

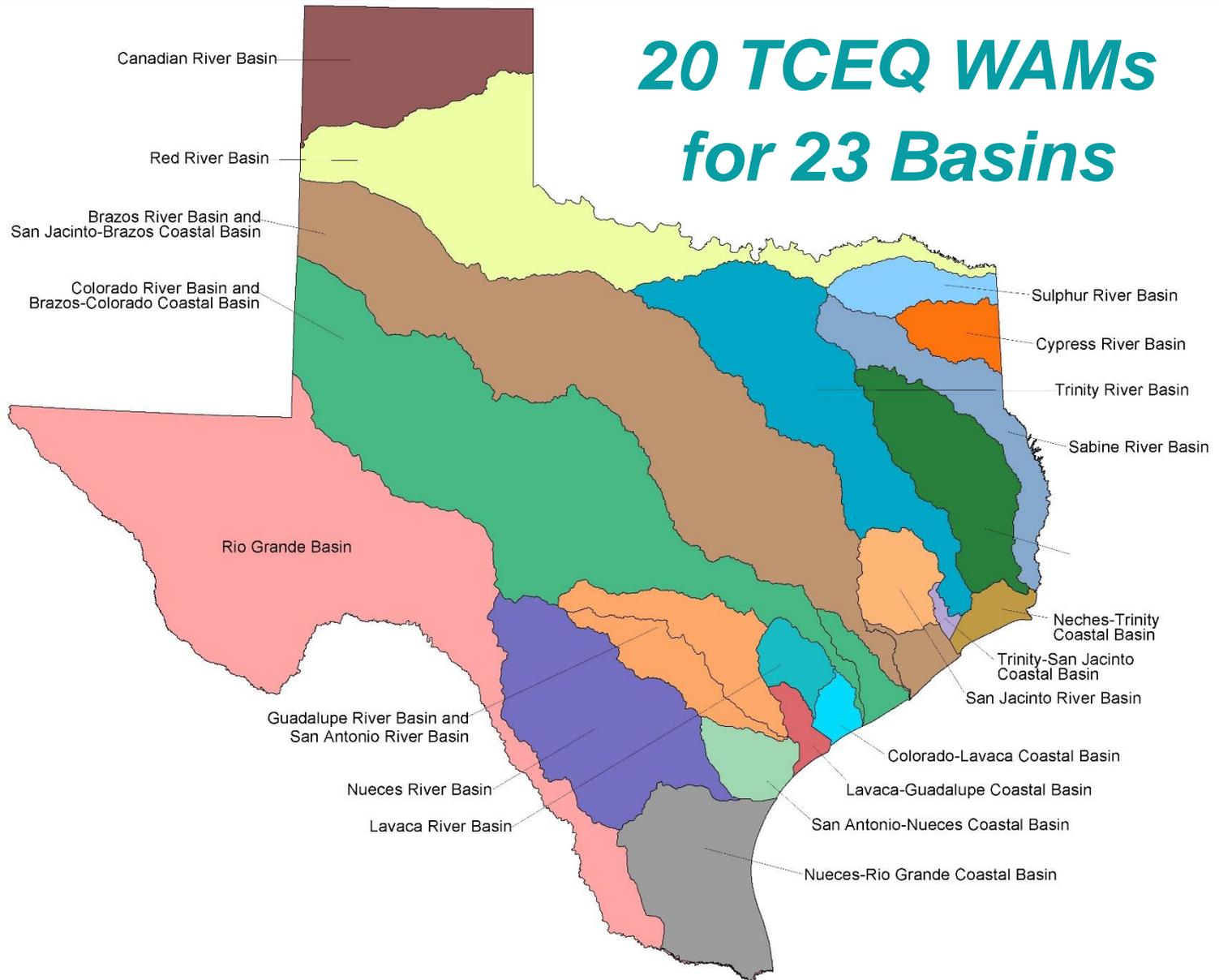


Water for Texas - 2017
Texas Water Development Board
Austin, Texas

Water Availability Models
- where we are today -

Bob Brandes
Austin, Texas
January 23-25, 2017

20 TCEQ WAMs for 23 Basins



Origin of State's Current WAMs

- **Senate Bill 1 in 1997 authorized development of Water Availability Models for 22 of 23 river and coastal basins in Texas**
 - **6 basins completed by end of 1999**
 - **16 basins completed by end of 2001**
- **House Bill 76 in 1999 authorized development of Rio Grande WAM**
 - **Texas and Mexico**
 - **Completed in 2004**

What is a Water Availability Model?

