Upper Rio Grande Basin

Water Operations Review

The Use of URGWOM In Upper Rio Grande Water Operation Review

US Army Corps of Engineers ®

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Office of the State Engineer
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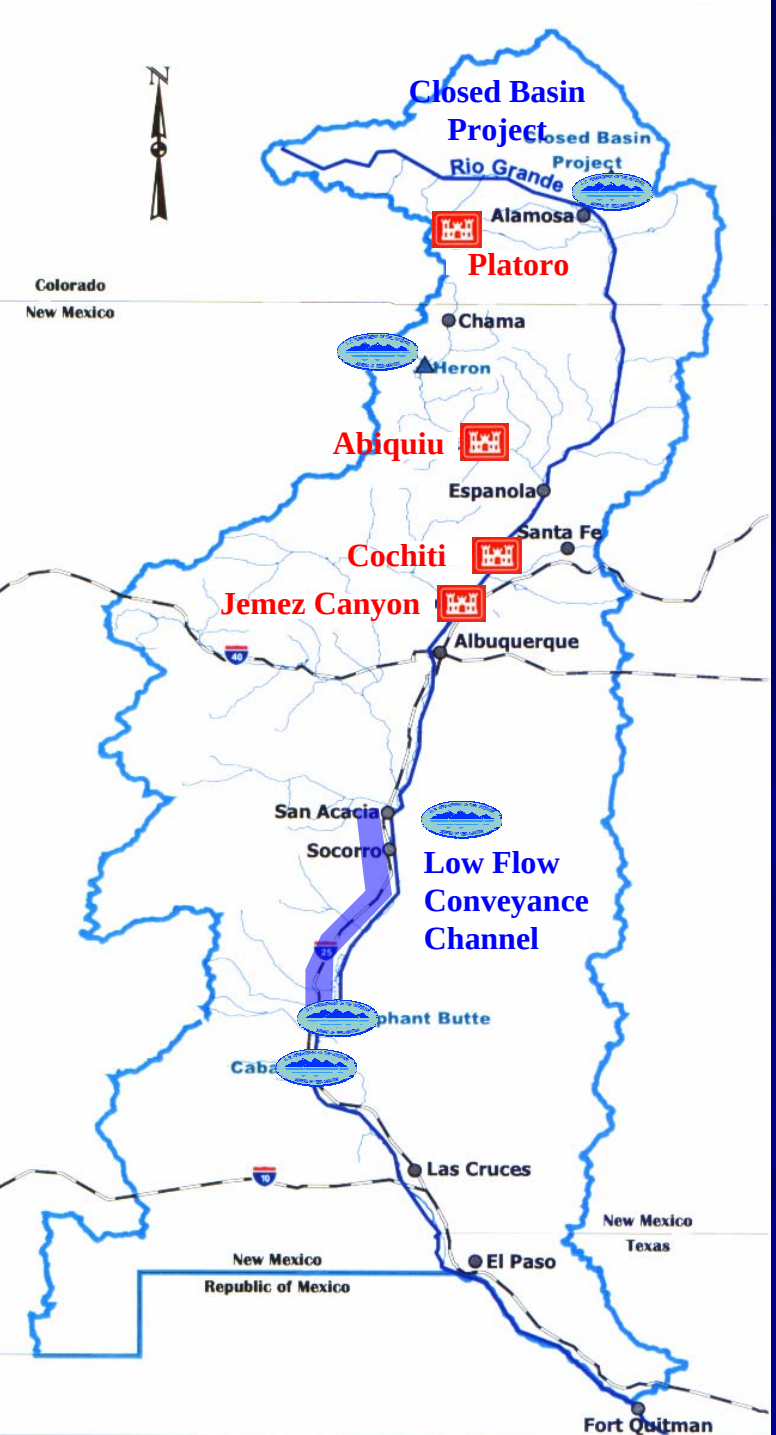
Interstate Stream Commission



Corps of Engineers

Manages reservoirs for

- Flood control
- Sediment control

Bureau of Reclamation

Manages water supply for:

- Irrigation, municipal and industrial use
- Recreation
- Fish and wildlife

New Mexico Interstate Stream Commission

Manages New Mexico's Water:

- State and Federal Laws compliance
- Maximize beneficial use of water within New Mexico
- Oversees reservoir operations

Purposes of the EIS

- Develop comprehensive baseline evaluation of current Water operations
- Evaluate proposed changes that are within current authorities

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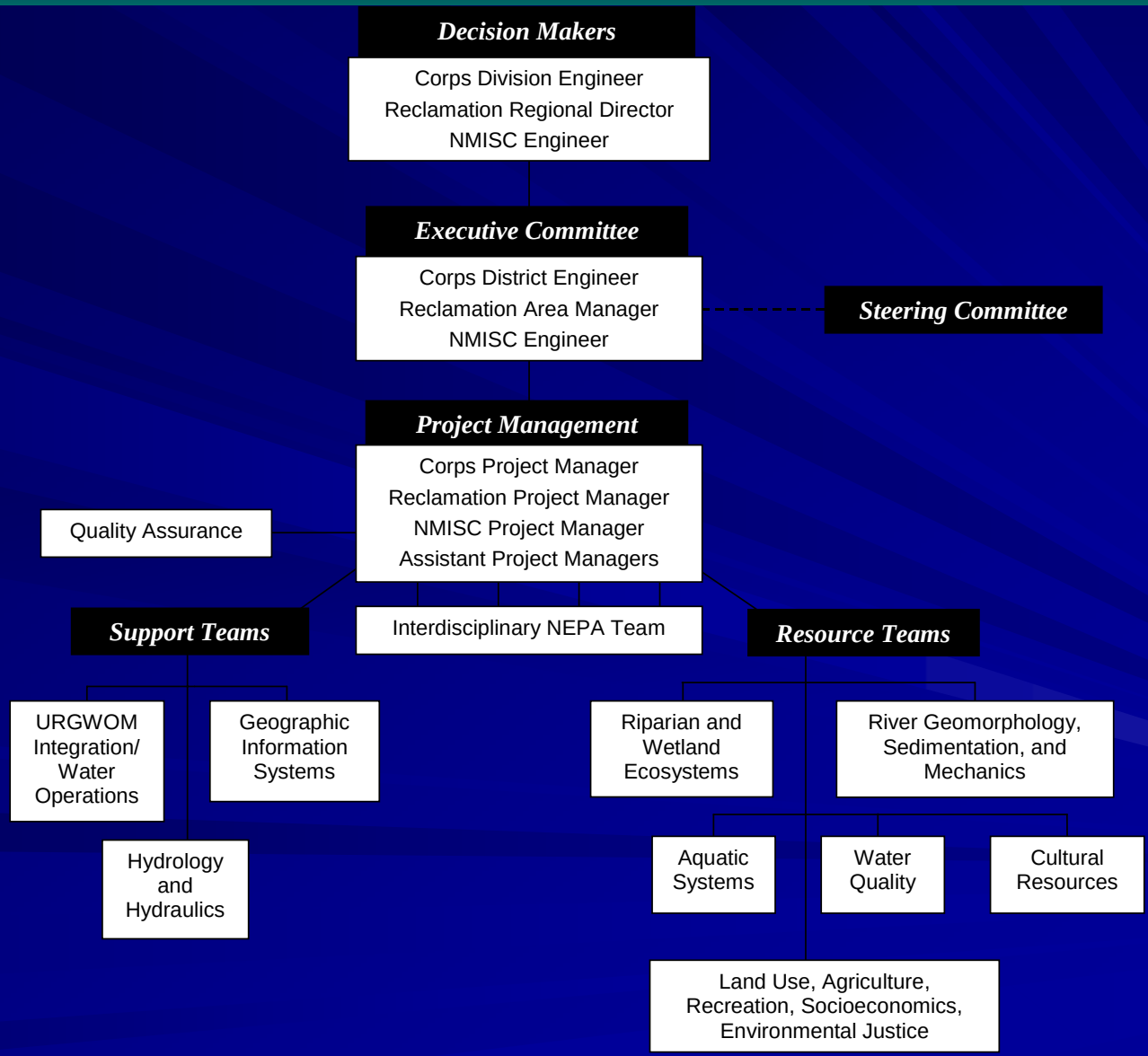


