

CONDITIONAL RELIABILITY MODELING OF SHORT-TERM RIVER BASIN MANAGEMENT

ASCE Texas Section
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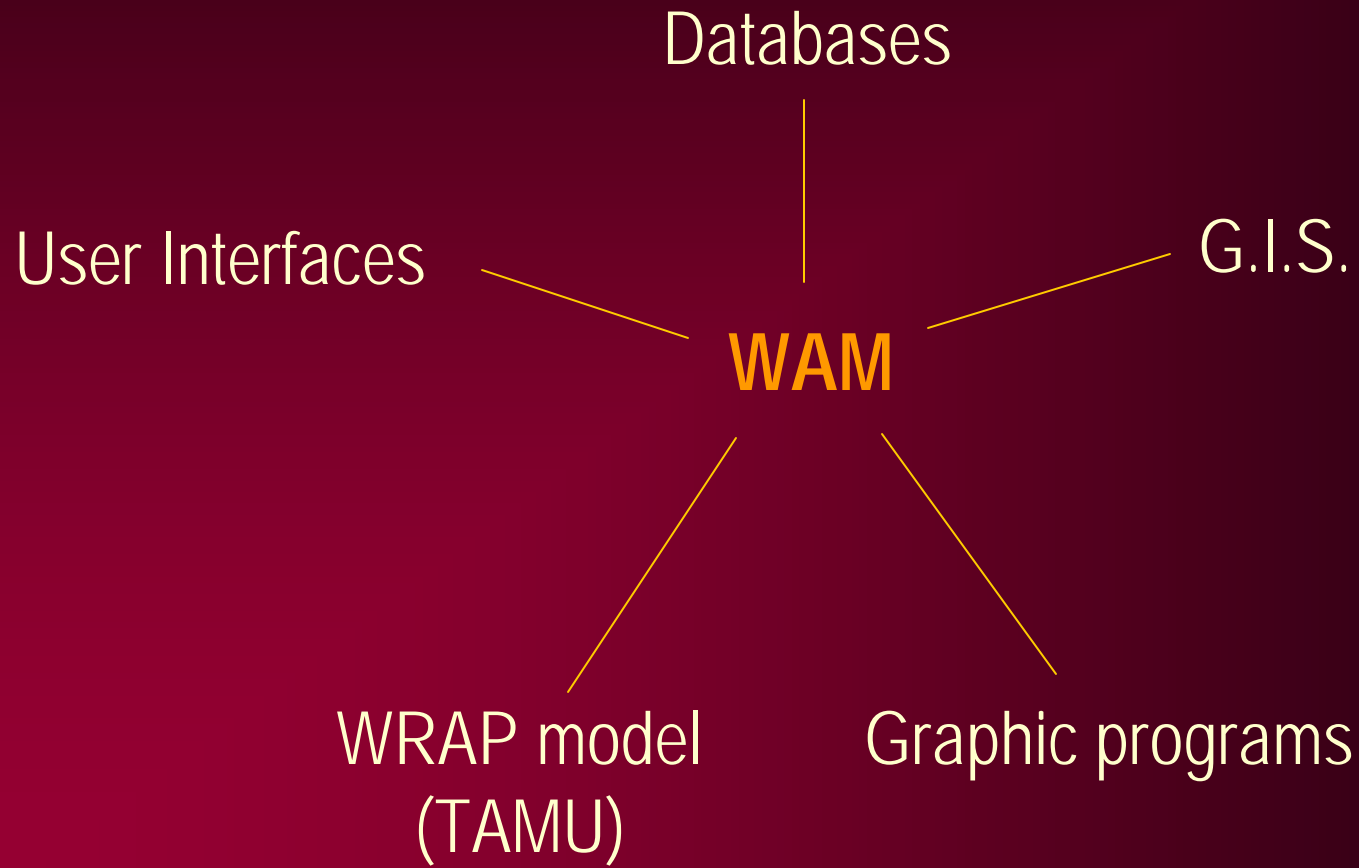
TEXAS WATER AVAILABILITY MODEL

Senate bill 1 (1997) directed TCEQ (before TNRCC) to develop water availability models.

Objectives of WAM

- Provide data analysis necessary for water management.
- Determine how much water is available for water rights.
- Facilitate planning efforts.

TEXAS WAM PROJECT (...continued)



TEXAS WAM PROJECT (...continued)

Applications:

AVAILABILITY OF WATER BY RIVER BASIN

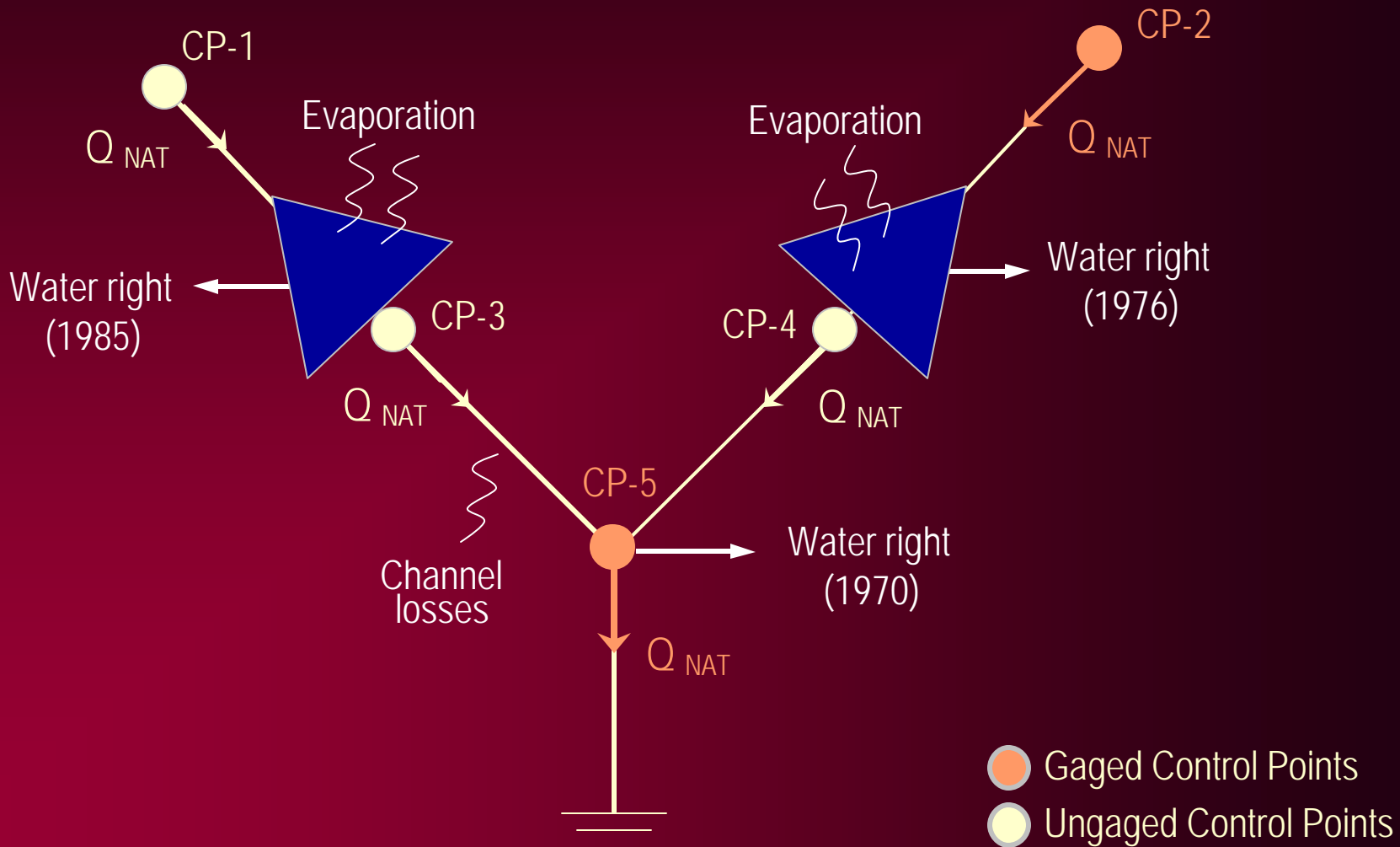
- 6 basins were completed in December 1999
- 16 basins completed in January 2002
- Rio Grande expected by January 2003

