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Managing Water in the West

Computing Natural Flows in the Colorado River Basin

March 1, 2005
RiverWare User Group Meeting

U.S. Department of the Interior
Bureau of Reclamation

Why Recompute Natural Flow?

- Natural flow is required input for CRSS
- Addressing Data Inconsistencies
  - Recomputing natural flow from 1971-95

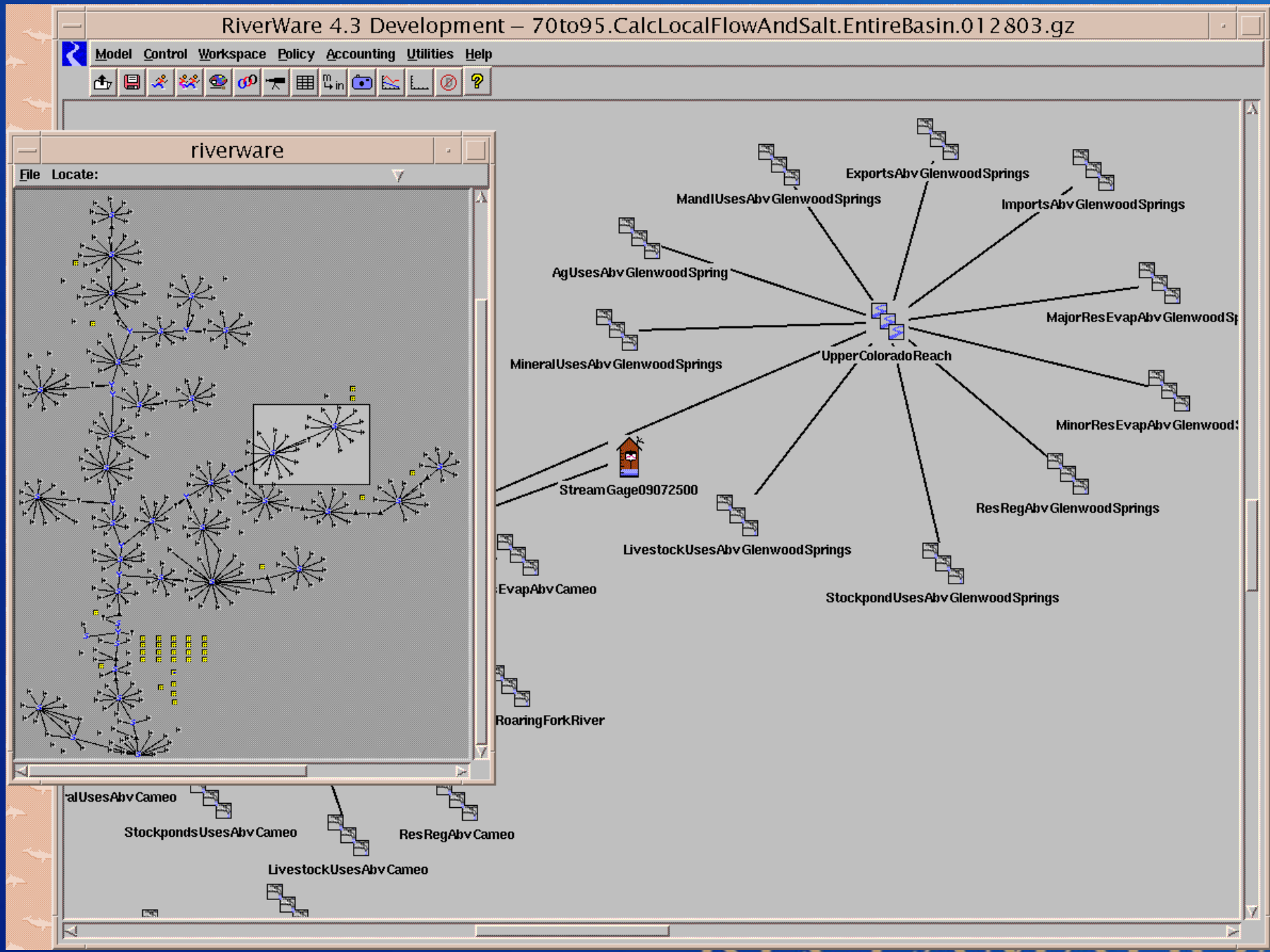
    Natural Flow = Historic Flow

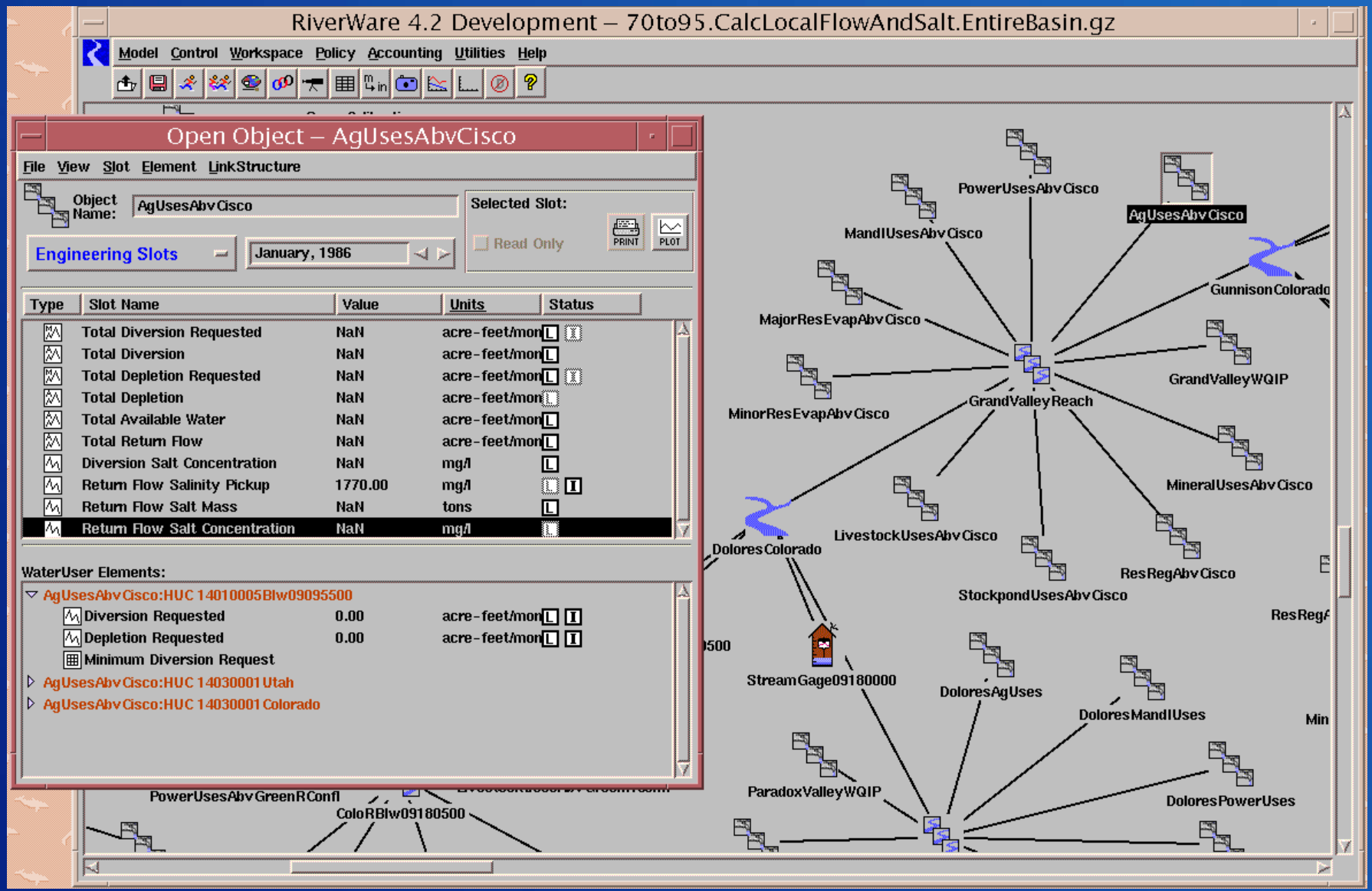
    + Consumptive Uses and Losses