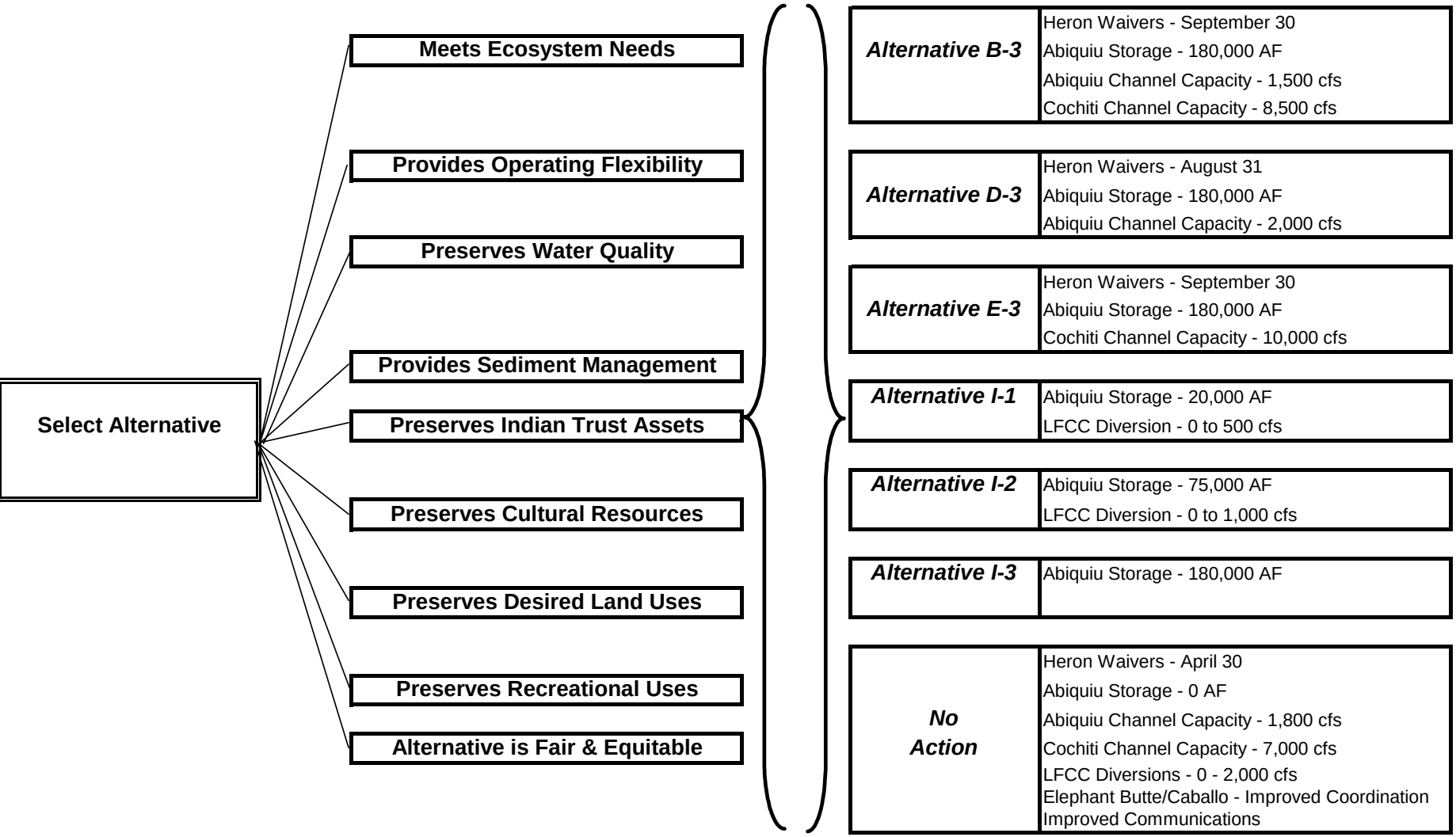
Developing Alternatives

- Proposed operations are within existing authorities
- Alternatives are physically possible
- Alternatives meet Memorandum of Agreement purpose and need statement
- Public scoping helped refine alternatives

Upper Rio Grande Basin Water Operations Review

- 10 FACILITIES were evaluated
  - Flexibilities Identified for 4 Facilities
    - Heron Reservoir timing of water delivery
    - Abiquiu Reservoir
      - Storing of native water
      - Channel capacity
    - Cochiti Reservoir
      - Channel Capacity
    - LFCC Operation