WATER RIGHTS PERMITS APPLICATION

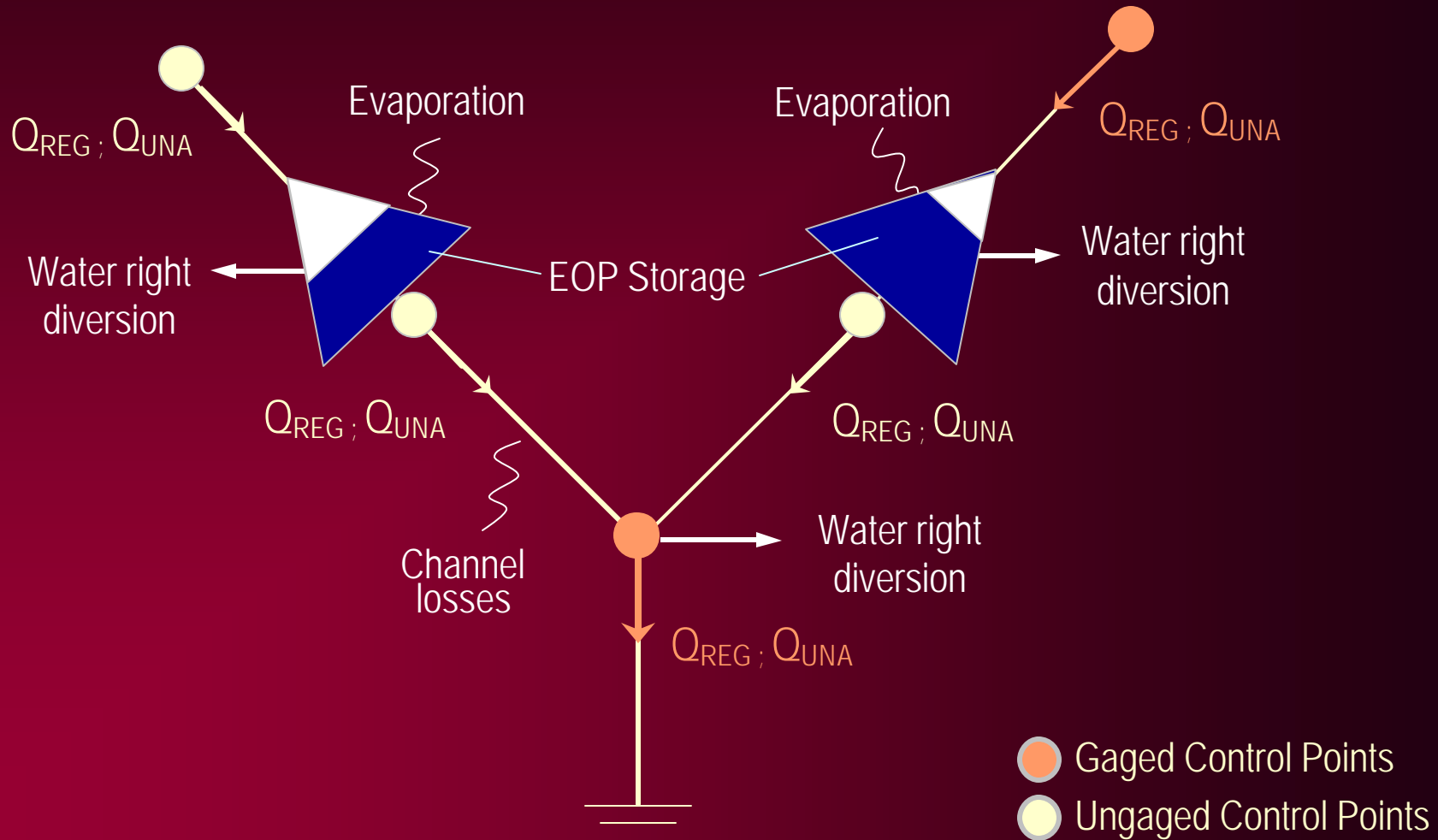
PLANNING

Part of the statewide water plan by TWDB will use WAM data.

WRAP MODEL : Basic concepts and input data



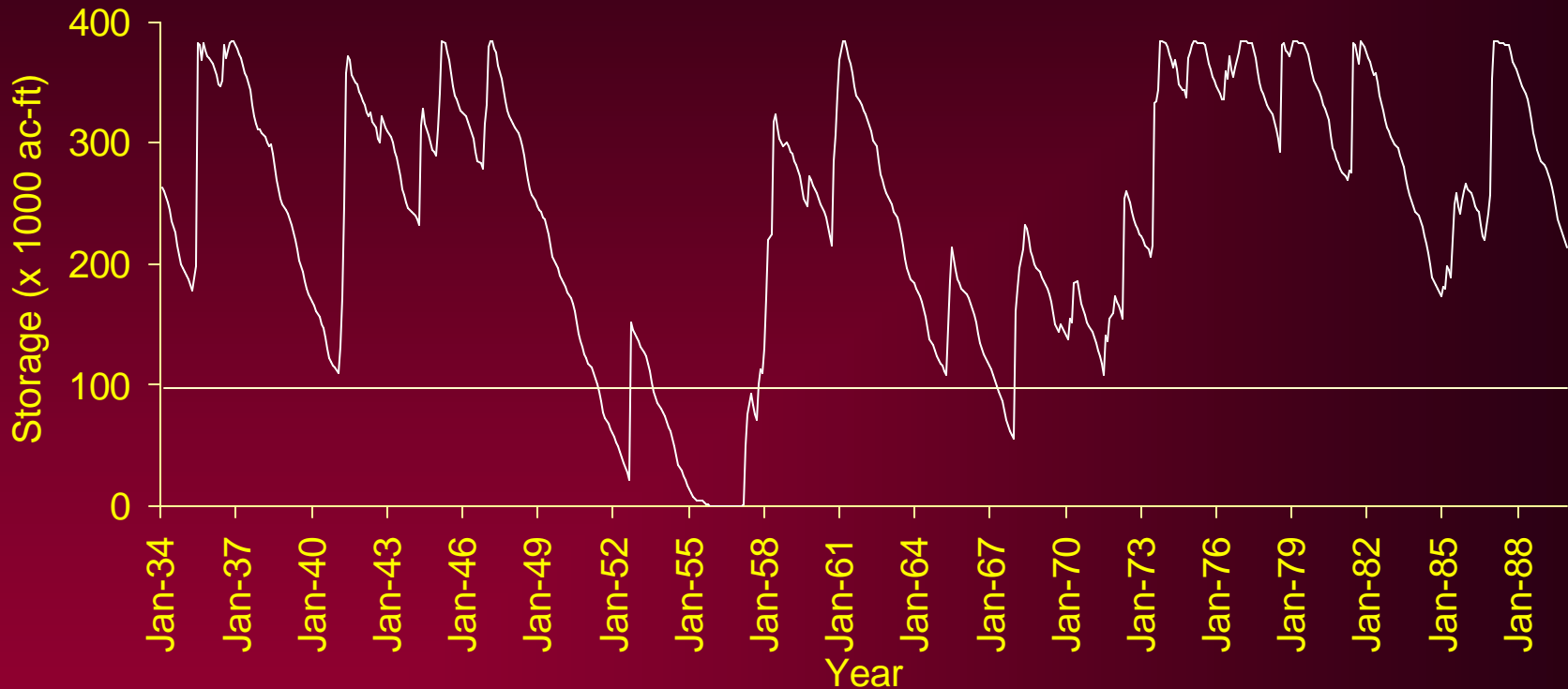
WRAP MODEL : Results



WRAP MODEL: Limitations

It is not appropriate for evaluating reliabilities for water rights in the near future, which are highly dependent on known current conditions of reservoir storage.