    +/- Reservoir Regulation
- Addressing Methodological Inconsistencies
  - RiverWare model computes natural flow
    - Ensures consistency
- Limited Documentation

Basic Model Inputs

- Historic USGS gauge data
  - 29 gauges
- Historic main-stem reservoir outflow and pool elevations
  - 12 main-stem reservoirs
- Historic off-stream reservoir change in storage
  - 24 off-stream reservoirs
- Consumptive uses and losses
  - 9 categories in Upper Basin
  - Decree Data in Lower Basin


RiverWare 4.3 Development – 70to95.CalcLocalFlowAndSalt.EntireBasin.012803.gz
Model Control Workspace Policy Accounting Utilities Help
riverware
File Locate:
ExportsAbvGlenwoodSprings
MandIUsesAbvGlenwoodSprings
ImportsAbvGlenwoodSprings
AgUsesAbvGlenwoodSpring
MajorResEvapAbvGlenwoodSp
MineralUsesAbvGlenwoodSprings
UpperColoradoReach
MinorResEvapAbvGlenwood
StreamGage09072500
ResRegAbvGlenwoodSprings
LivestockUsesAbvGlenwoodSprings
StockpondUsesAbvGlenwoodSprings
EvapAbvCameo
RoaringForkRiver
alUsesAbvCameo
StockpondsUsesAbvCameo
ResRegAbvCameo
LivestockUsesAbvCameo



