A Model for Determining Usable Water from Two Gila River Diversion and Storage Alternatives

Jim Brainard

Norm Gaume

Peter Coha

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Modeling Objectives

1) Quantify usable project water
   - Water the project would make available for supplemental irrigation and export over the continental divide
2) Illustrate the impact of project losses on usable water

Approach

- Simulate diversion of peak flows to storage reservoirs in accordance with legal restrictions (CUFA)
- Simulate reservoir releases
  - Augment low flows
    - Supplemental irrigation
    - Environmental mitigation – add water to the river when low
  - Water for Deming
    - Deming asked the ISC on Aug 26 for 2500 AF/year
- Simulate project losses
  - Diversion and conveyance losses
  - Seepage and evaporation losses

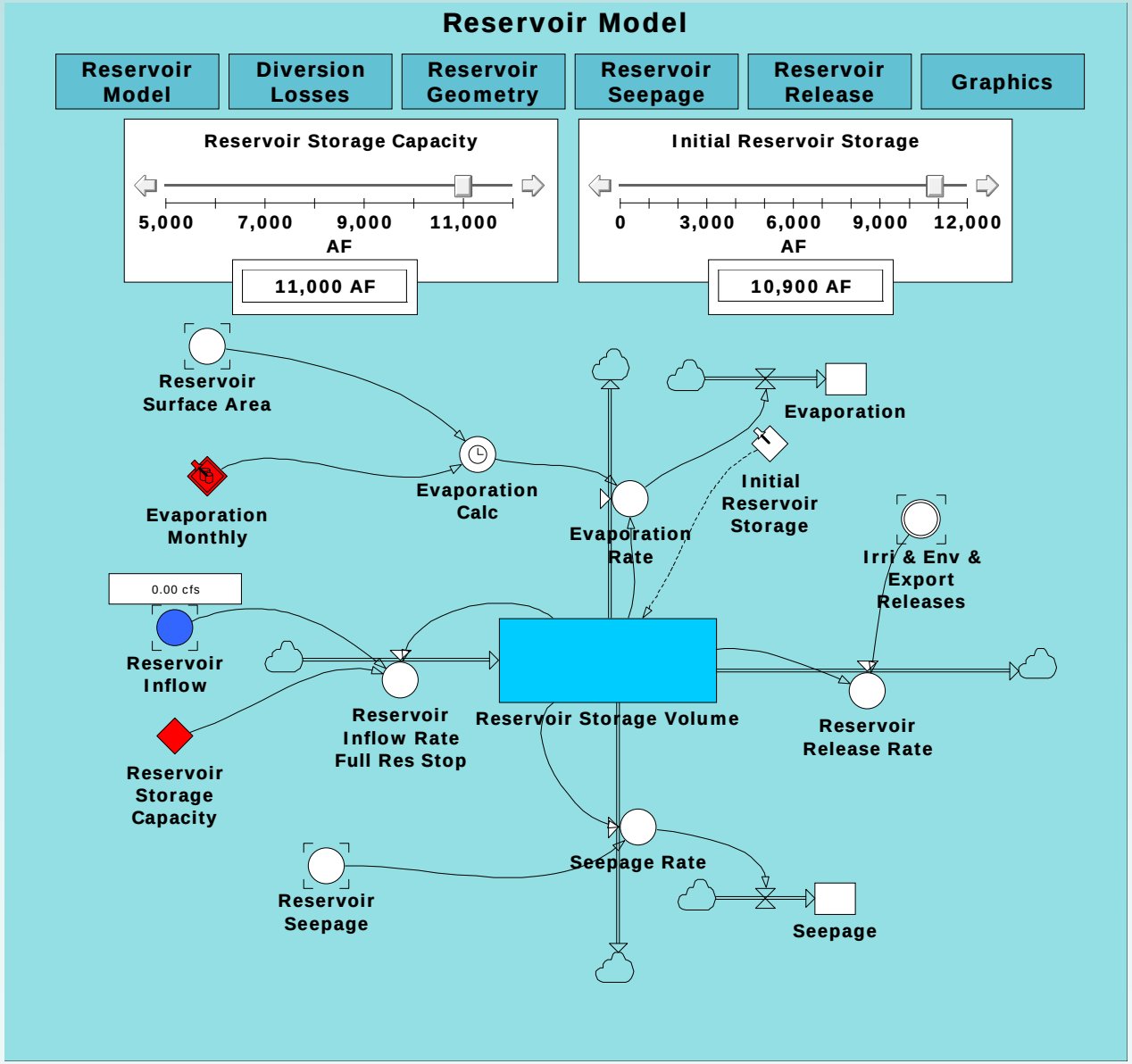
Model Background

- Model is built in Powersim Studio 10®
  - Time series simulations