Detailed Analysis of Alternatives: EIS Decision Hierarchy

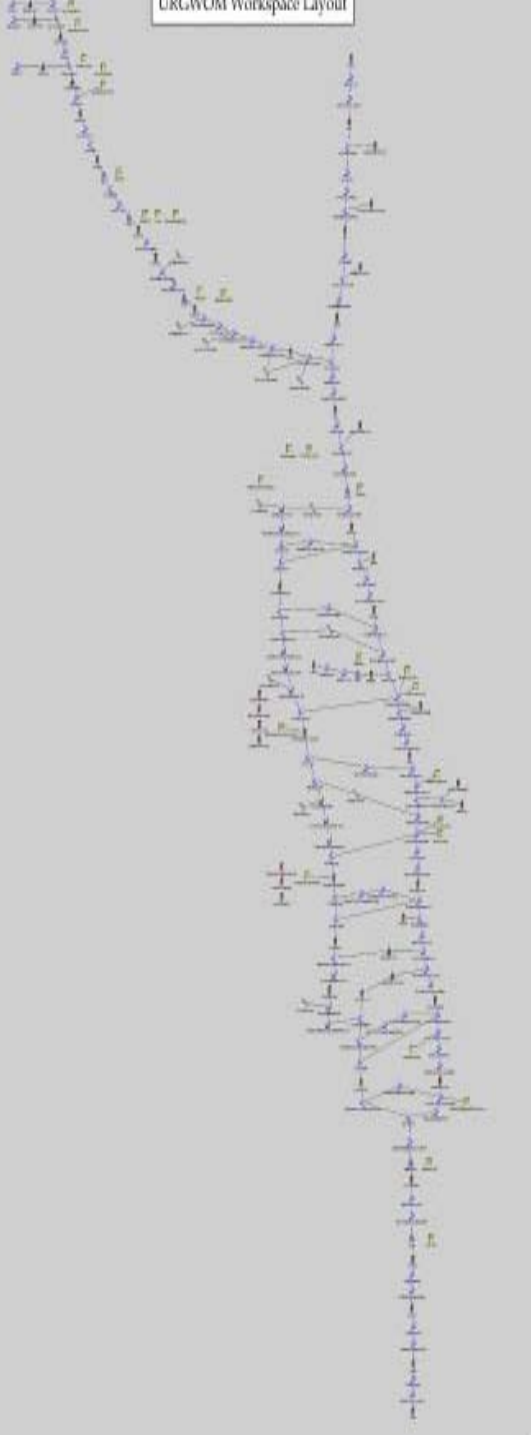


Key Tools:

- Upper Rio Grande Water Operation Model (URGWOM)
- 40-year Hydrologic Sequence
- Hydraulic Models:
  - Flo-2D
  - RMA-2
- San Acacia SW/GW model
- GIS and database development

Upper Rio Grande Basi
Water Operations R