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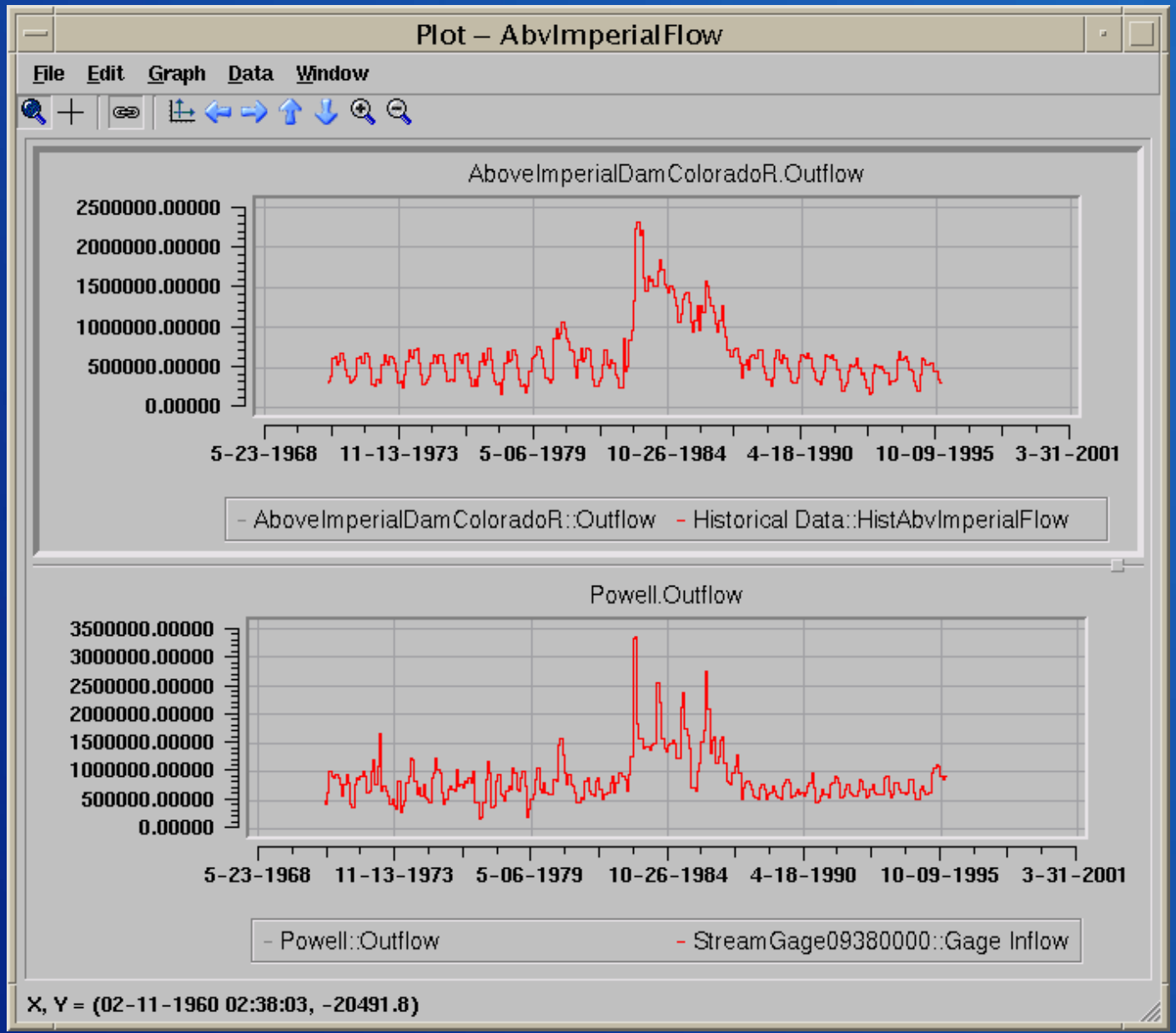
Model Outputs

- Natural flow for each reach
  - 20 reaches in the Upper Basin
  - 9 reaches in the Lower Basin
- Output from model via
  - DMI to HDB
  - .rdf file

Verifying Model Results

- After data input :Output following
  - Historic Gauges
  - CU and L data
  - Reservoir Regulation
- Verify data is same as that input
- Run natural flow model in reverse
  - Check that gauge data is simulated exactly