WRAP MODEL: Limitations

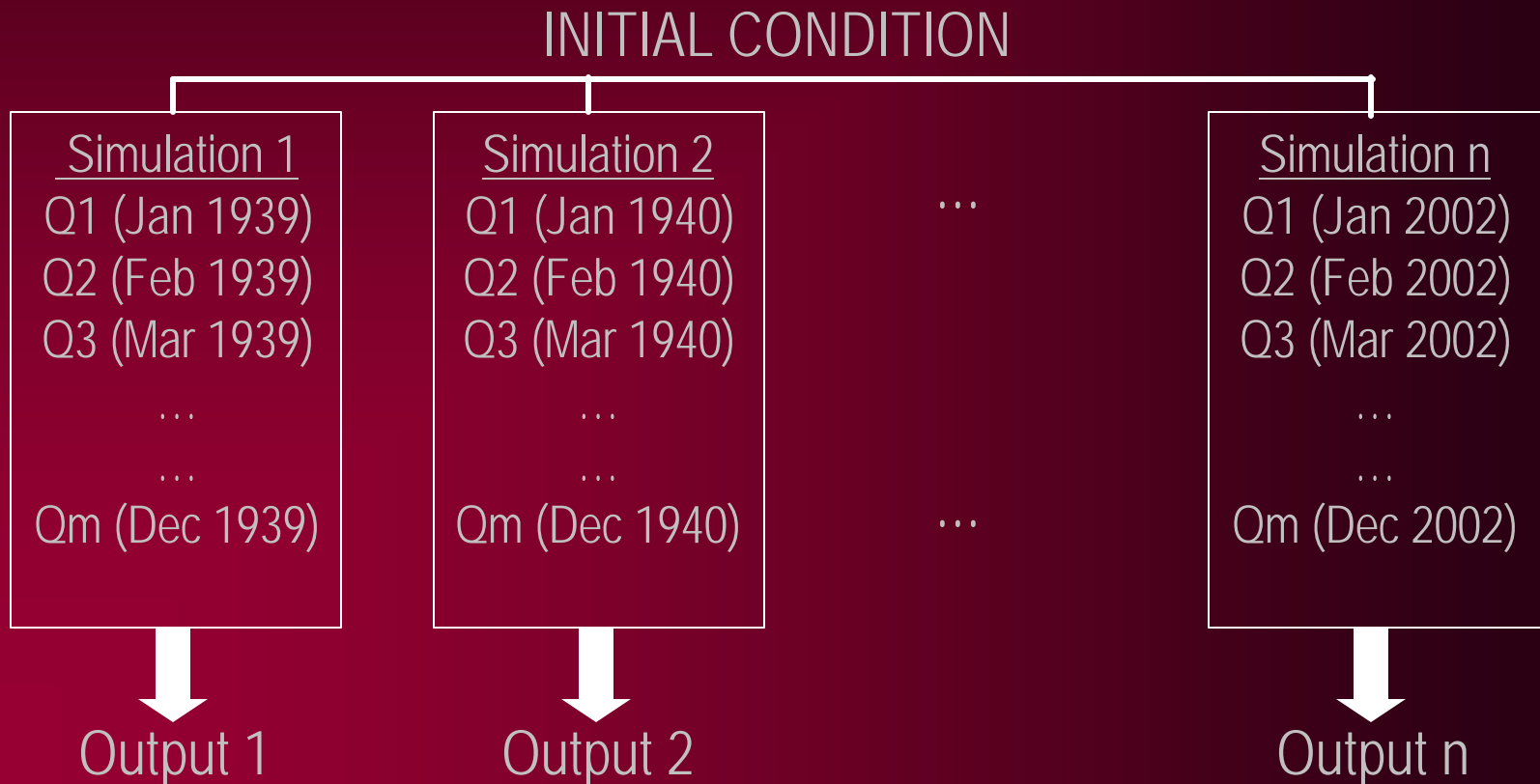


Periods without shortage = 657 out of 672 (97.8%)

What is the probability of satisfying demand when reservoir falls below 100,000 ac-ft?

CONDITIONAL RELIABILITY

Statistical analysis of small sequences.



WRAP CONDITIONAL RELIABILITY

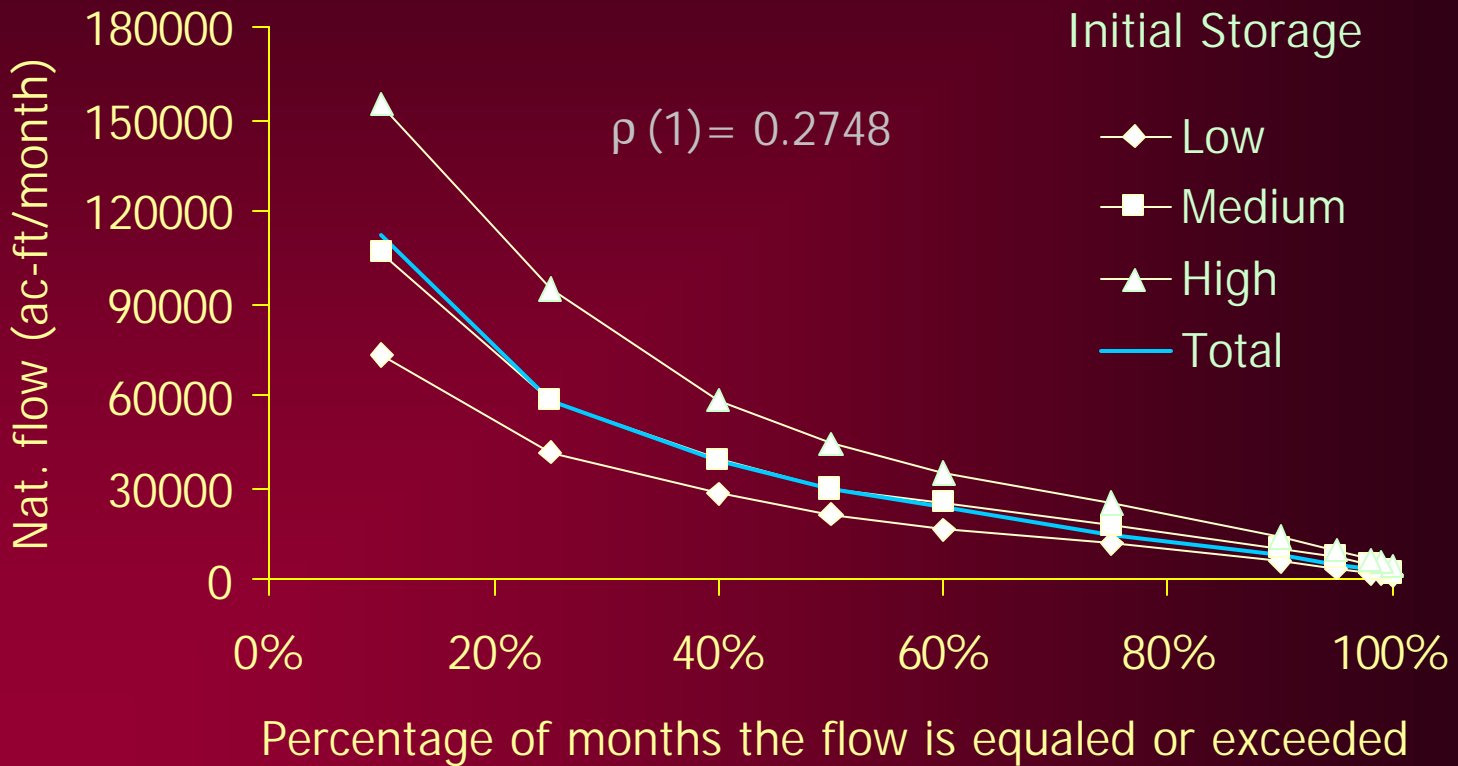
WRAP-CRM is based on the combination of:

1- Conditional Frequency Duration Curves

(Measures the probability of flows)

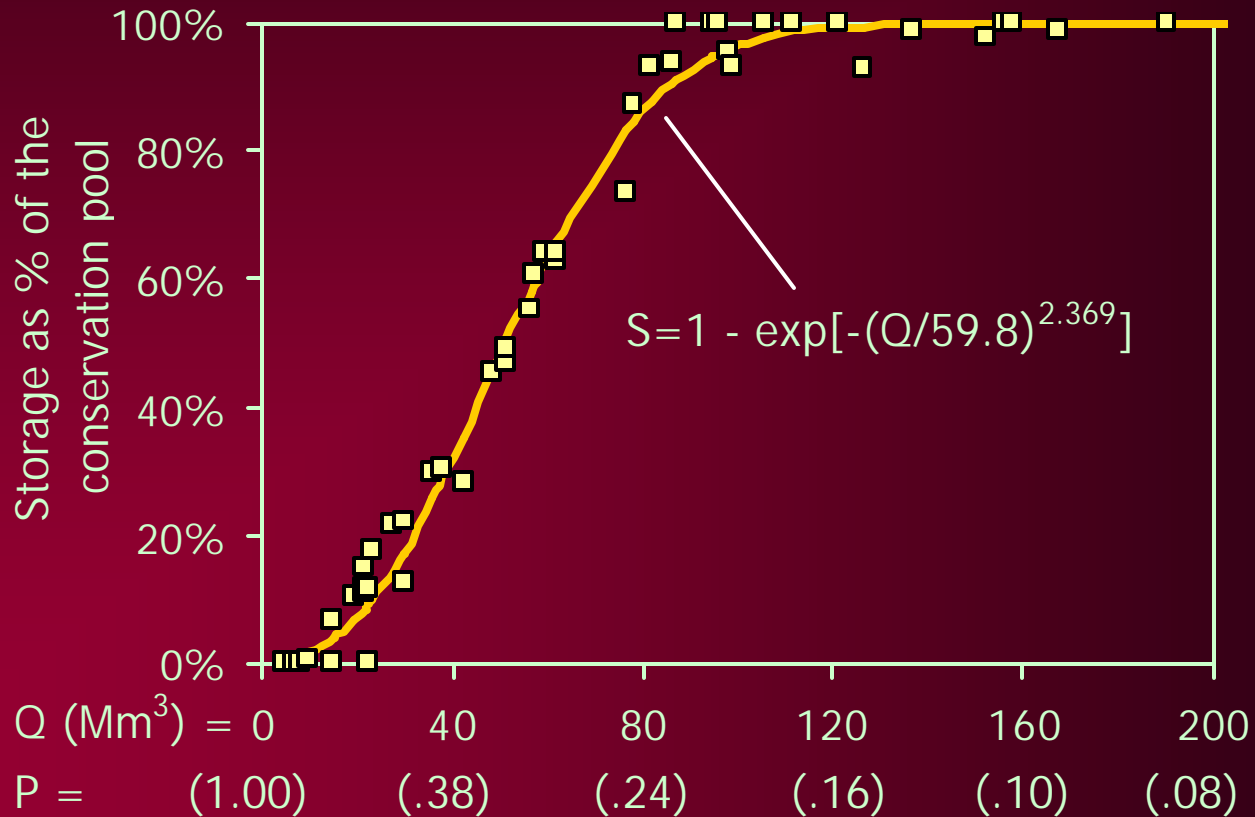
2- Level of water supply achieved with the flow

EXAMPLE OF CFDC

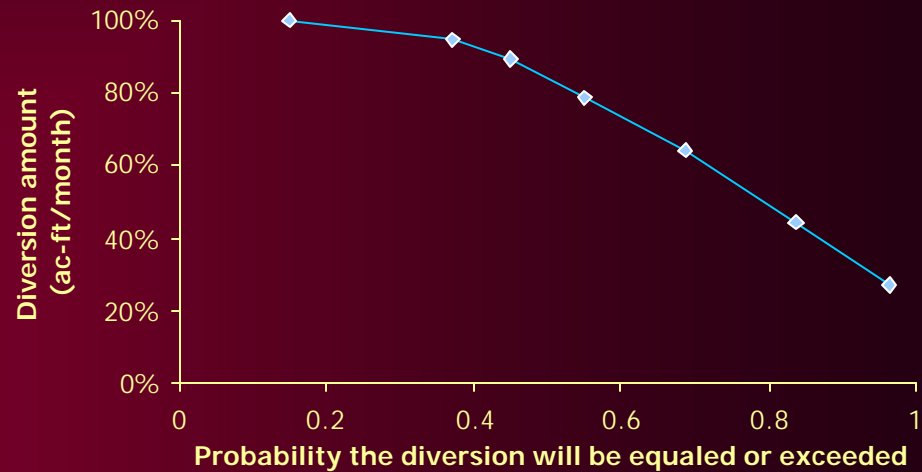
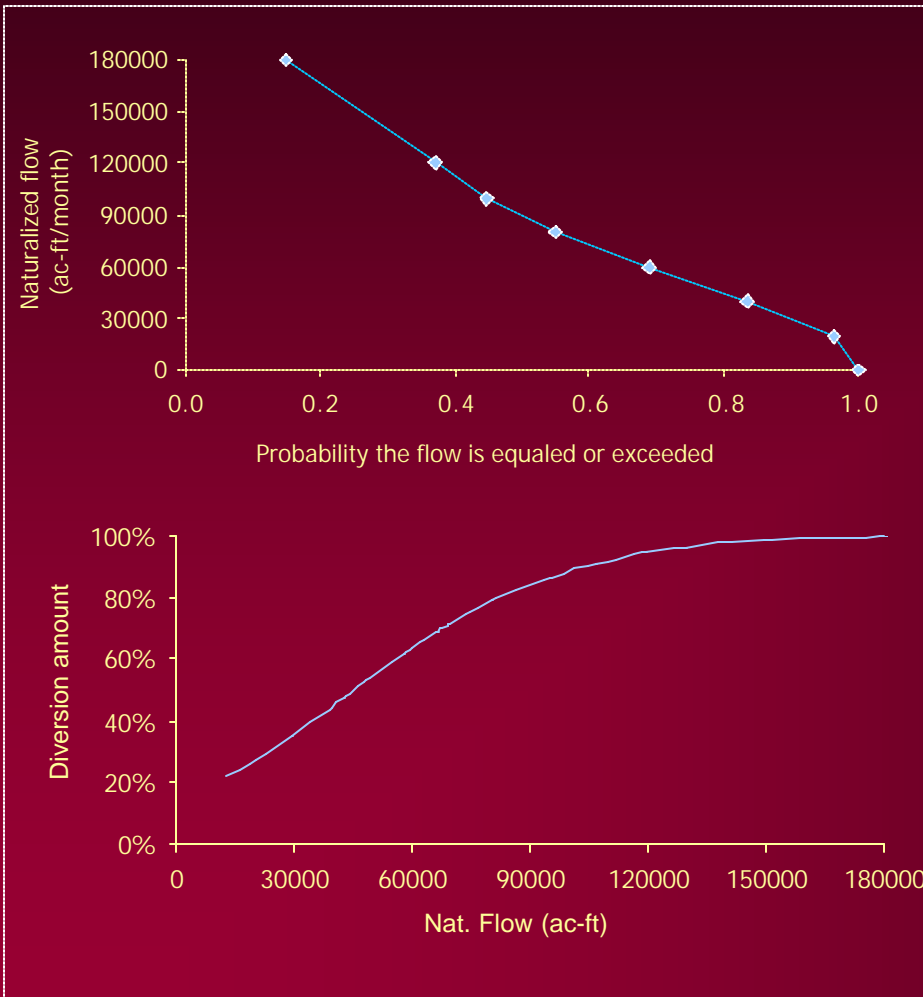


