Evaluation of the 2003 Biological Opinion and Other Alternatives Using URGWOM

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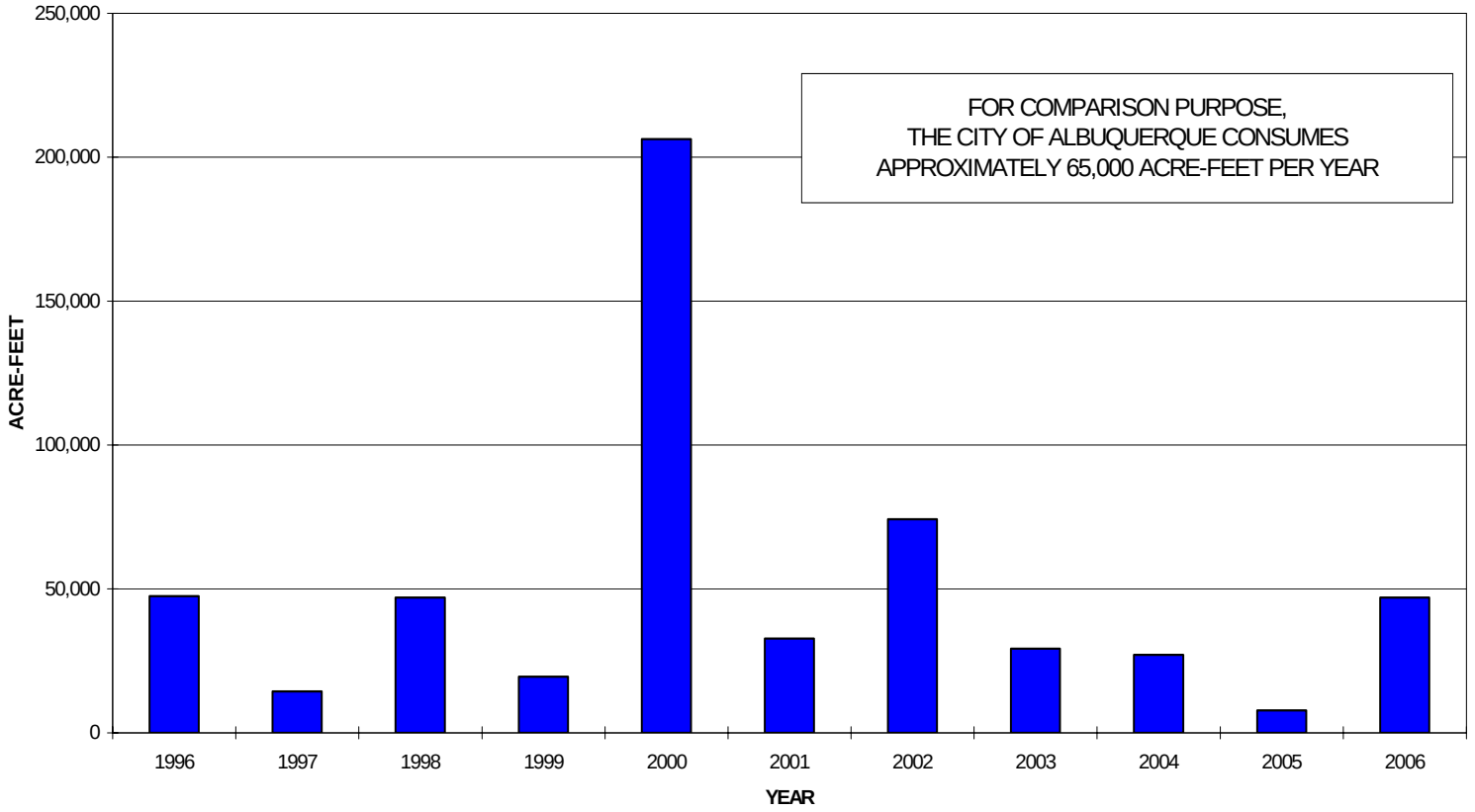
Rio Grande Basin