- URGWOM Planning model was used to evaluate water operations and hydrologic impact.
- water accounts: Native & “San Juan-Chama” water
- Operational “Rules”
- Links to ET-Toolbox and San Acacia SW/GW model and HEC-DSS Database



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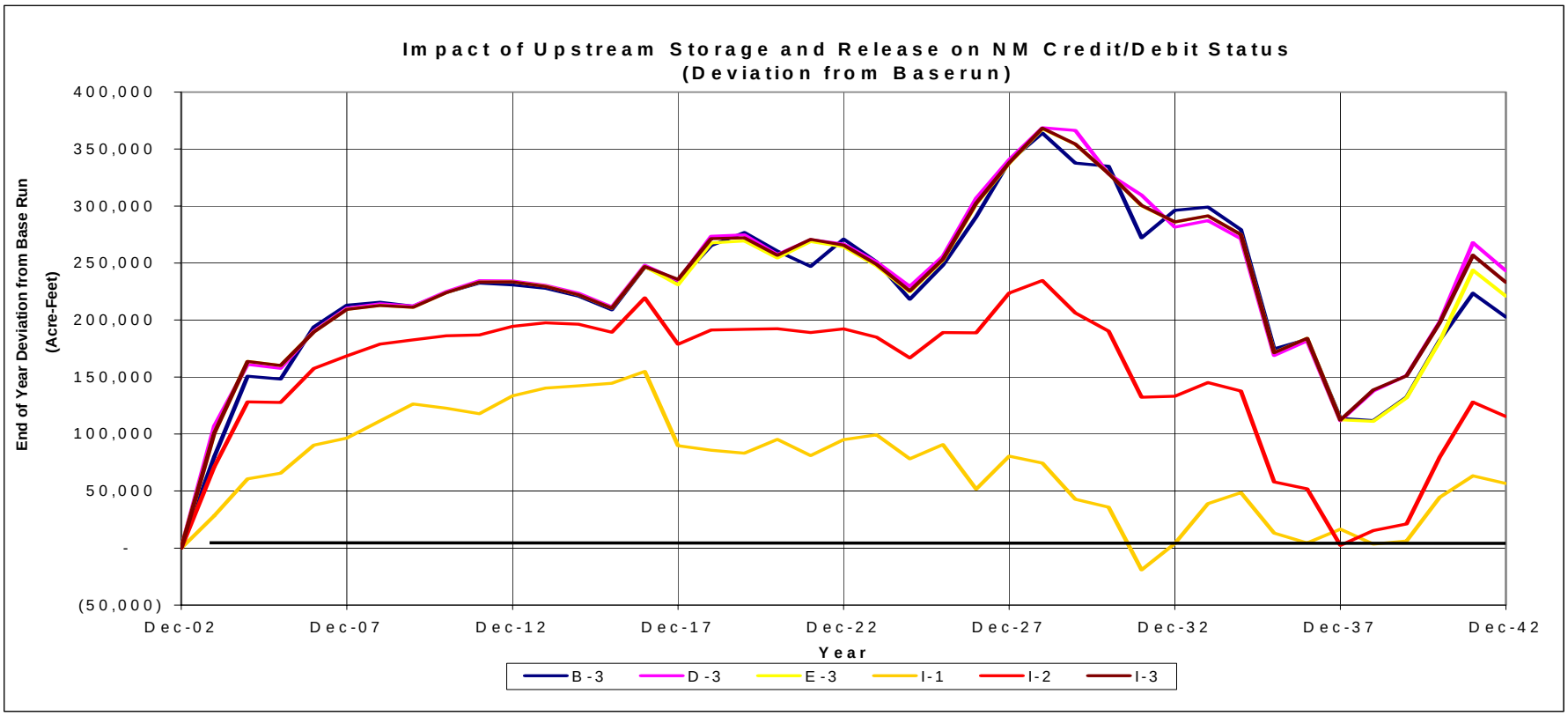
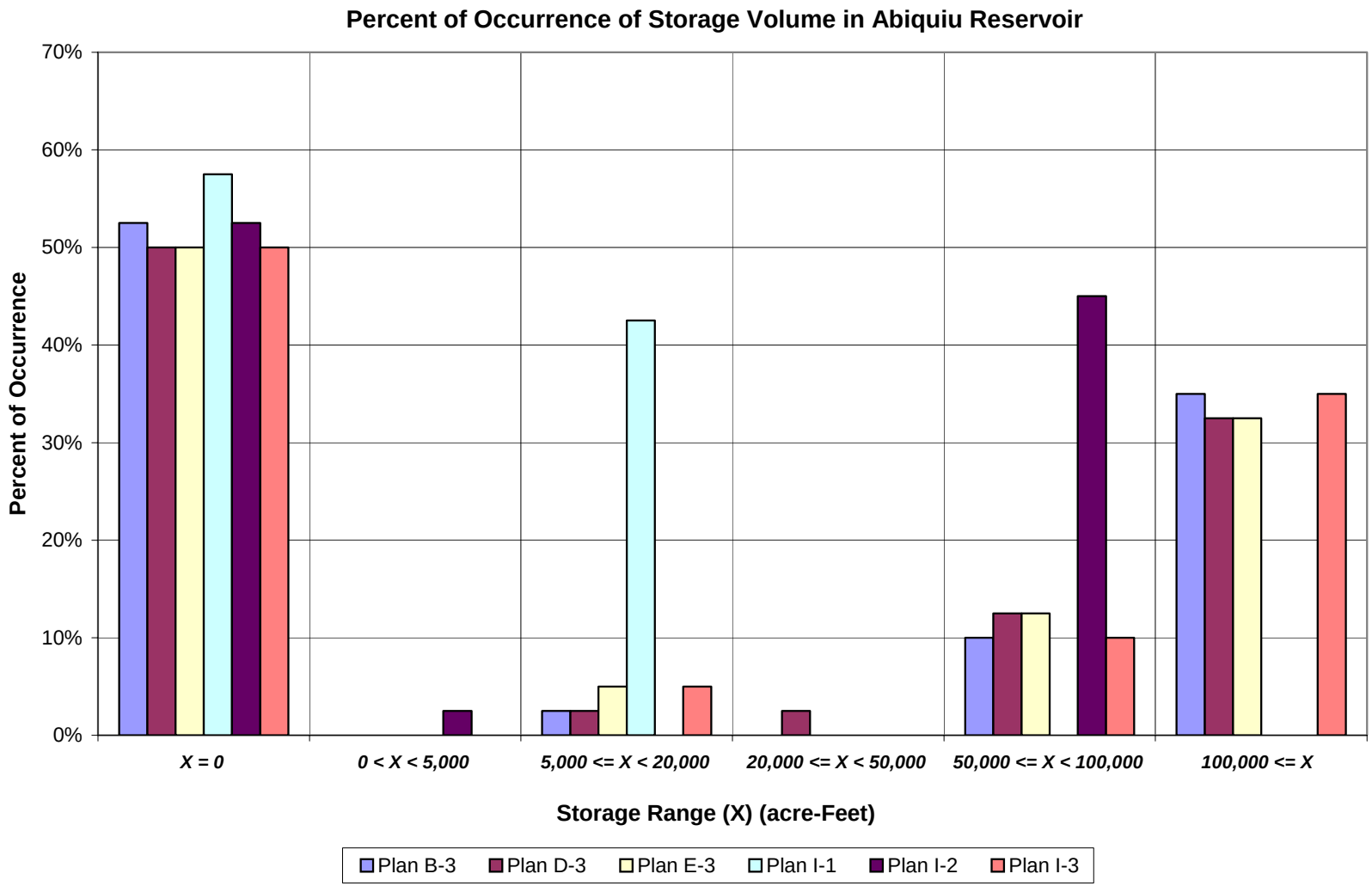