NAT. FLOW-DIVERSION RELATIONSHIP

Several short term simulations

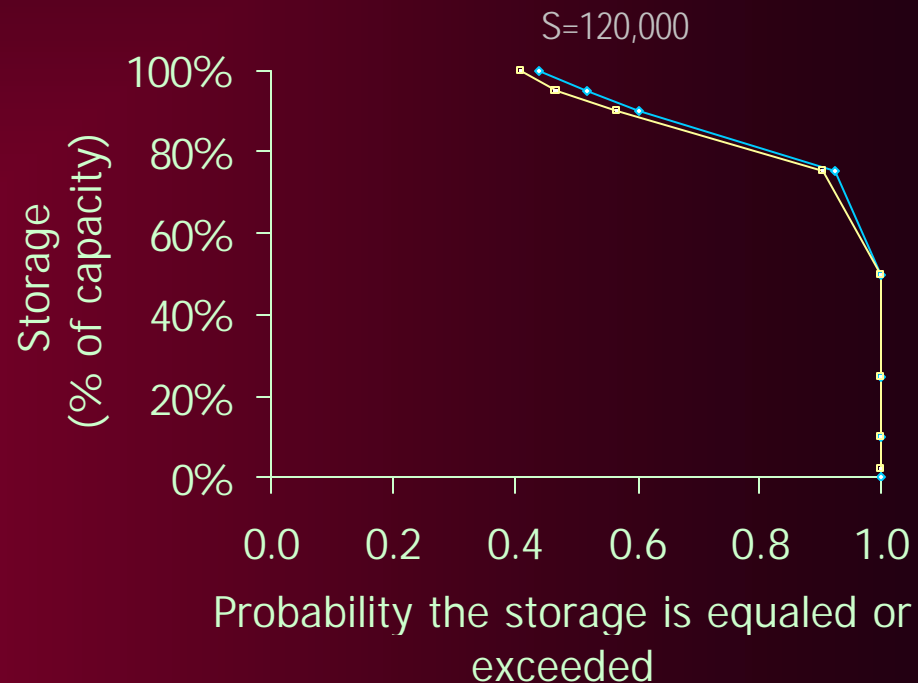
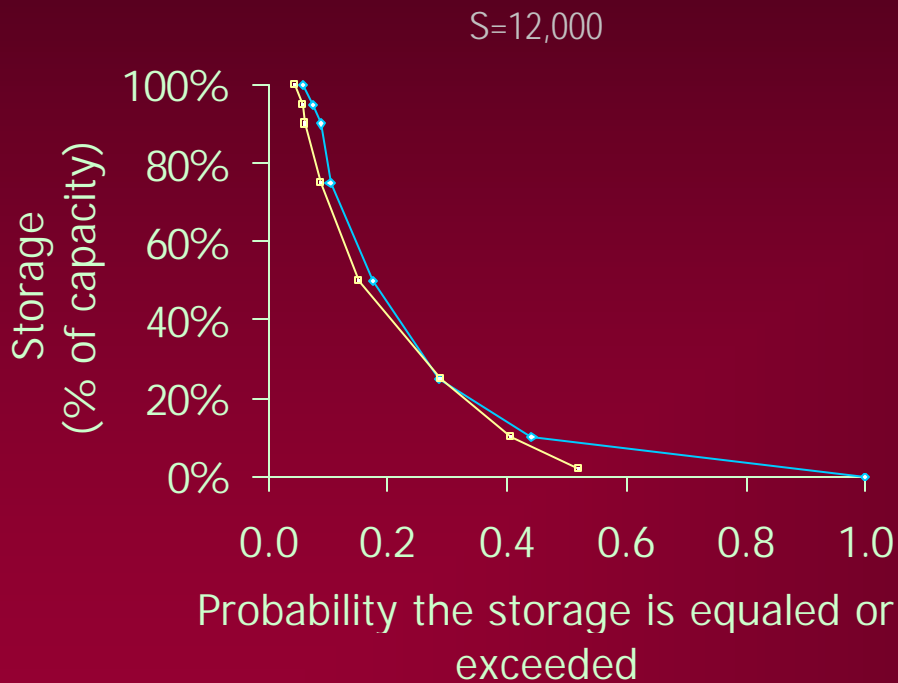


