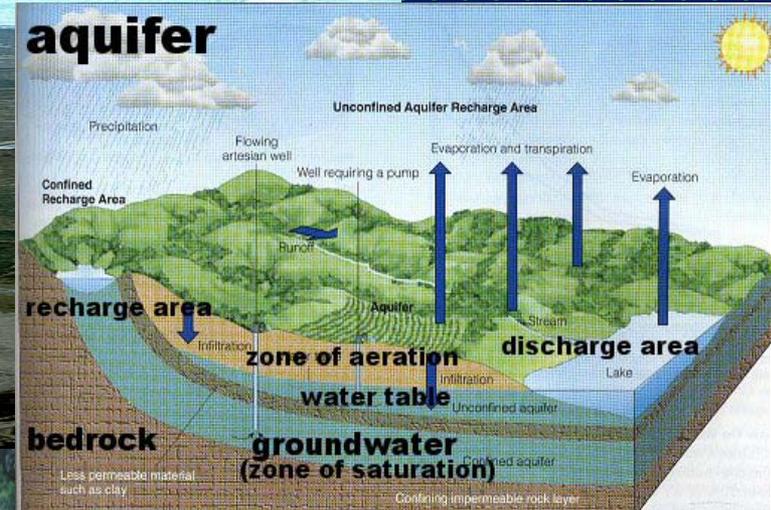


**Hydrologic Models in the
Courtroom
Working Paper
Dividing the Waters Model
Assessment Committee**

Hydrologic Models in the Courtroom



Routing Scheme for VIC-nL



Models: Their Uses,
Development, &
Assessment

WORKING OUTLINE

- **The Model Building Process**
- **Opinions of Model Builders**
- **Criteria for Judging Adequacy of Models**
- **Case Examples of the Use of Models in Complex Adversarial Proceedings**
- **Judging/Assessing Models and Model Based Expert Testimony**

Comments on Modeling

Bredehoeft and Konikow (1993):

- The very words **calibrate** and **validate** are misleading because they imply veracity.
- Any test of a model can only be used to invalidate it.

Comments on Modeling

Oreskes (1994):

- **Verification, validation, and confirmation** really only apply to closed systems, a condition never met in models of natural systems.
- In natural systems parameters are incompletely known, variables are burdened with inferences and assumptions, and model results are always non-unique.

Comments on Modeling

Woessner and Anderson (1996):

- All models are uncertain.
- Acceptability of a specific model is, ultimately, a subjective assessment made in the context of the model's stated purpose.

ASTM MODEL DOCUMENTATION ELEMENTS

- **MODEL FUNCTION**
- **GENERAL SETTING**
- **CONCEPTUAL MODEL**
- **COMPUTER CODE DESCRIPTION**
- **MODEL CONSTRUCTION**
- **PREDICTIVE SIMULATION**
- **SUMMARY & CONCLUSIONS**
- **REFERENCES**

DAUBERT CRITERIA

- Have theories and techniques been *tested*.
- Have they have been subjected to *peer review and publication*.
- Do techniques employed have a *known error rate*.
- Are techniques subject to *standards* governing their application.
- Do the theories and techniques enjoy *widespread acceptance*.

CASE STUDIES

**REPUBLICAN RIVER COMPACT
CASE (RRCA MODEL)**

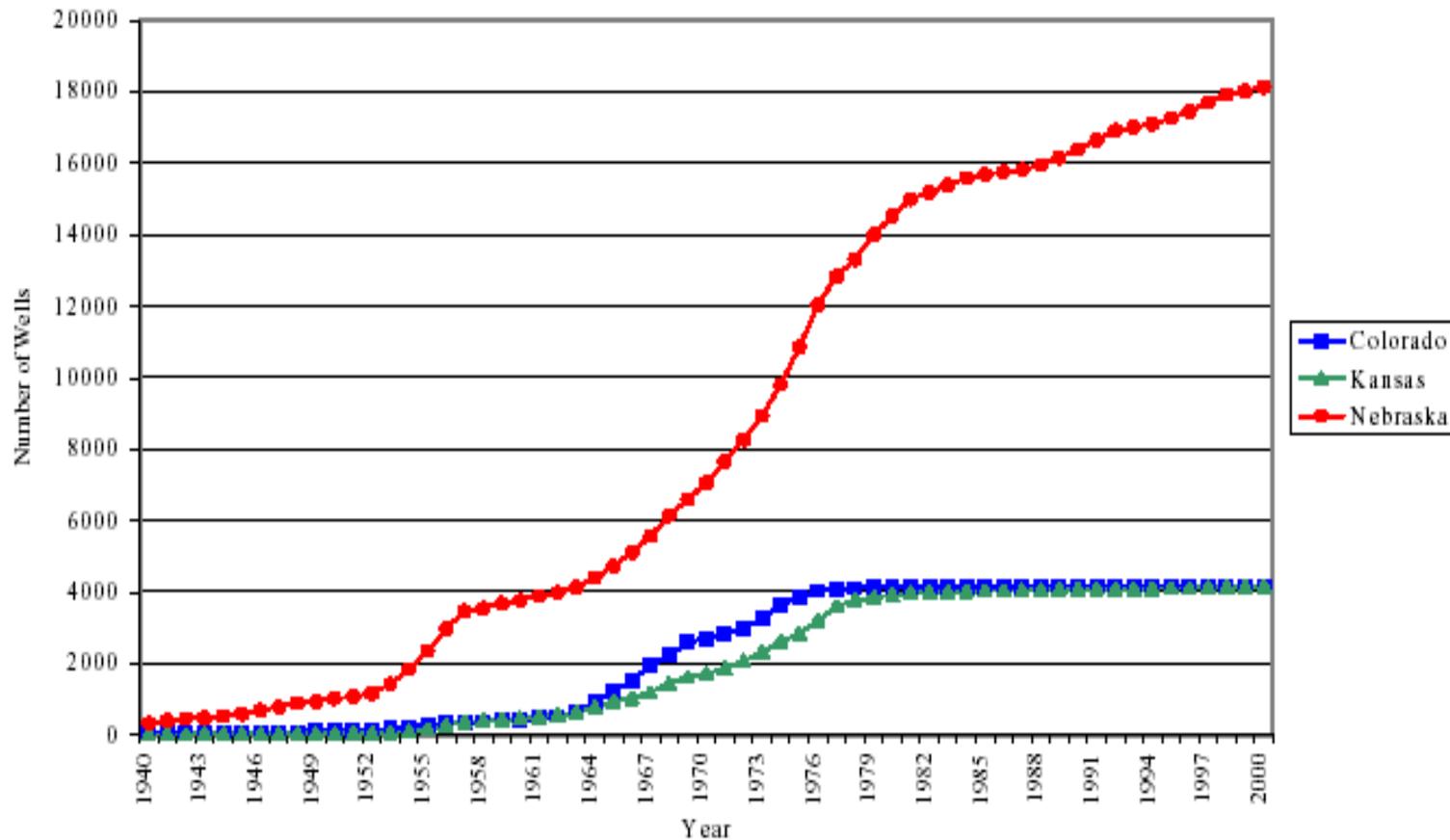
**ARKANSAS RIVER COMPACT
CASE (HIM MODEL)**

Republican River Basin



Well Development in Republican

Cumulative Number of Active Wells in the Republican River Model Domain



Judging/Assessing Models and Model Based Expert Testimony

**ARE THERE ALTERNATIVES TO
CROSS-EXAMINATION?**