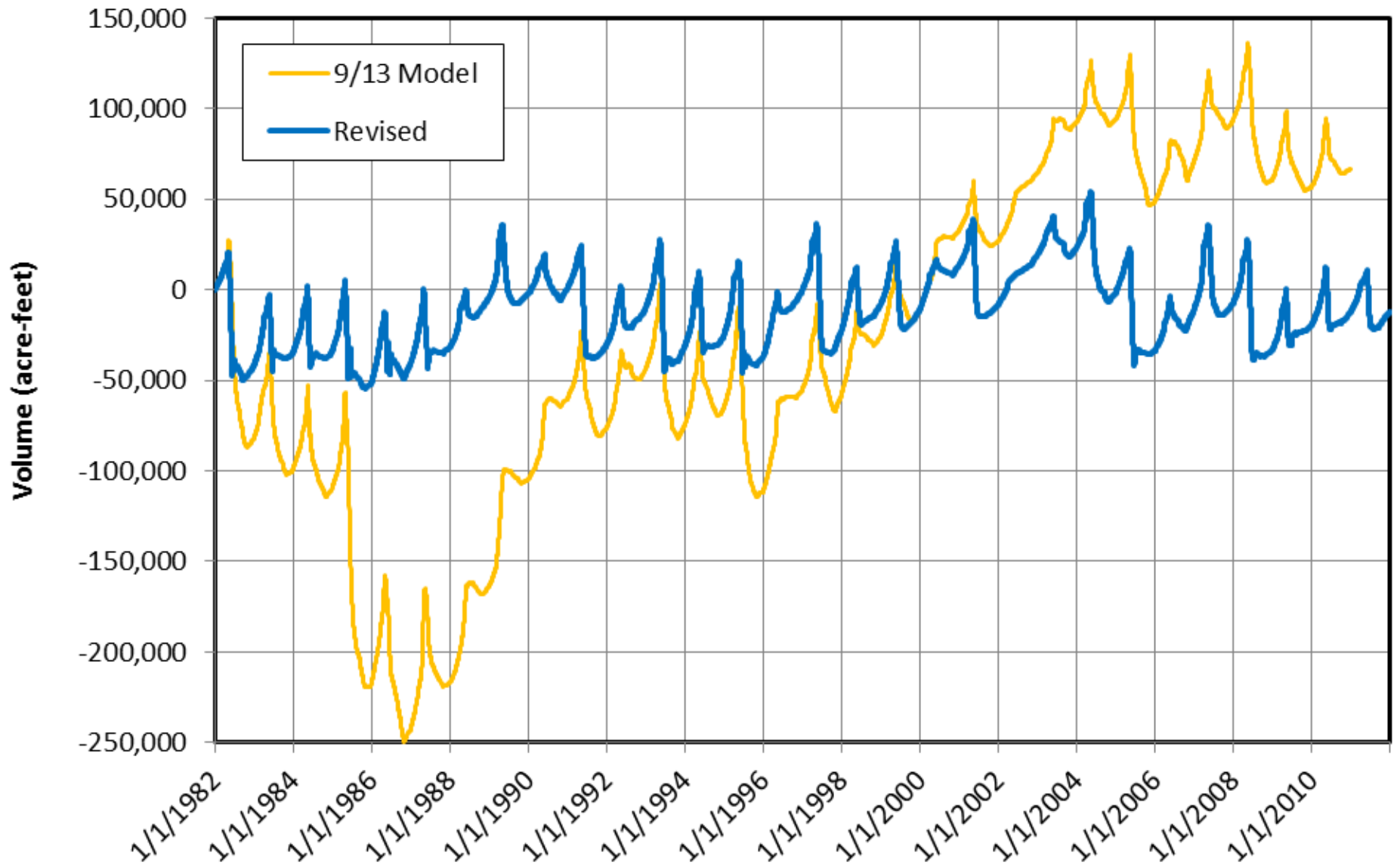
IF ( ThisObject IN ListSubbasin ( "RioGrandeDistrict20" ) ) THEN
  ThisObject ^ "CompactDelivery.Slot Inflow" [ LocalTimestep ( ThisObject ) ]
    = NaNToZero ( ThisObject . "Inflow2" [ LocalTimestep ( ThisObject ) ] ) * NaNToZero ( CompactCalculations.RioGrandeCompactCurtailmentPercentage [ @"t - 1" ] )
ELSE
  ThisObject ^ "CompactDelivery.Slot Inflow" [ LocalTimestep ( ThisObject ) ]
    = NaNToZero ( ThisObject . "Inflow2" [ LocalTimestep ( ThisObject ) ] ) * NaNToZero ( CompactCalculations.ConejosCompactCurtailmentPercentage [ @"t - 1" ] )
END IF

Show:  Execution Constraint  Description  Comments
  
```

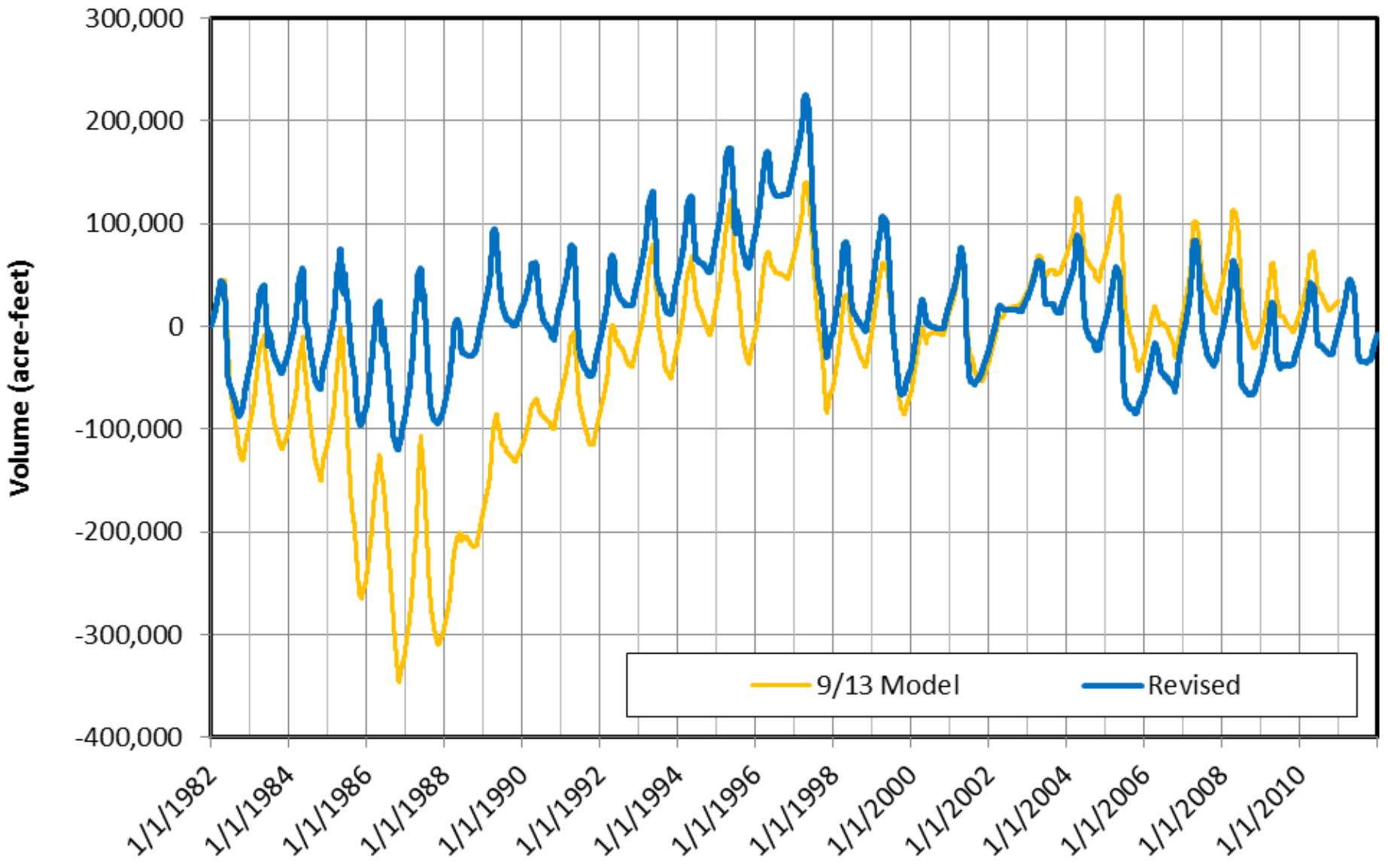
RBS Results: Rio Grande Balance



RBS Results: Conejos Balance



RBS Result: Rio Grande & Conejos Balance



RBS Results: Summary Statistics

Statistic	Rio Grande		Conejos		Rio Grande + Conejos	
	<i>Sept. 2013</i>	<i>Feb. 2015</i>	<i>Sept. 2013</i>	<i>Feb. 2015</i>	<i>Sept. 2013</i>	<i>Feb. 2015</i>
Minimum	-78,200	-48,000	-242,900	-51,900	-319,100	-88,900
Quartile 1	-53,100	300	-99,400	-33,200	-97,500	-25,900
Median	-18,400	9,200	-55,300	-12,400	-18,800	-6,000
Quartile 3	-2,500	20,500	56,800	-4,500	14,800	28,100
Maximum	124,500	154,800	93,800	23,200	69,200	154,500

Statistics are calculated from end-of-year balance. All values have units of acre-feet.

Compact Evaluation Conclusions

- No logic added to limit credit to 150,000 acre-feet; so each cumulative departure slot accurately represents under/over delivery of CO to NM
- Compact methods were reviewed and corrected. Still room for additional improvements/methodology calibration
- Model calibration and improvement of Platoro operational policy will complement the improvements made to curtailment methodology and the accuracy of the model

CO Portion Model: Progress Summary

Ruleset Descriptions and Changes

- Draft descriptions added for all rules
- Remaining work is in progress

Rio Grande & Santa Maria Reservoirs

- Technical Team decided not to add because they will not contribute anything significant to model

Accounting Model Layout Improvements

- Work complete

CO Portion Model: Progress Summary (Cont.)

Review Existing Compact Calculation Methods

- Work is complete, pending Tech Team review

Coord. w/ CDWR to determine Platoro Ops

- Work is in progress

Combine w/ Main Model

- Work has not started

- All work will be documented in a final report