Percent of Occurrence of Storage Volume in Abiquiu Reservoir
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Occurrence
X = 0
0 < X < 5,000
5,000 <= X < 20,000
20,000 <= X < 50,000
50,000 <= X < 100,000
100,000 <= X
Storage Range (X) (acre-Feet)
Plan B-3
Plan D-3
Plan E-3
Plan I-1
Plan I-2
Plan I-3

Stakeholder Testing

Objective:

Get the Stakeholder to use URGWOM and evaluate how model simulates the Rio Grande system.

- Twenty three individuals from 16 organizations
- Twelve hours of class time over 2 days
- Hands on using:
  - RiverWare basics
  - URGWOM examples

Three selected scenarios were run:

1. Decreased initial reservoir storage
2. Decreased inflow
3. Target flow of Rio Grande at Central and San Acacia

Only 11 representatives from 8 agencies were able to complete model runs

Development of 40-year Hydrologic Sequence

Karen MaCclune, Ph.D.

SSP & Associates

Why generate synthetic sequence?

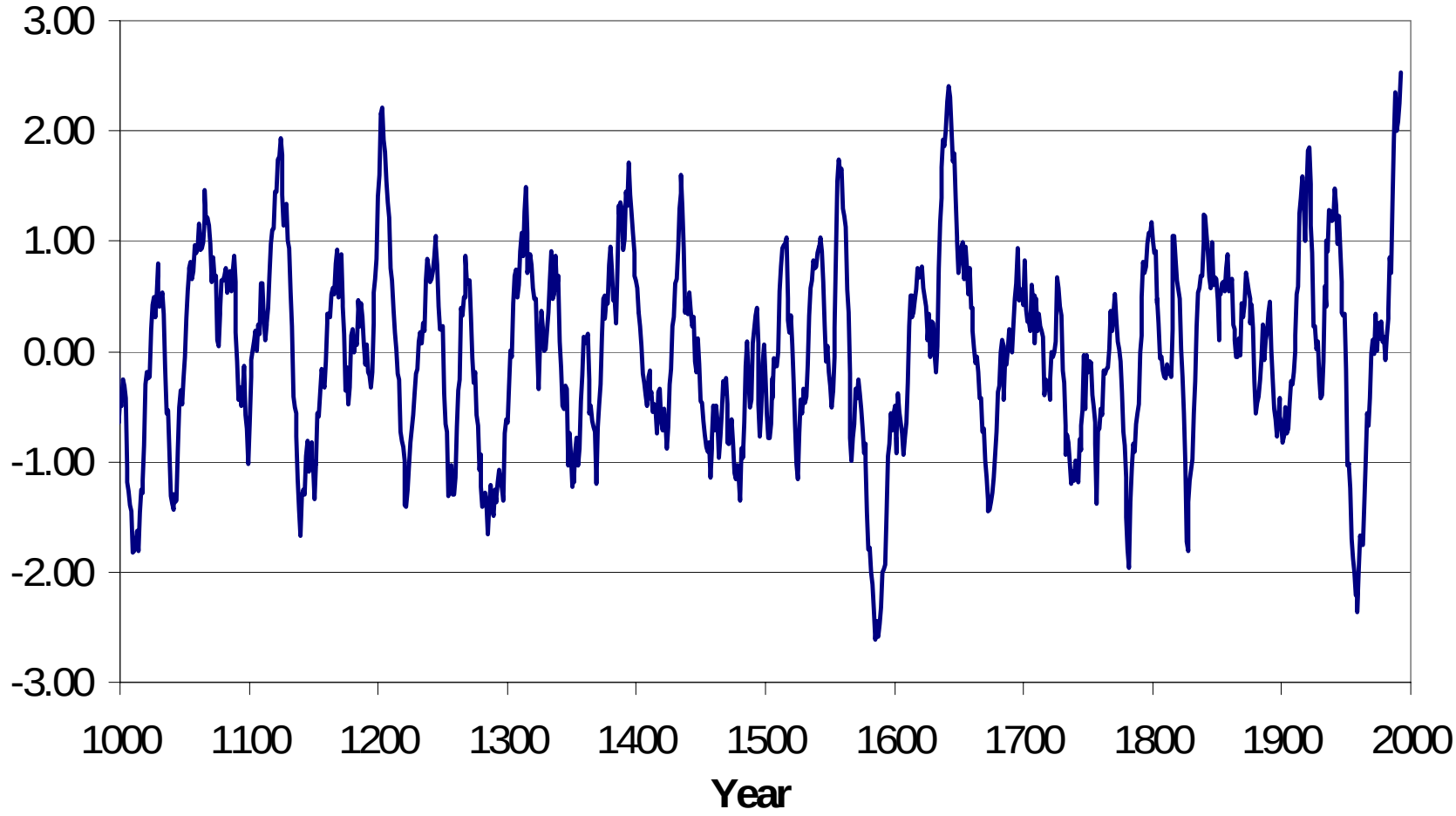
- To represent hydrologic inputs in URGWOM Planning Model for EIS Alternatives Analysis
- Using the “pool” of 1975-1999 hydrology input files available to URGWOM
- Yet, representing long-term climate conditions, not the wet period of the past quarter century

Criteria for planning sequence

- Include a “typical” drought and a “typical” wet period, as well as average years
- Include a multi-year run of “very dry” years, akin to that seen in the 1950s
- Include at least one year of extreme dry and wet conditions, as seen in 1977 and 1985
- Average of sequence fall close to long-term average condition

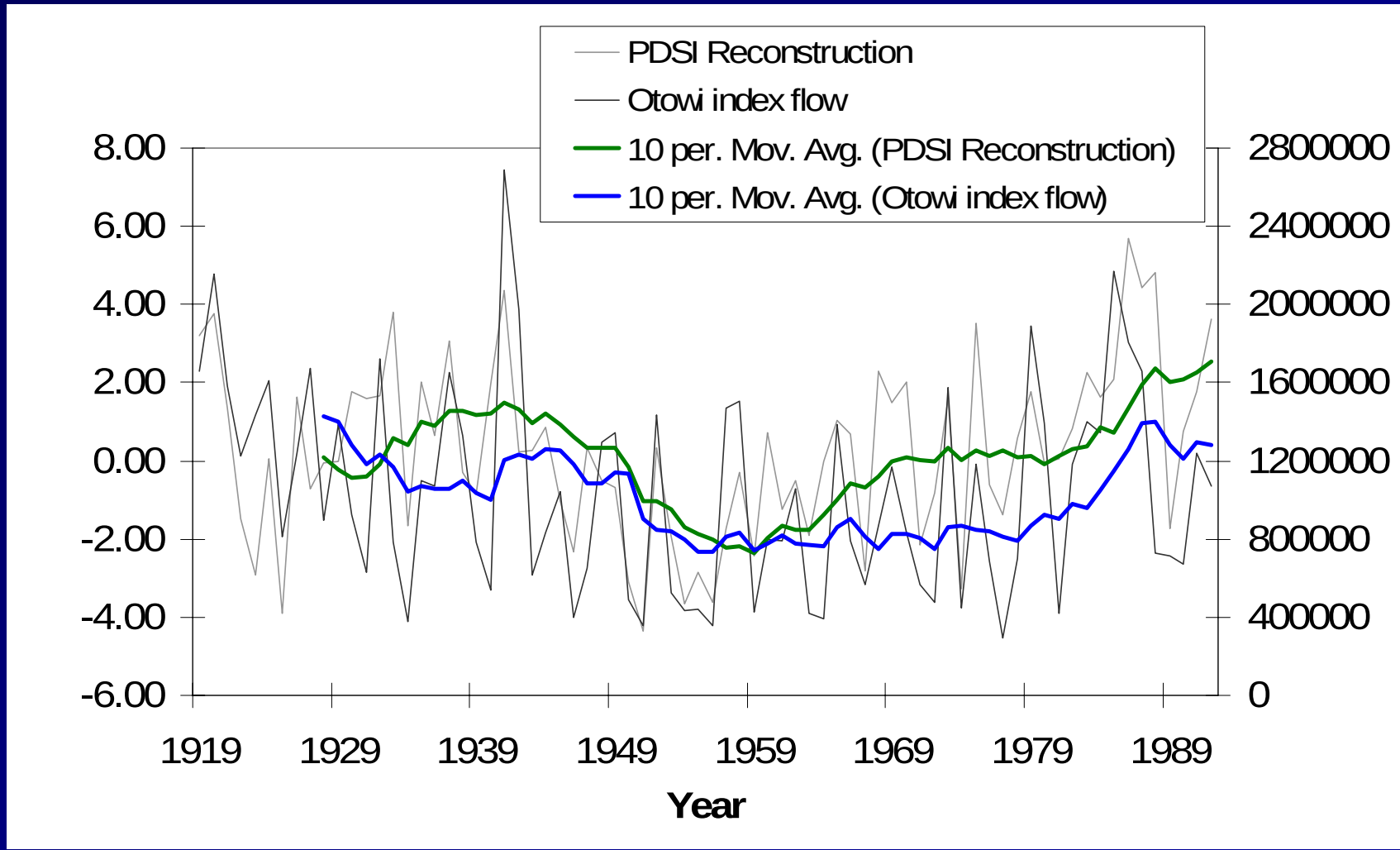
Middle Rio Grande Basin Reconstructed PDSI