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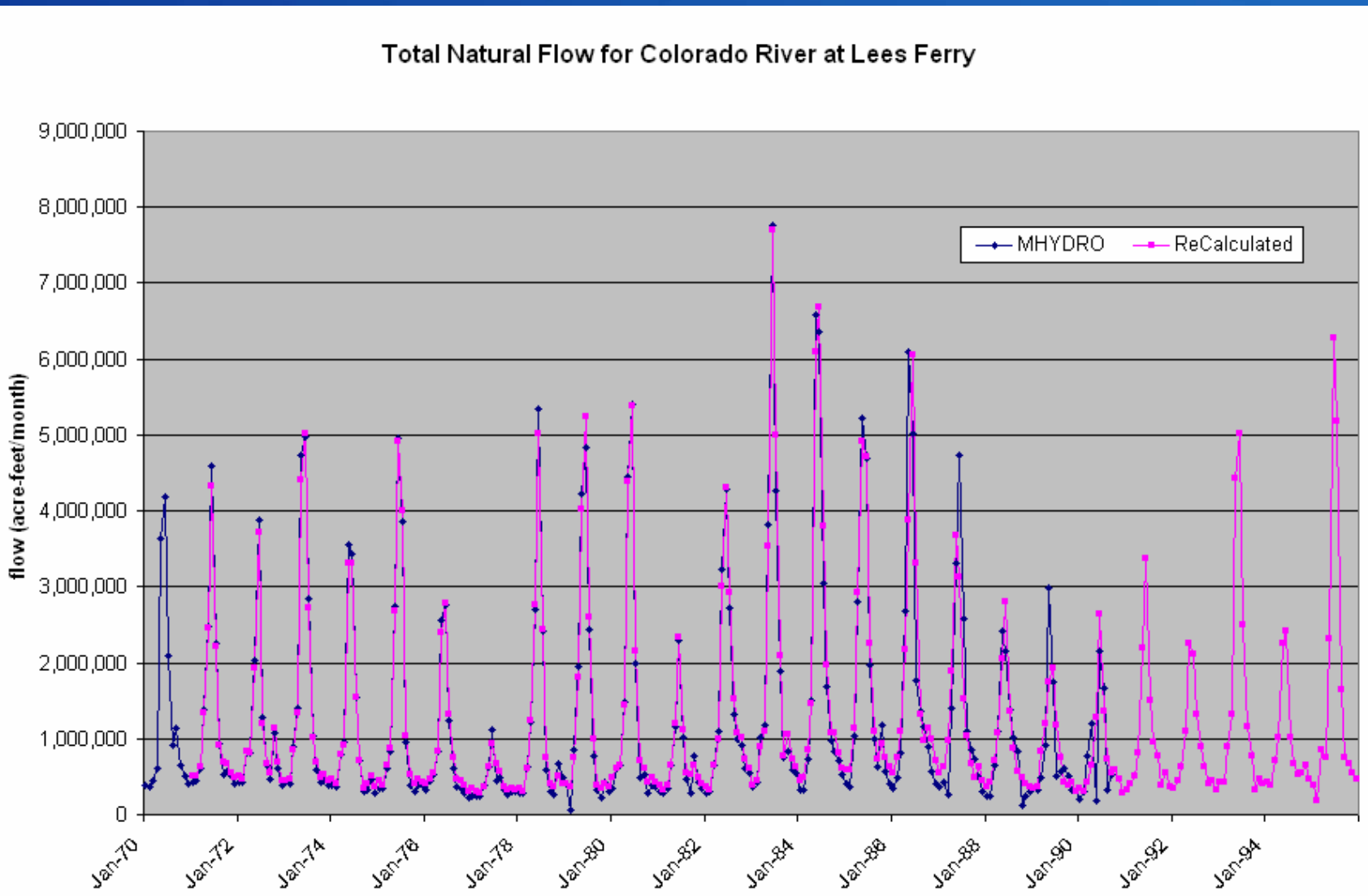
Comparison of “Official” and Recomputed Natural Flow

- Recomputed minus MHYDRO

  Average annual difference 1971-90

  (acre-feet/year)

  – Green: 158,577 (3%)
  – Colorado: 1,908 (0%)
  – San Rafael: -7,169 (-4%)
  – San Juan: 80,104 (4%)
  – Upper Basin: 601,636 (4%)
  – Lower Basin: 528,556 (3%)