RELATING PROB. OF EXCEEDENCE WITH DIVERSION



AUTOCORRELATED VS. INDEPENDENT

Probability of storage using equally likely assumption

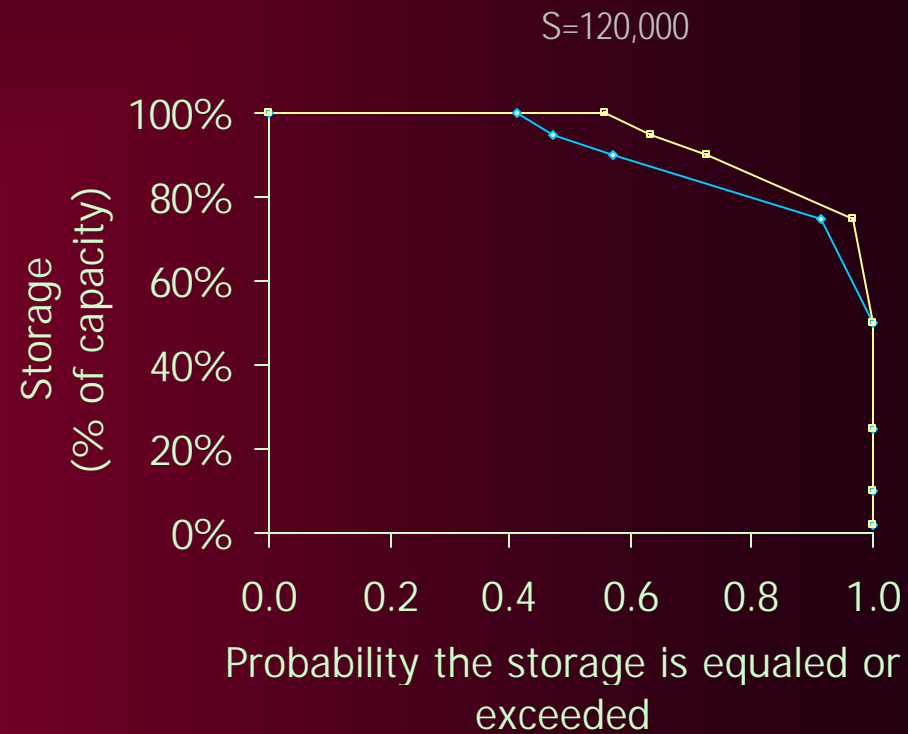
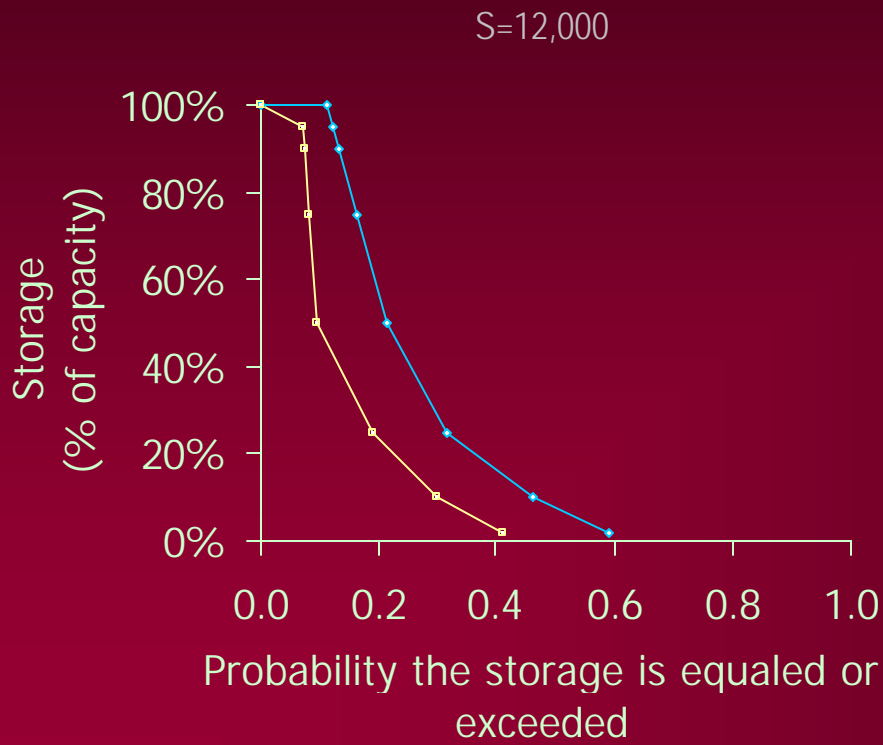


— Independent

— Autocorrelated

AUTOCORRELATED VS. INDEPENDENT SERIES (...continued)