  - Tracks flows and accumulates those flows
    - Mass balance approach (Bathtub modeling)
  - Easy incorporation of feedback between accumulations and flow
  - Efficient model building with user friendly interface
    - Fast runtimes
    - User can easily change variables of interest and re-run the models
      - Graphical comparison of results from different runs

Gila River Diversion Models

- Two Models
  - Mogollon Canyon Reservoir and Diversion Model
    - I will only show the Mogollon model in this presentation
  - Sycamore and Greenwood Canyon Reservoir and Diversion model

Mogollon Canyon Model



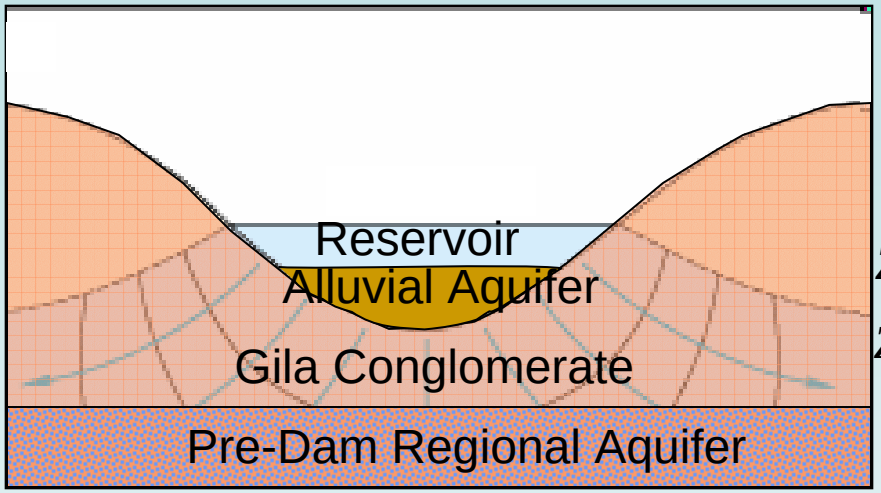
Data Sources

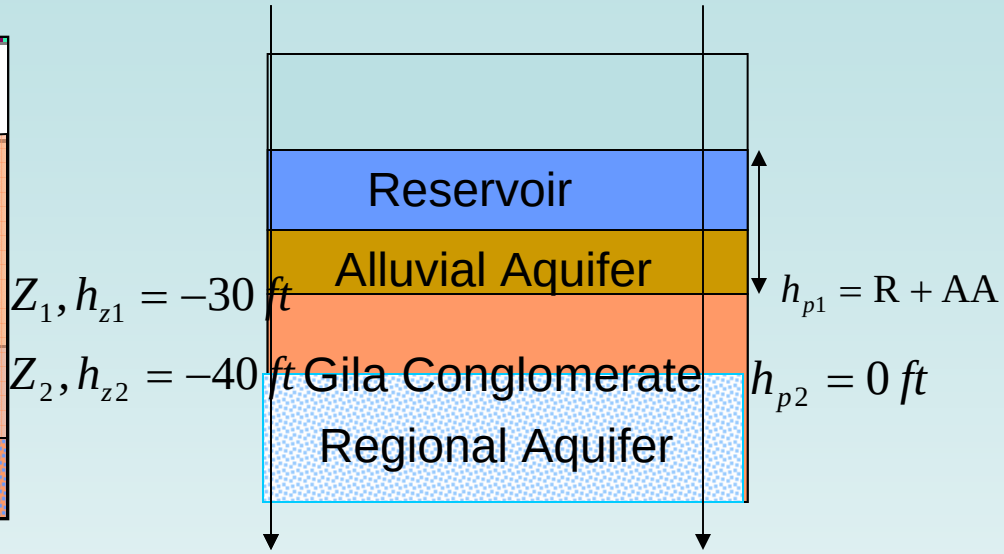
- Reservoir dam location, storage capacity, full pool elevation:
  - BoR Appraisal Level Report (July 2014)
- Reservoir Surface Area at Full Pool:
  - Jeff Boyd (Mogollon), Google Earth (Sycamore and Greenwood)
- Reservoir Inflow:
  - Corrected CUFA model output (Peter Coha)