10-year running average



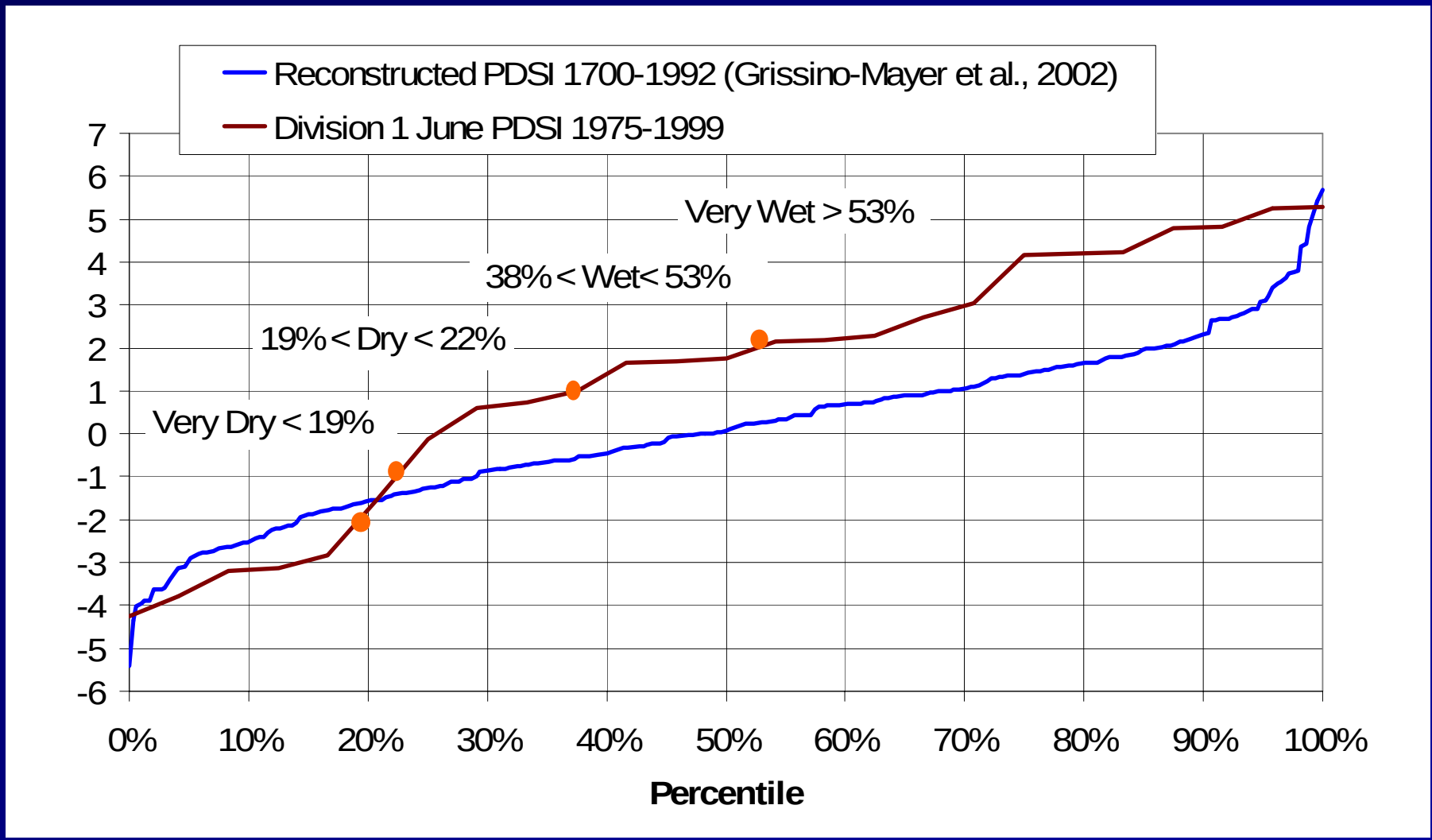
Grissino-Mayer et al., 2002

PDSI Reconstruction and Otowi Index flow, 1919-1992

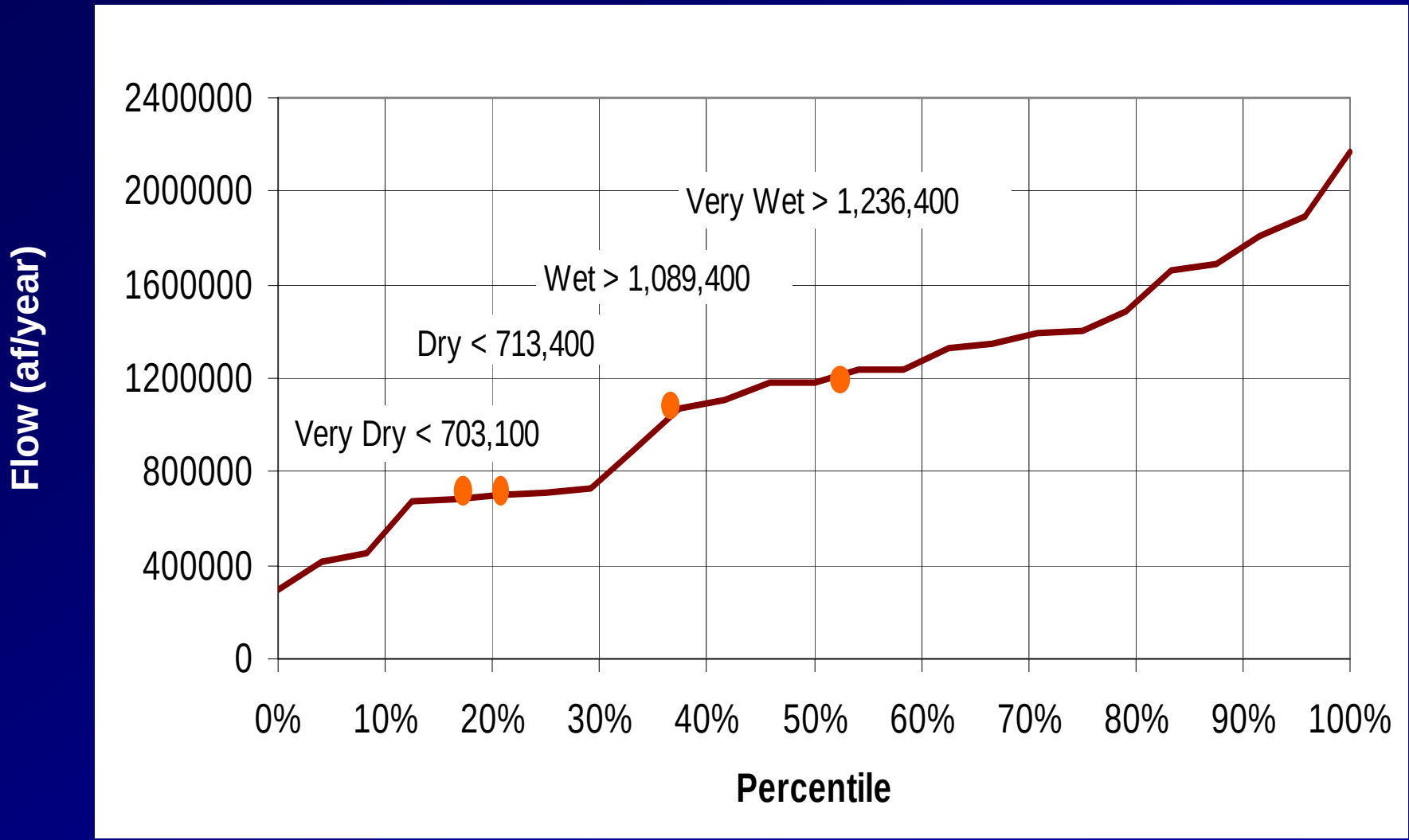


PDSI reconstruction from Grissino-Mayer et al., 2002

Ranked PDSI and associated cutoffs for very dry, dry, average, wet and very wet conditions