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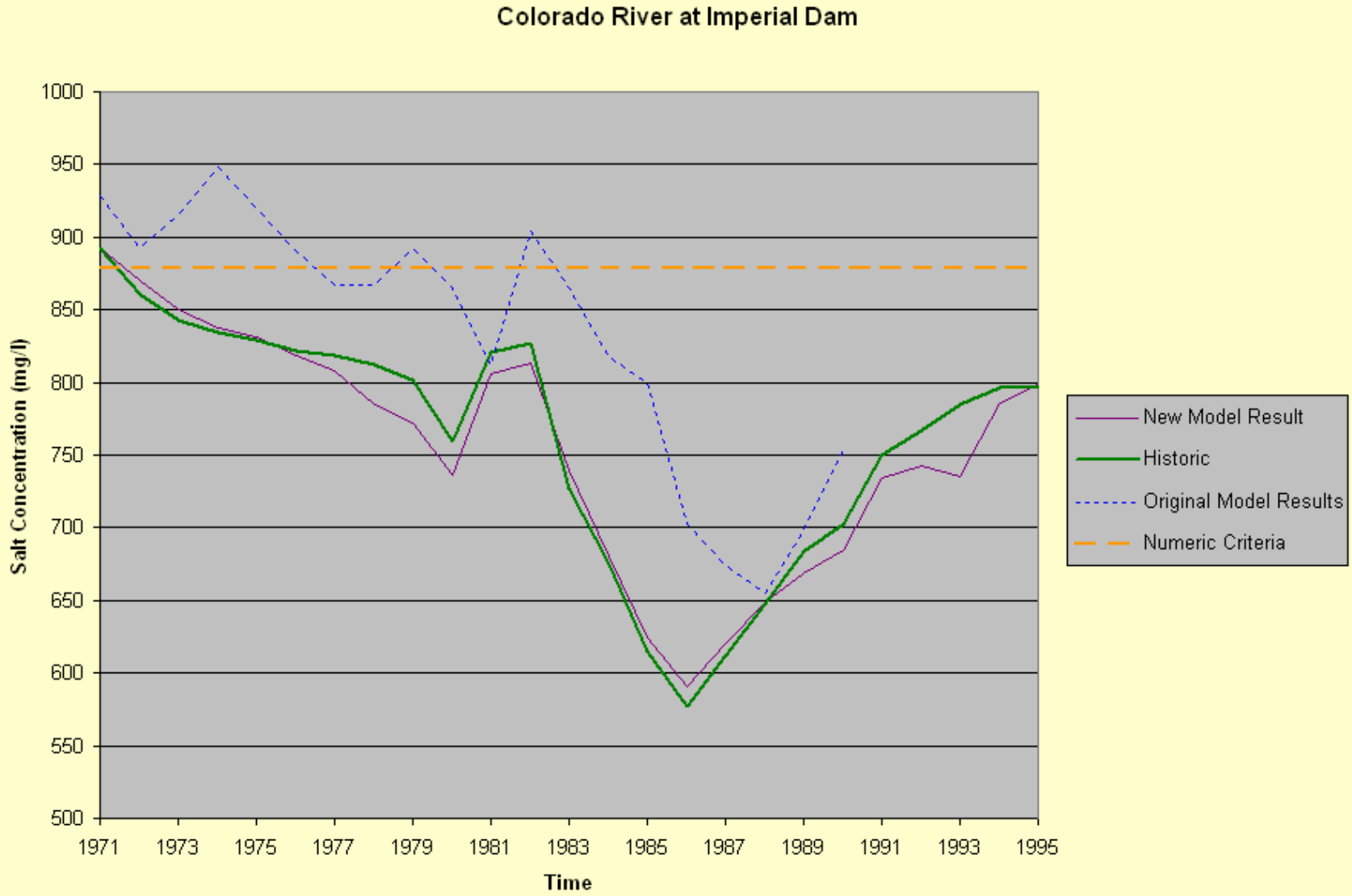
Publications

- Reclamation, (2004). “Draft Upper Basin Consumptive Uses and Losses Report as Revised After Peer Review 1971-1995.”
- Clayton, R., (2004). “Upper Colorado River Consumptive Use Determination at CRSS Natural Flow Node Locations CY 1971-1995.”
- Prairie, J., and Callejo, R., (2005). “Natural Flow And Salt Computation Methods 1971-1995”

Salinity Model Connection

- Future projections for long-term planning
  - Numeric Criteria
- Original salinity model over-prediction
- Brief description of solution
  - Modeling natural salt
  - Submodel computes
    - natural salt = *f* (natural flow)
- 2005 Triennial Review



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Concluding Remarks

- Reclamation has removed both data and methodological inconsistencies
- Natural flow data is dynamic
- The computation can be readily understood
- Model can easily be linked to external database

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For further information:
http://cadswes.colorado.edu/~prairie

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