Data and Information Sources

- Open Water Evaporation:
  - USDA National Resource Conservation Service
- Seepage Parameter (Hydraulic Conductivity):
  - BoR (2014), RJH Consultants, Inc (2014)., Finch et al. (2008), Hanson (1994)
- Hydrologeologic Parameters:
  - BoR (2014), Trauger (1972) Hawley et al (2000), Hawley (personal communication)
- Reservoir Release Assumptions:
  - City of Deming export constant at 2500 AF/year
  - up to 10 cfs for supplemental irrigation and for environmental mitigation

Conceptual Model for Seepage





$$Q = -KA\frac{dH}{dZ}$$

$Q = \text{Volumetric Flow Rate}$

$K = \text{Hydraulic Conductivity}$

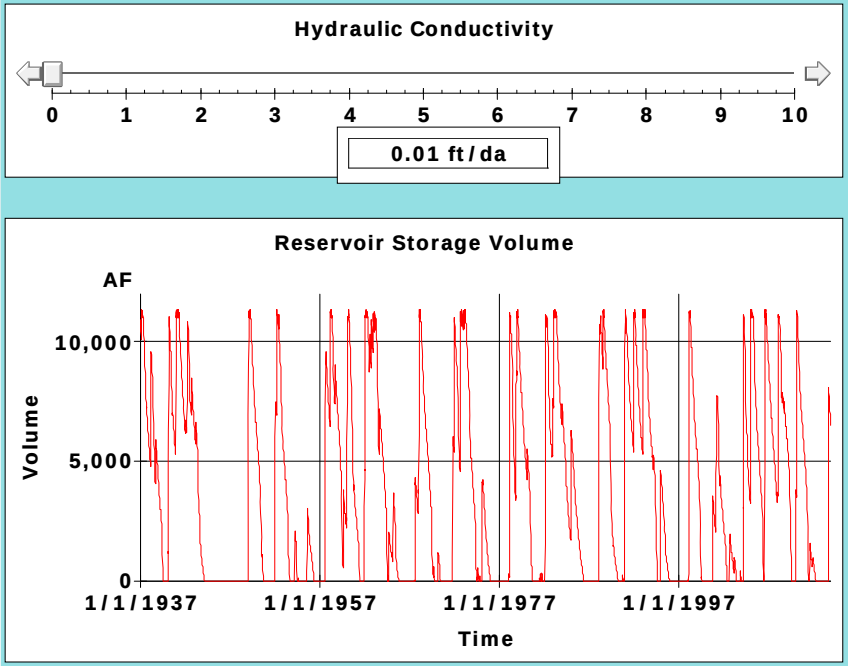
$A = \text{Cross–Sectional area of Flow}$