A computer-based processor that simulates the available supply of surface water for each water right in a river or coastal basin considering:

- Existing legal and regulatory constraints, e.g. water rights priorities**
- Authorizations and conditions specified in individual water rights**
- Naturalized hydrologic variations reflective of historical trends and extremes**

How are Water Availability Models Used ?

- **Water rights permitting by TCEQ**
 - **Determine available supply for new appropriations and amendments**
 - **Assess impacts on other water rights**
 - **Satisfy SB3 environmental flow standards**
- **SB1 regional water supply planning**
 - **Regional Water Planning Groups**
 - **TWDB**

Key Roles of WAMs in Regional Water Planning

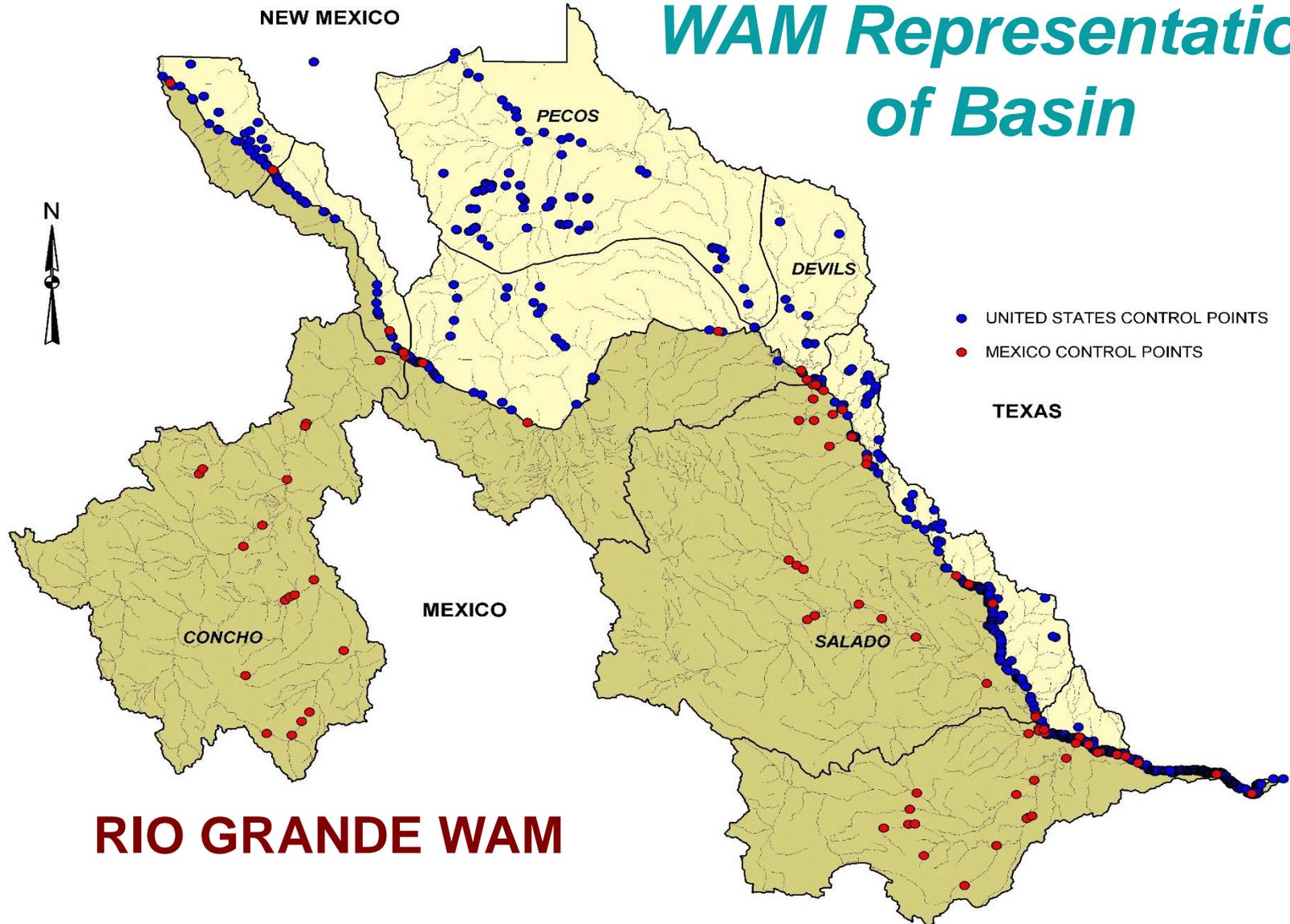
- **Determine existing surface water supplies for water user groups and specific projects (under drought of record conditions)**
 - **Reservoir yields**
 - **Run-of-river diversions**
- **Determine potential surface water supplies for recommended projects and strategies (under drought of record conditions)**
- **Incorporate SB3 environmental flow standards into future project evaluations**