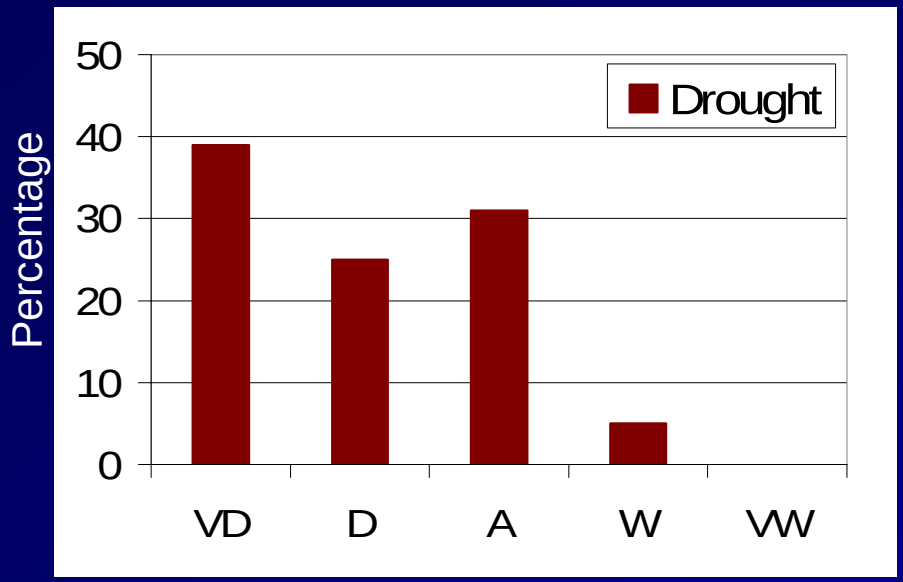


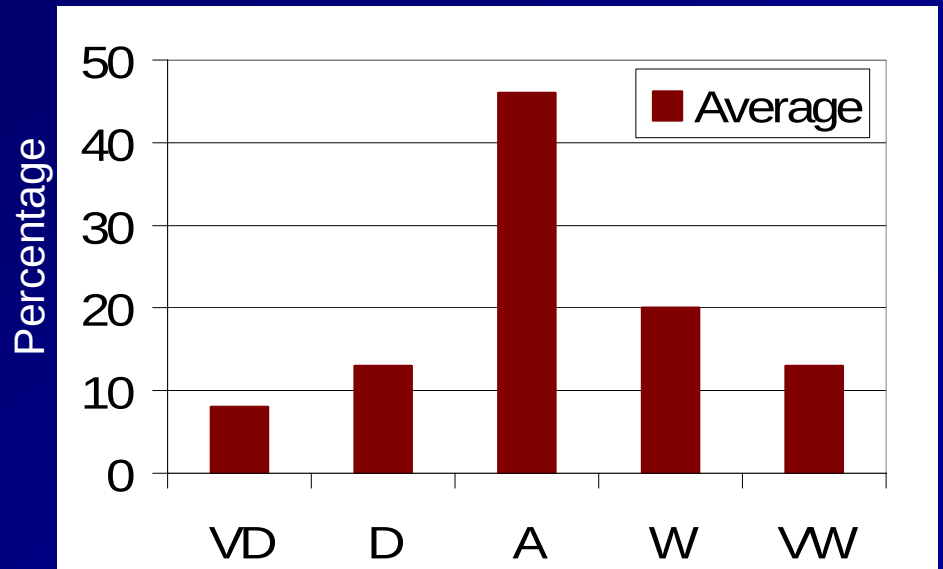
Otowi flow cutoffs

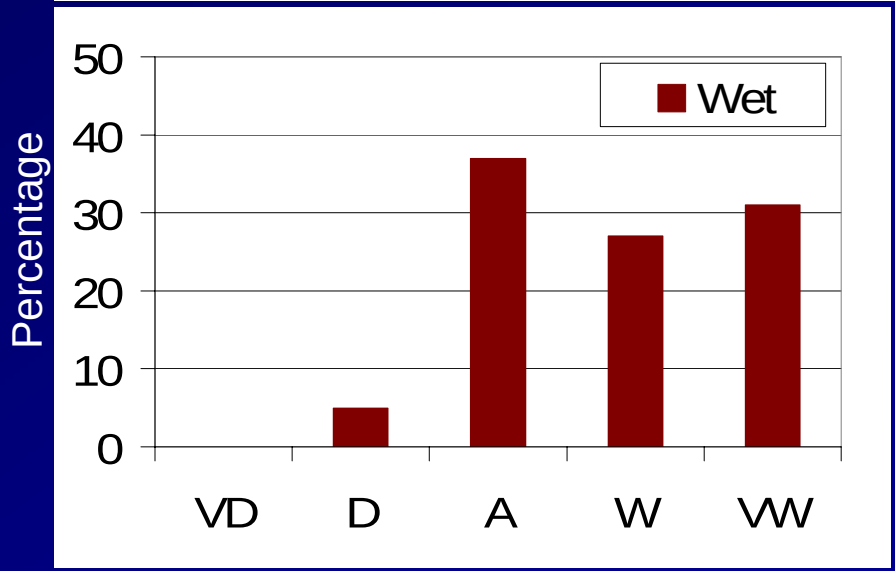


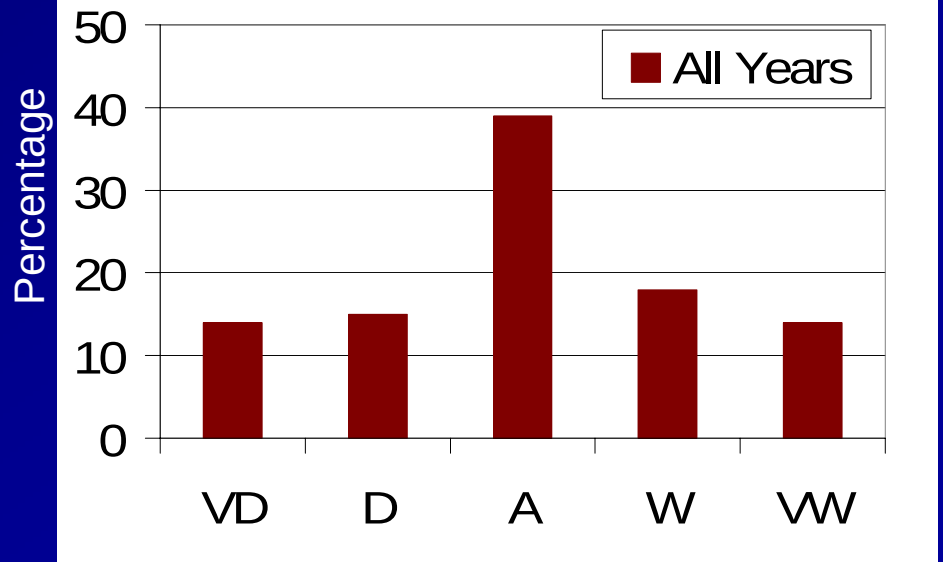
Percentage Distribution of Conditions

1700-1992 data, Grissino-Mayer PDSI reconstruction





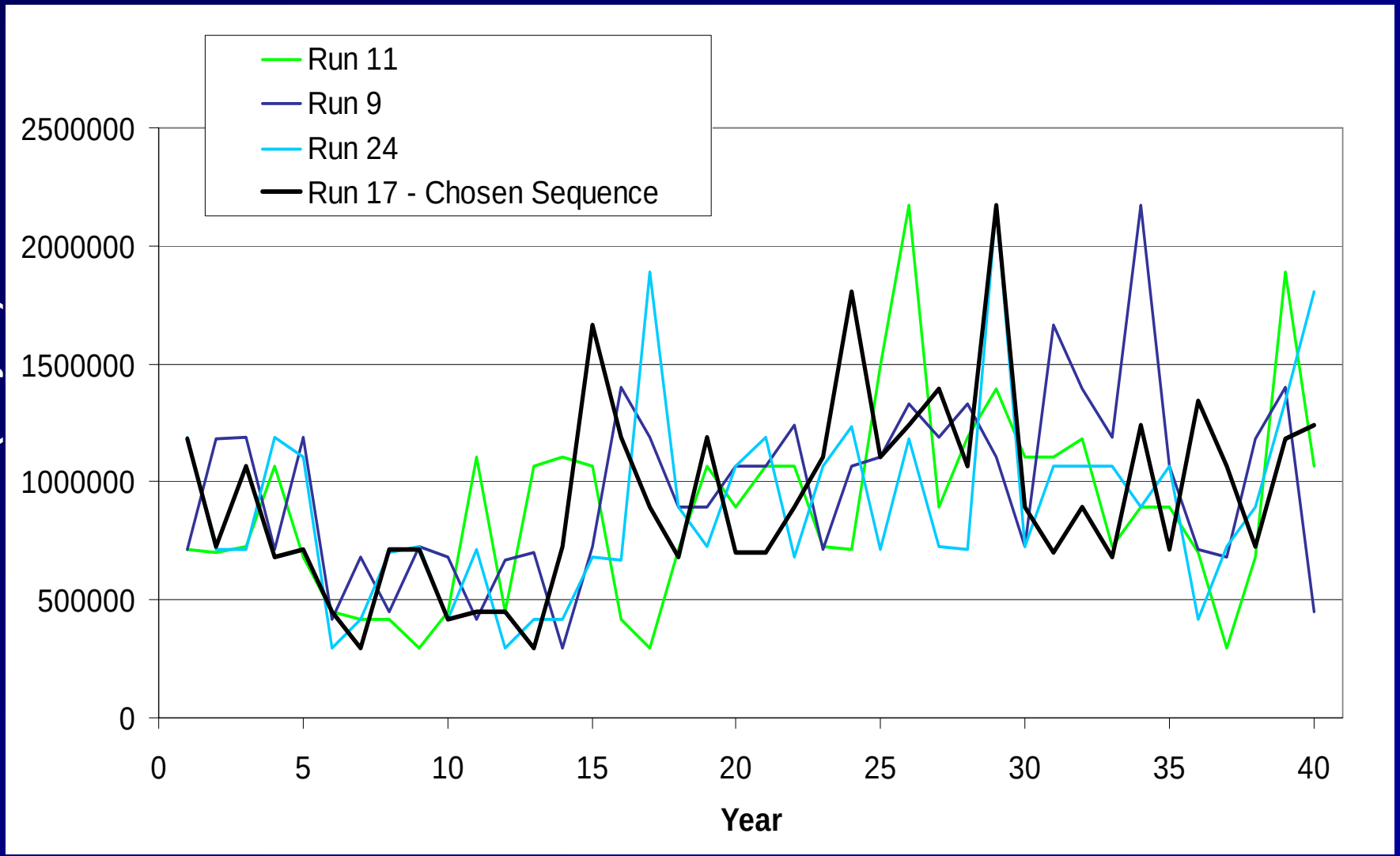




Additional Selection Criteria

- Because randomly generated sequences don't always include every year, and some sequences will be skewed higher or lower by "chance", the following criteria were applied in selecting one of the randomly generated sequences:
  - Must include at least one occurrence of 1977, lowest flow (296,500 af/y) in "very dry" bin
  - Must include a "run" of dry years to represent conditions analogous to the 1950s drought
  - Must include at lease one occurrence of 1985, highest flow (2,169,100 af/y) in "very wet" bin
  - Average of flows in sequence should fall within the range of 900,000 to 1,000,000 af/y, to approximate the long-term average condition

Sample synthetic hydrographs



Summary

- Method provides a 40-year sequence of years for which hydrologic data are available for the URGWOM planning model
- The inflow data for these years will be used to set hydrologic conditions for model runs that evaluate alternative operating conditions
- The 40-year sequence is not meant to be predictive of the future; but, provides a realistic range of hydrologic conditions over which contemplated operational changes can be evaluated.