$$\frac{dH}{dZ} = \frac{H_2 - H_1}{Z_2 - Z_1}$$

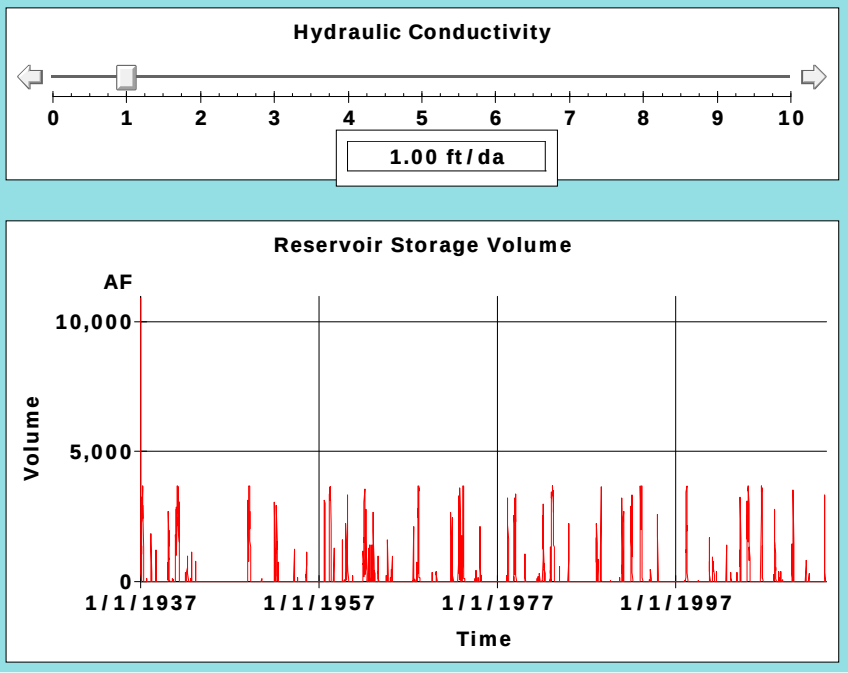
$$H = h_p + h_z$$

Results: Reservoir Storage

.01ft/day

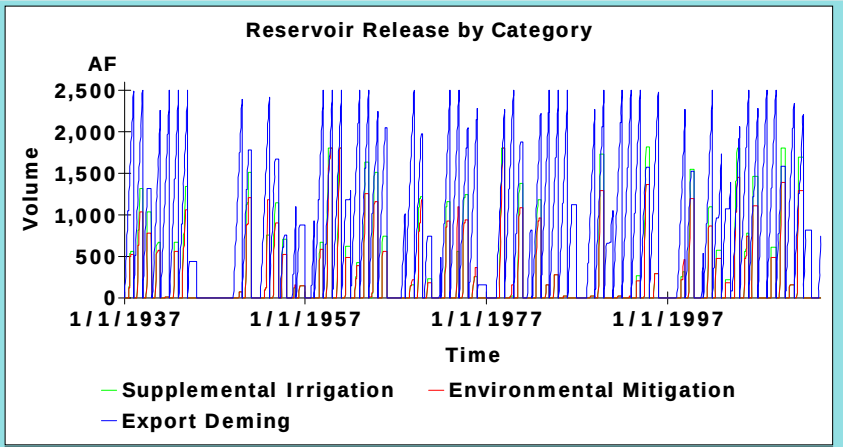


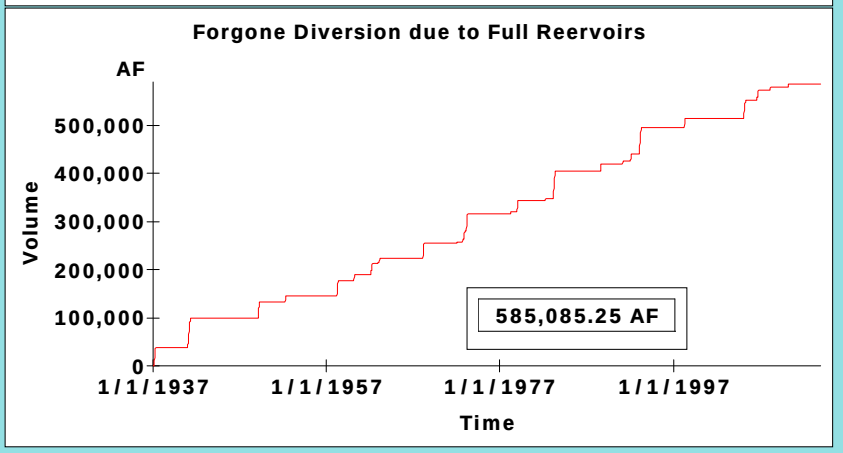
1ft/day



Releases & Foregone Diversions

.01ft/day





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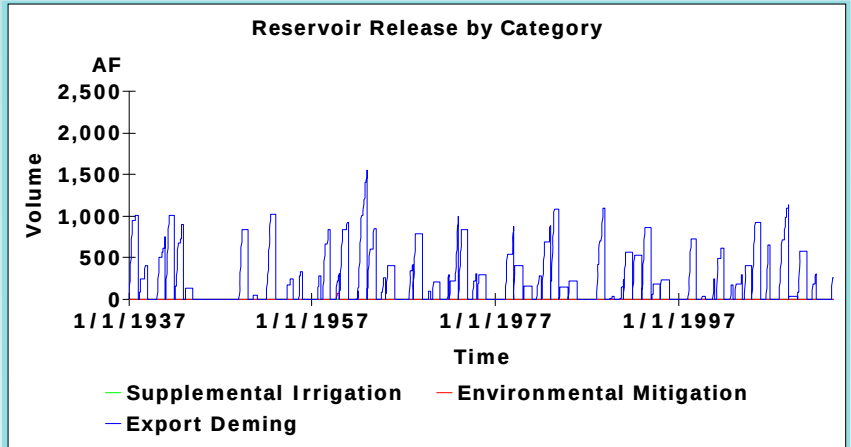