What comprises a Water Availability Model?

**WAM = Computer Program (WRAP)
+ Basin-Specific Data Files**

- **WRAP (Water Rights Analysis Package)**
- **Basin-Specific Data Files include:**
 - **Computational node connectivity**
 - **Water rights priorities and descriptions**
 - **Naturalized historical hydrology**
 - **Historical reservoir net evaporation rates**
 - **Program operation commands**

WAM Representation of Basin



RIO GRANDE WAM

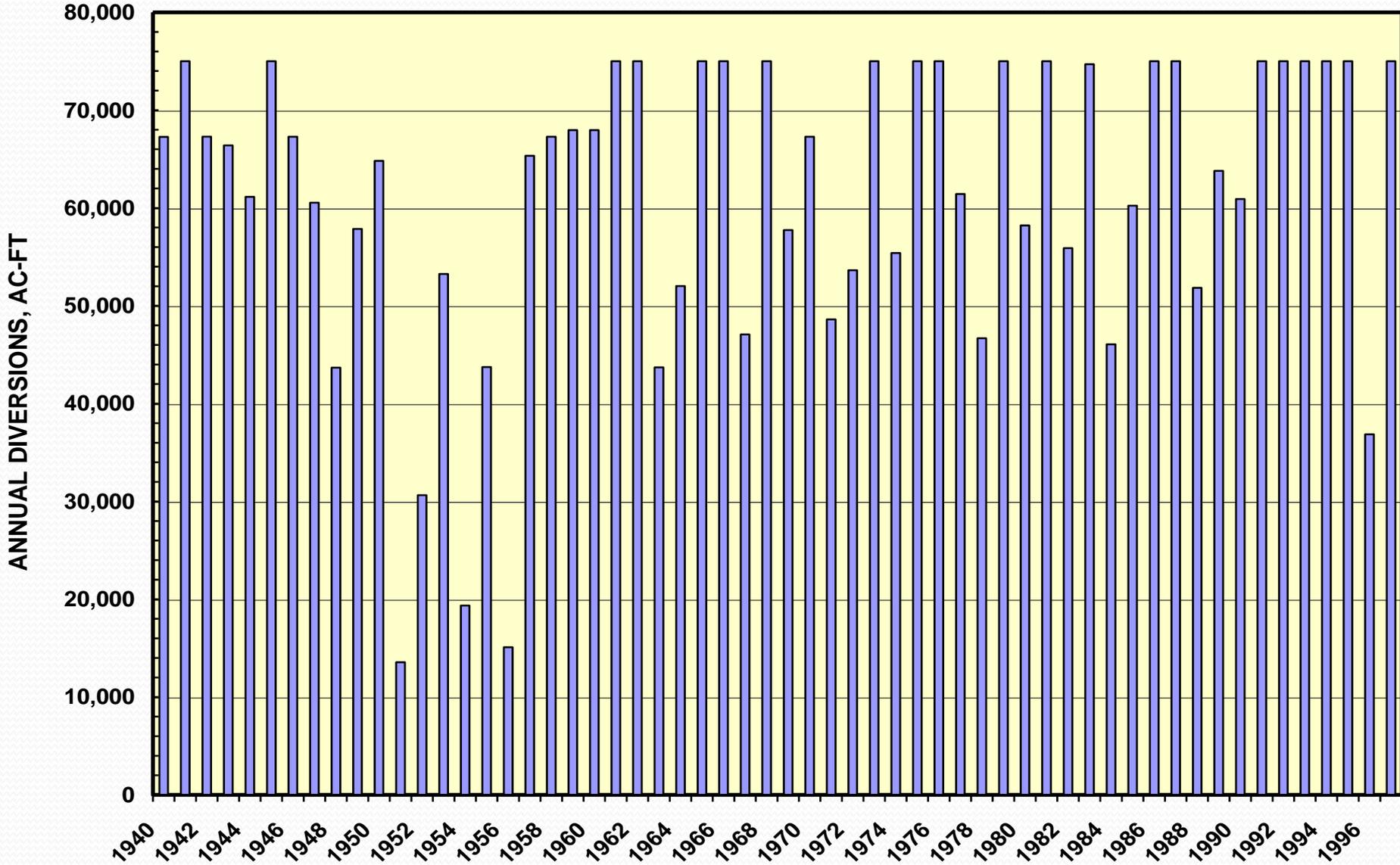
Key Features of Water Availability Models