Probability of storage using WRAP-CRM

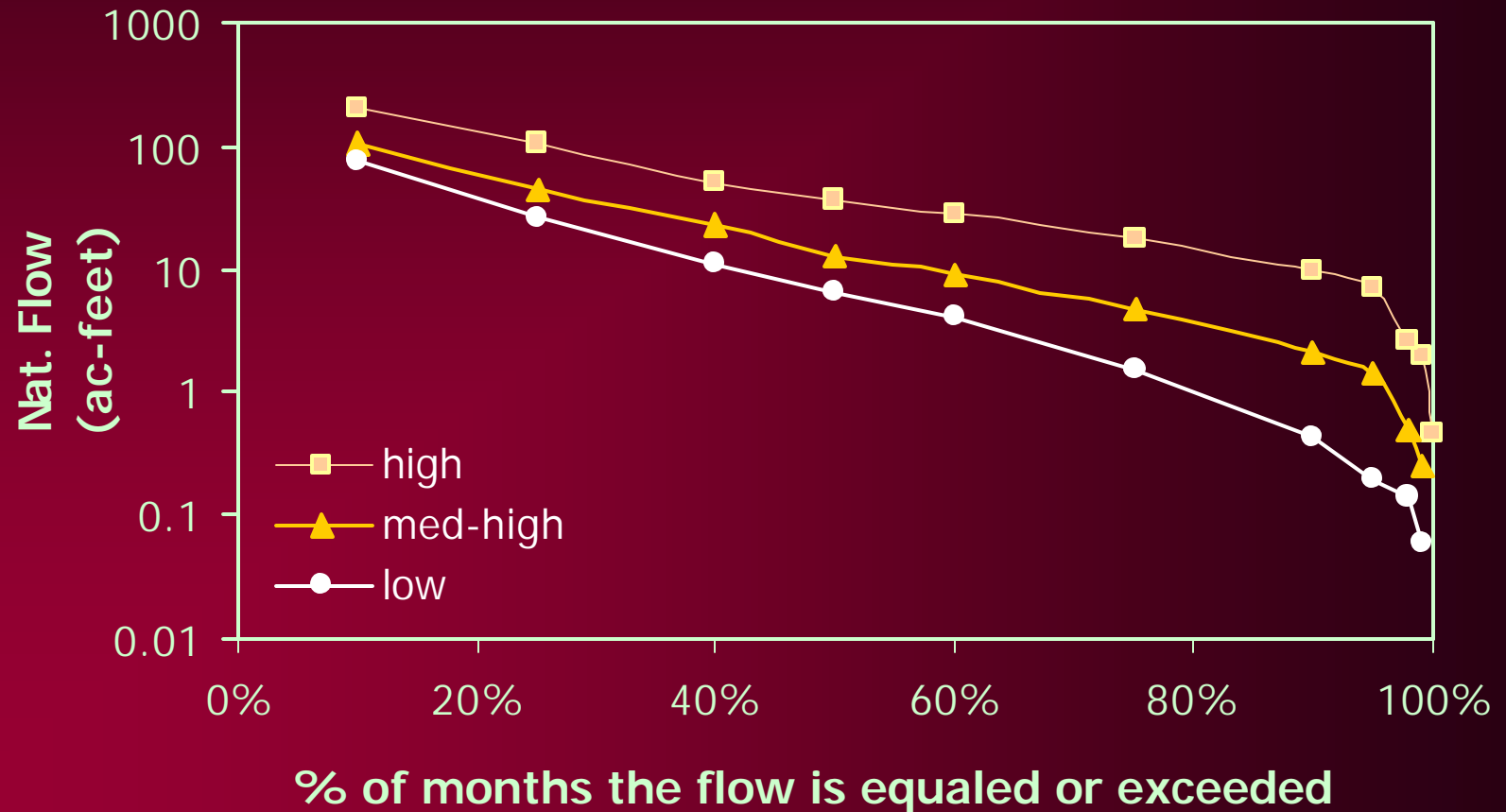


— Independent

— Autocorrelated

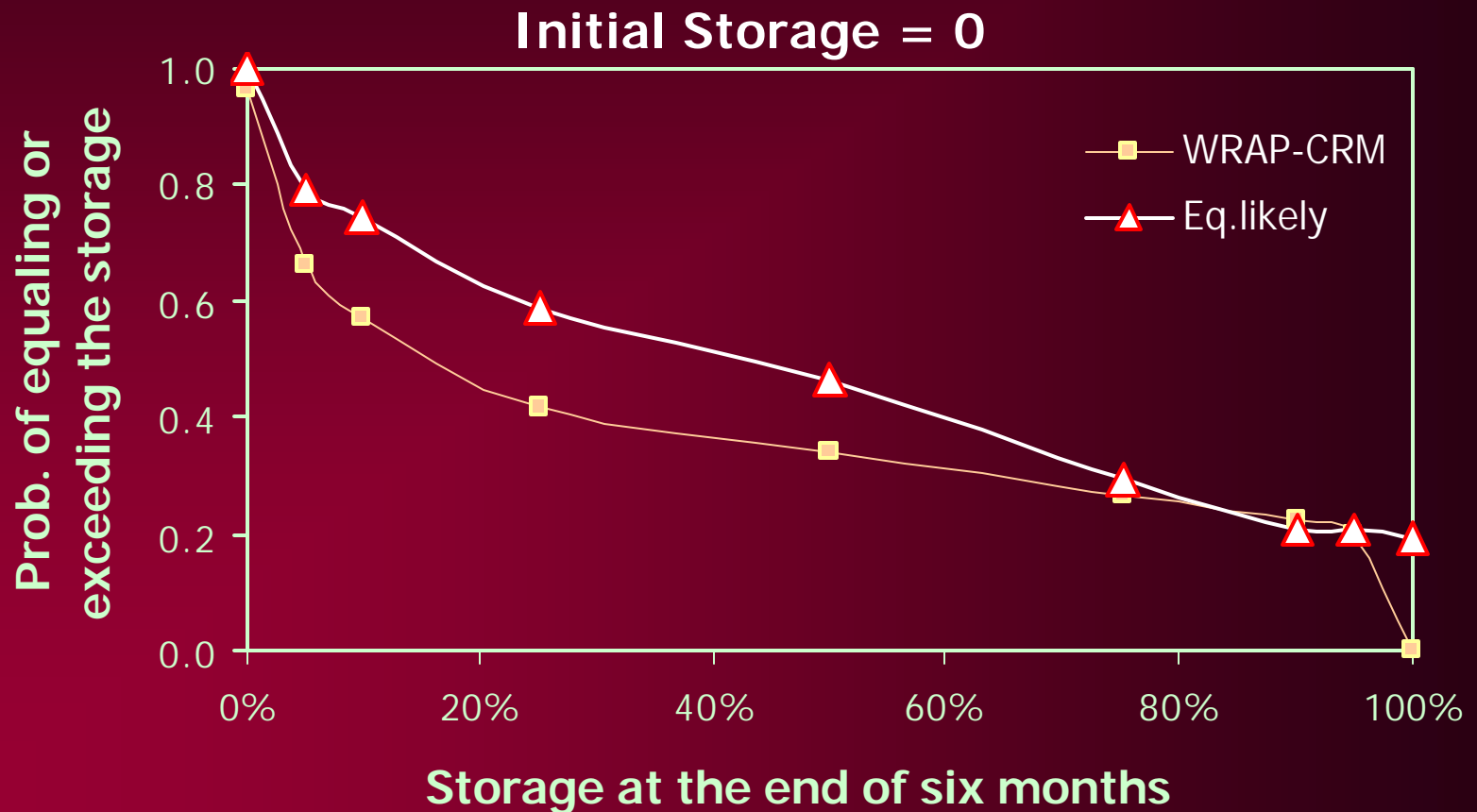
EXAMPLE: Proctor Reservoir

CDFC after 6 months

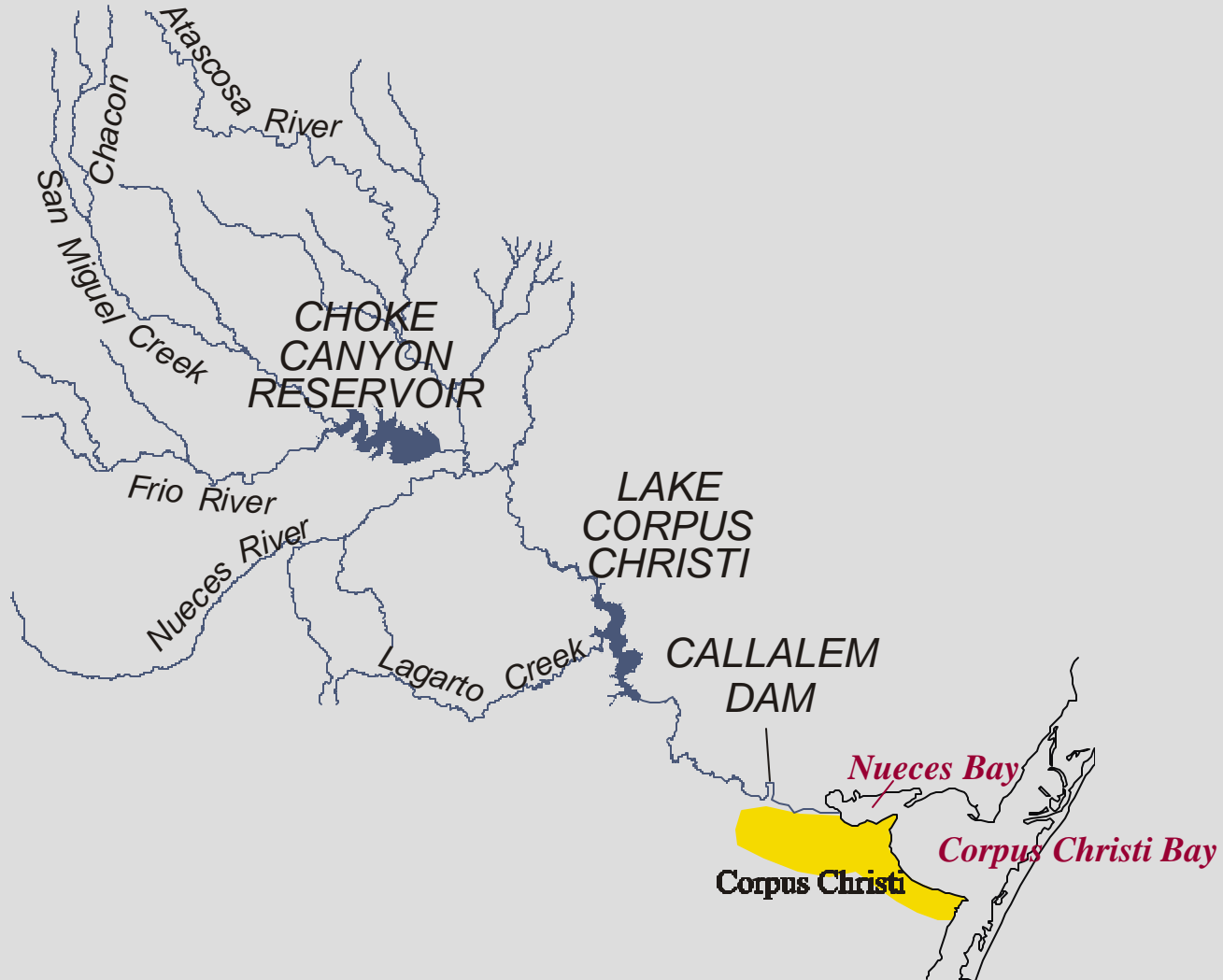


EXAMPLE: Proctor Reservoir

Probability distribution of storage after 6 months

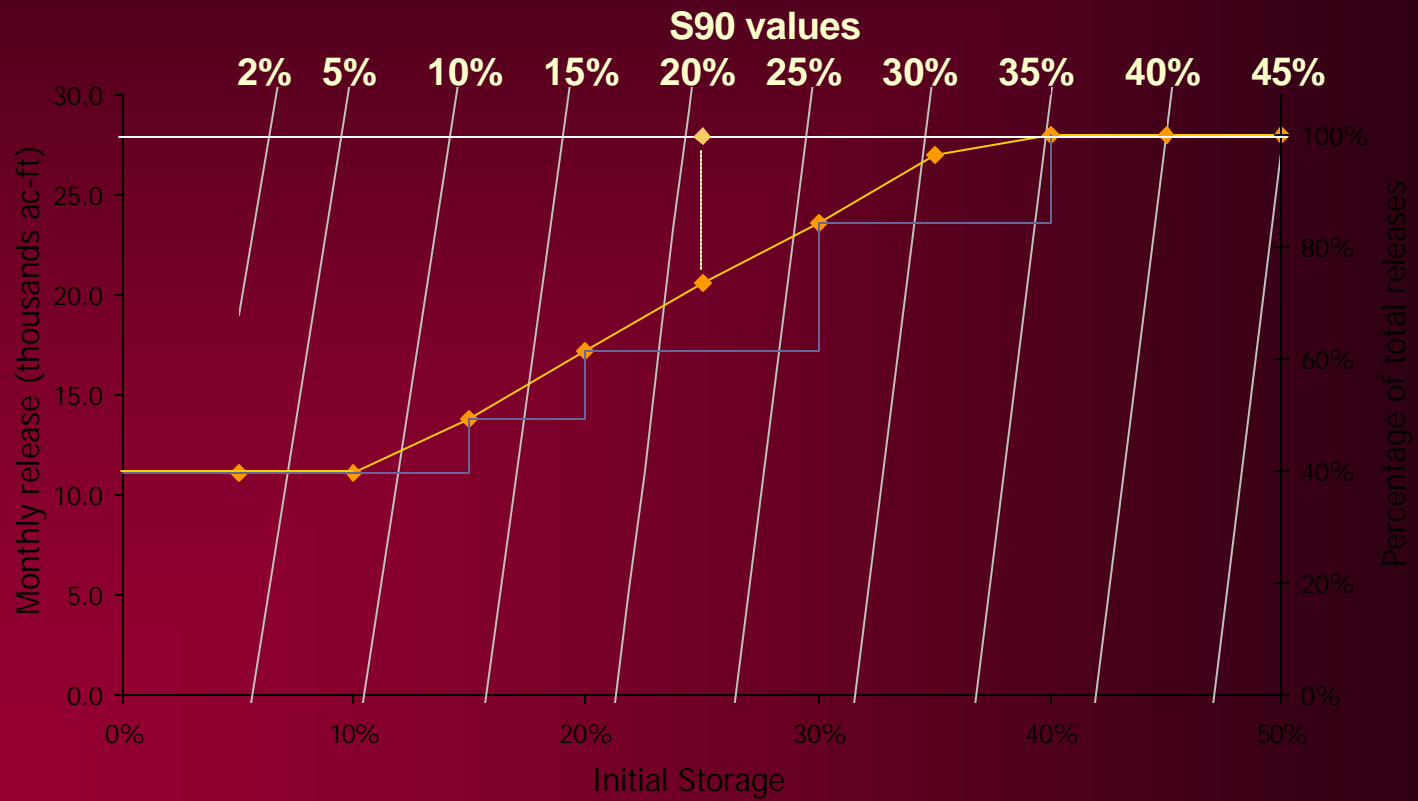


PRACTICAL APPLICATION: City of Corpus Christi



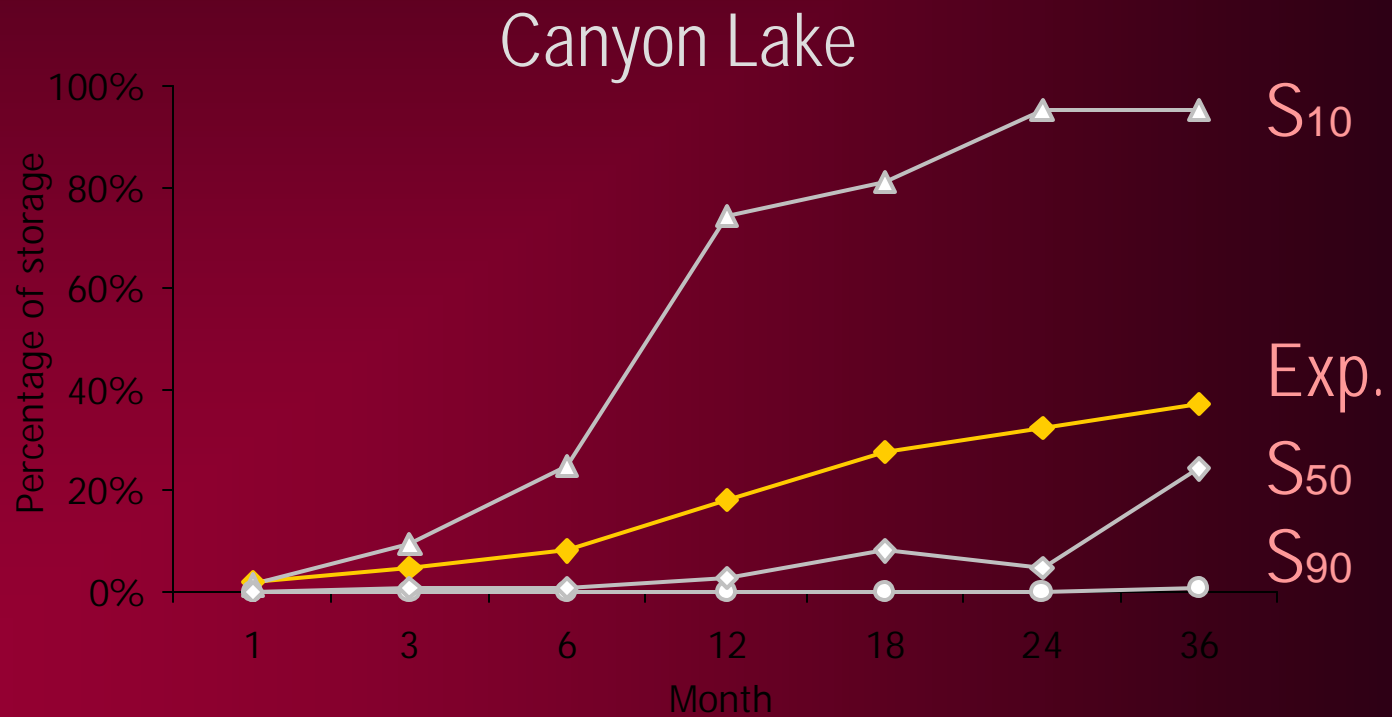
DROUGHT CONTINGENCY PLANS

Releases as function of storage



RESERVOIR RESILIENCE

The ability to recover from low storage



CONCLUSIONS

The CRM overrides the assumption of having sequences equally likely. It is able to incorporate serial flow properties by using a simple and yet significant parameter such as the storage.

CONCLUSIONS

The application exercises showed that the CRM can be used in a variety of planning activities. It is able to assess management policies in regard to the level of risk.

- Formulation/Evaluation Drought Contingency Plans
- Defining releases as a function of storage
- Resilience – Filling up nature of reservoirs
- Test of operational rules.

ACKNOWLEDGMENTS

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