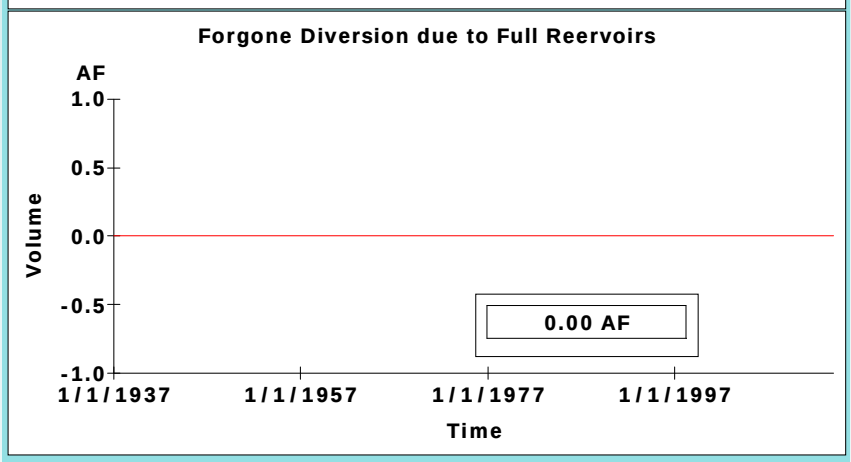
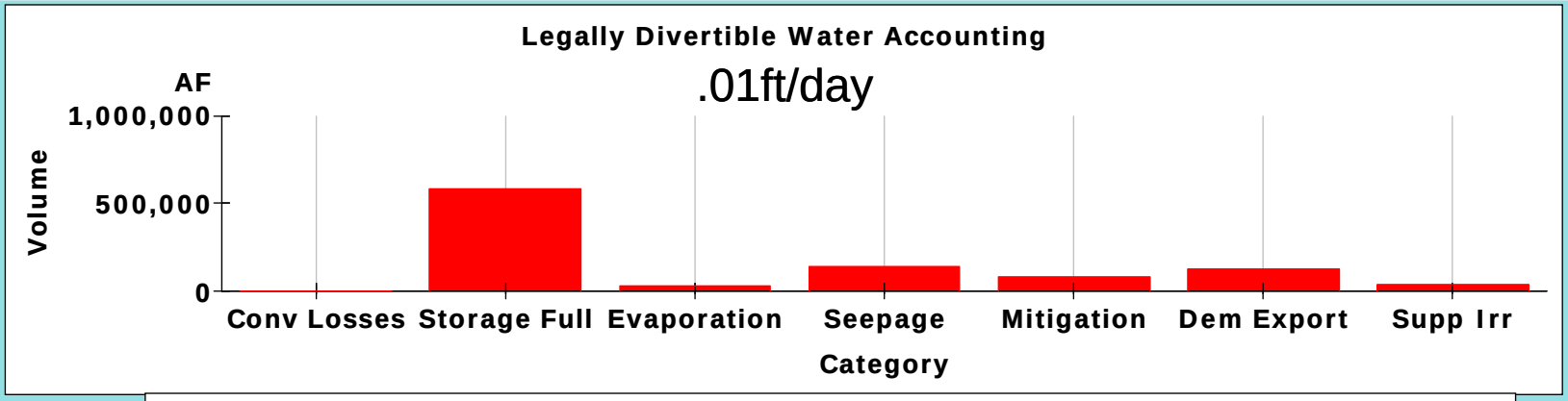
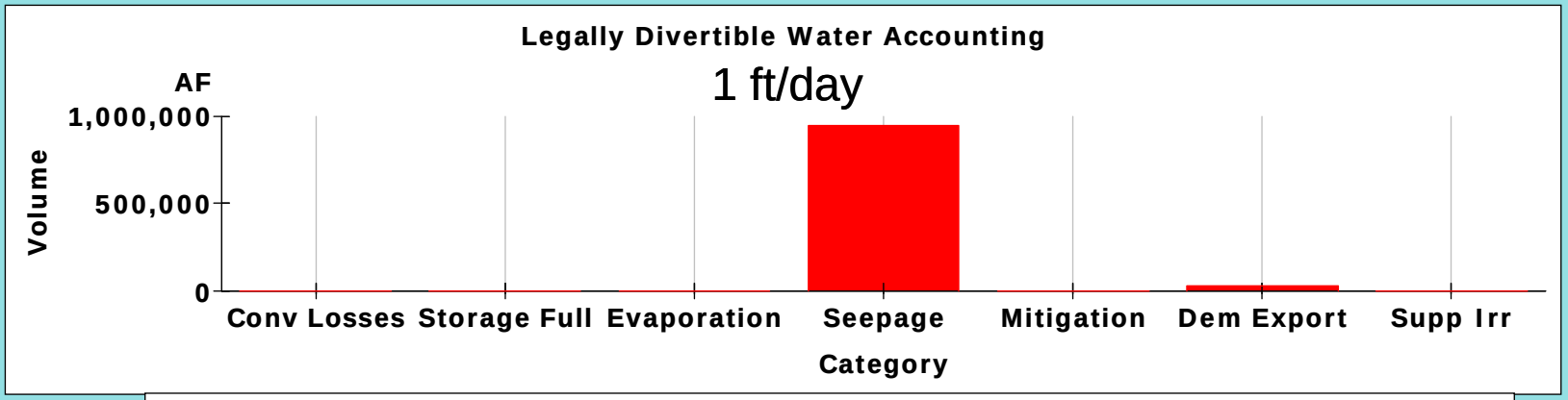




Legally Divertible Water



174 AF	585,085 AF	32,047 AF	140,240 AF	84,507 AF	128,031 AF	39,250 AF



174 AF	0 AF	2,352 AF	943,249 AF	70 AF	30,743 AF	70 AF

Conclusions

- Seepage of the Gila Conglomerate is of major concern
  - The uncertainty presents a high risk of project failure
  - BHI (Sept 2014) proposes lining reservoirs
    - Very expensive, no previous installations in dry flashflood prone large reservoirs, very problematic maintenance

Questions?

We will be demonstrating the model tomorrow afternoon outside the auditorium.

Thank You For Your Attention

References

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