- Existing WAM data sets typically reflect 1940 to late 1990s historical hydrologic conditions
- Monthly time steps currently used in all WAMs by TCEQ and TWDB – daily time step in progress
- Prior appropriation doctrine – first in time, first in right – applied for allocating flows among all water rights in a basin, except for Rio Grande
- Special conditions can be represented, such as SB3 environmental flow standards, reservoir system operations, water rights subordination, and wastewater reuse

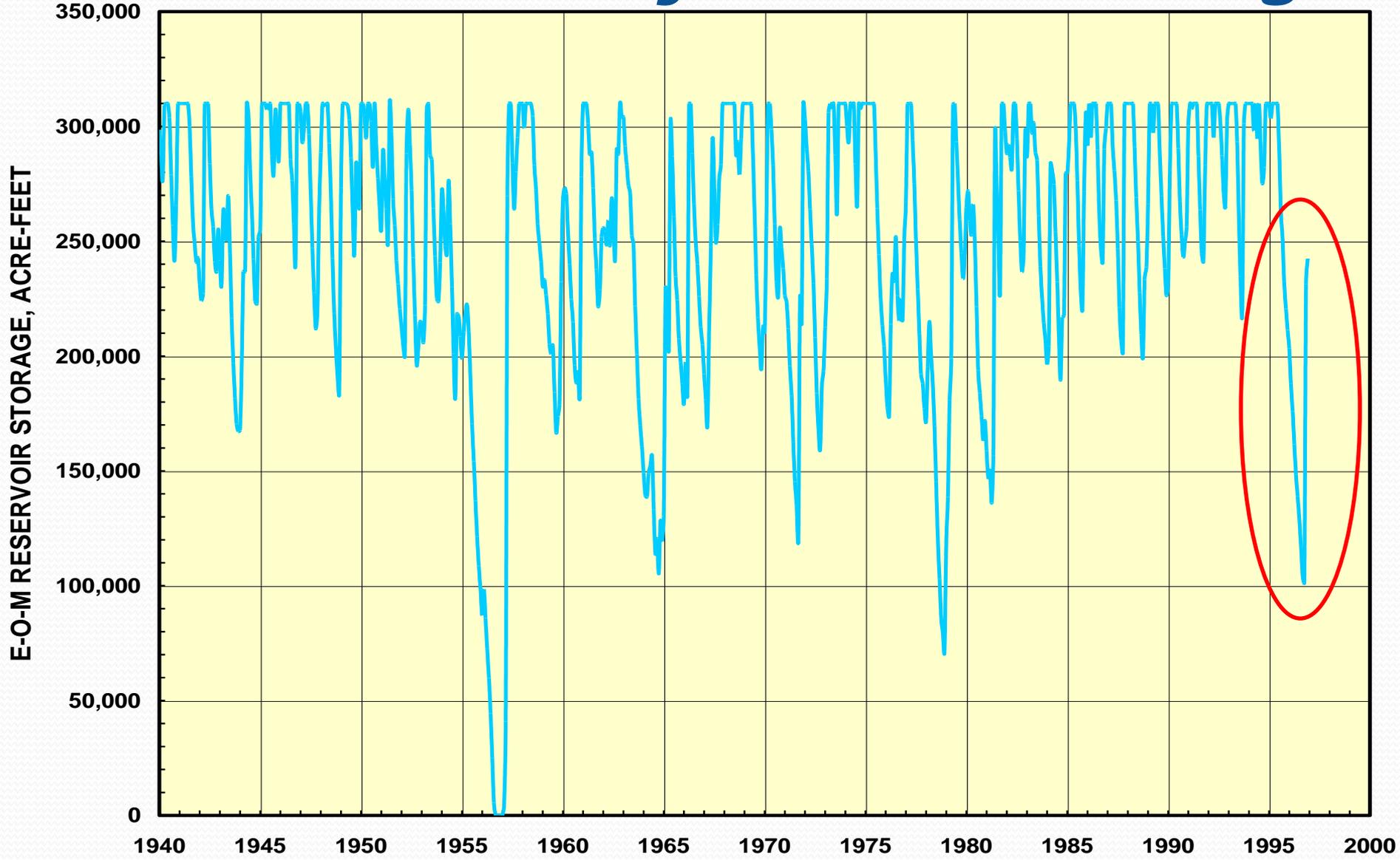
Typical Output from WAMs

- **Monthly Diversions for All Water Rights**
- **Reliabilities of Water Rights Diversions**
 - **% of Time Full Diversion Satisfied**
 - **% of Full Diversion Satisfied on Average**
- **End-of-Month Reservoir Storage Values**
- **Monthly Evaporation Losses from Reservoirs**
- **Monthly Return Flows from Diversions**
- **Monthly Regulated Streamflows**
- **Monthly Unappropriated Streamflows**
- **Monthly Flows to Bays and Estuaries**

Simulated Annual Diversions



Simulated Monthly Reservoir Storage



Why Existing WAMs Need to be Updated

- **Hydrologic data bases for all but one existing WAM end in late 1990s – Rio Grande in 2000**
- **Drought of record for many basins has changed from 1950s to recent years not included in data**
- **Basing available water supplies on droughts less severe than the drought of record results in over-estimation of firm supplies**
- **Communities and other water users are at risk of water shortages when available supplies are over estimated**

Factors Affecting Priorities for Updating Individual WAMs

- **Occurrence of new drought of record since end of WAM data base**
- **Need to revise firm water supplies for existing water rights and projects**
- **Proposed major projects in a basin that may be limited by available unappropriated water**
- **Regulatory requirements for updating some existing WAMs – Colorado and Brazos**
- **Funding needs for updating individual WAMS**

Possible Priorities for WAM Extensions

PRIORITY FOR EXTENSION	BASIN	NO. OF WATER RIGHTS	PRIMARY CONTROL POINTS	HYDROLOGIC PERIOD OF RECORD	YEARS TO EXTEND THRU 2016	ESTIMATED COST \$
1	Sulphur River	56	6	1940-1996	20	259,000
2	Rio Grande	876	43	1940-2000	16	805,000
3	Nueces River	255	41	1934-1996	20	633,000
4	Guadalupe-San Antonio Rivers	1,120	46	1934-1989	27	1,265,000
5	Red River	400	31	1948-1998	18	662,000
6	Neches River	330	20	1940-1996	20	506,000
7	Colorado River/Brazos-Colorado	1,288	45	1940-2013/1998	3/18	230,000
8	Trinity River	1,020	41	1940-1996	20	1,122,000
9	San Jacinto River	200	17	1940-1996	20	403,000
10	Brazos River/San Jacinto-Brazos	1,200	77	1940-1997	19	288,000
11	Lavaca River	55	7	1940-1996	20	259,000
12	Colorado-Lavaca Coastal	30	1	1940-1996	20	69,000
13	Canadian River	38	6	1948-1998	18	127,000
14	Sabine River	192	18	1940-1998	18	506,000
15	Cypress River	84	6	1948-1998	18	259,000
16	Neches-Trinity Coastal	108	4	1940-1996	20	138,000
17	Trinity-San Jacinto Coastal	17	2	1940-1996	20	69,000
18	Lavaca-Guadalupe Coastal	6	2	1940-1996	20	46,000
19	San Antonio-Nueces Coastal	21	6	1948-1998	18	69,000
20	Nueces-Rio Grande Coastal	78	29	1948-1998	18	173,000
					Total	7,888,000



Questions