- *The system is fully Allocated;*
- *Acequia, Conservation & Irrigation Districts are the major Surface water user;*
- *Legal Constraints*
  - *Rio Grande Compact and other laws;*
- *Endangered Species:*
  - *Silvery Minnow,*
  - *Southwestern Willow Flycatcher.*

Supplemental Water Program

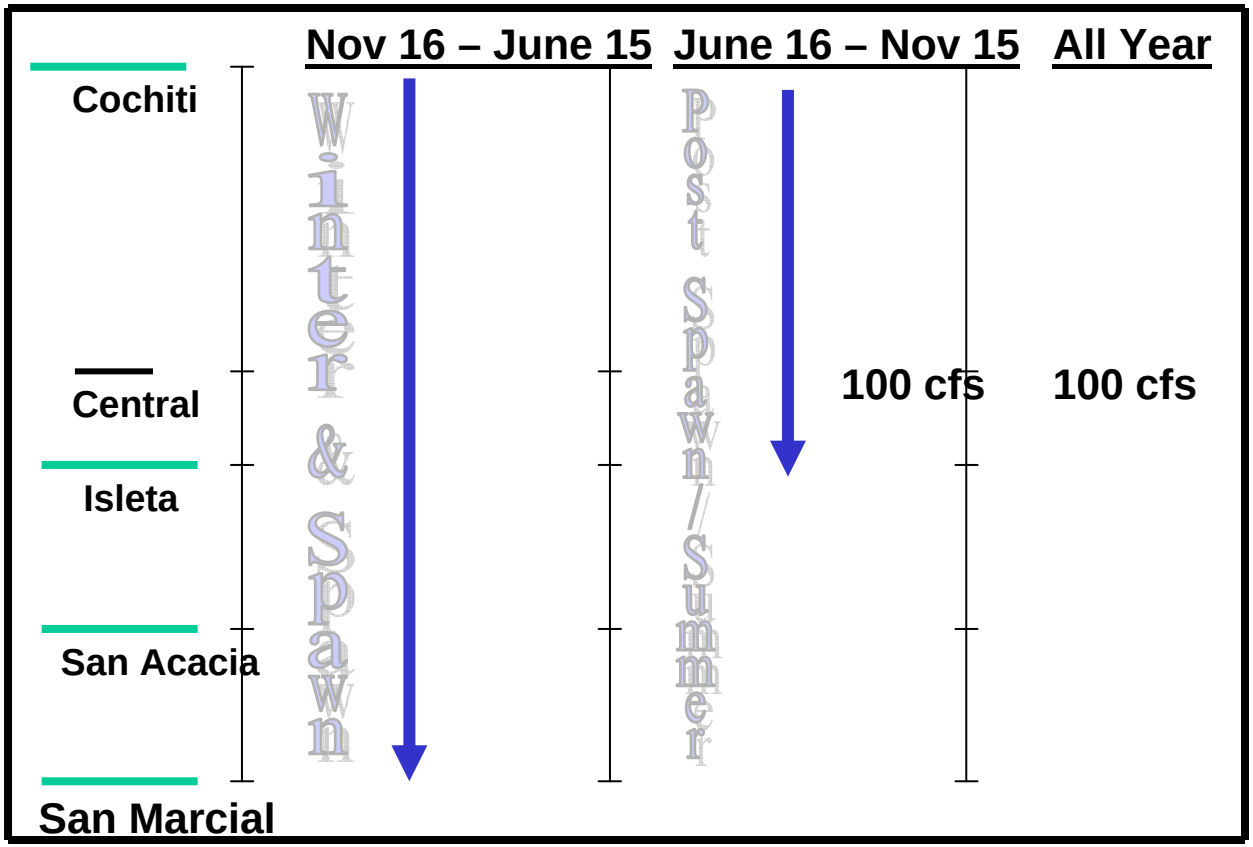
Established by the Reclamation with cooperation of other agencies to meet ESA demand and thus avoid conflicts with other water users.



2003 Biological Opinion

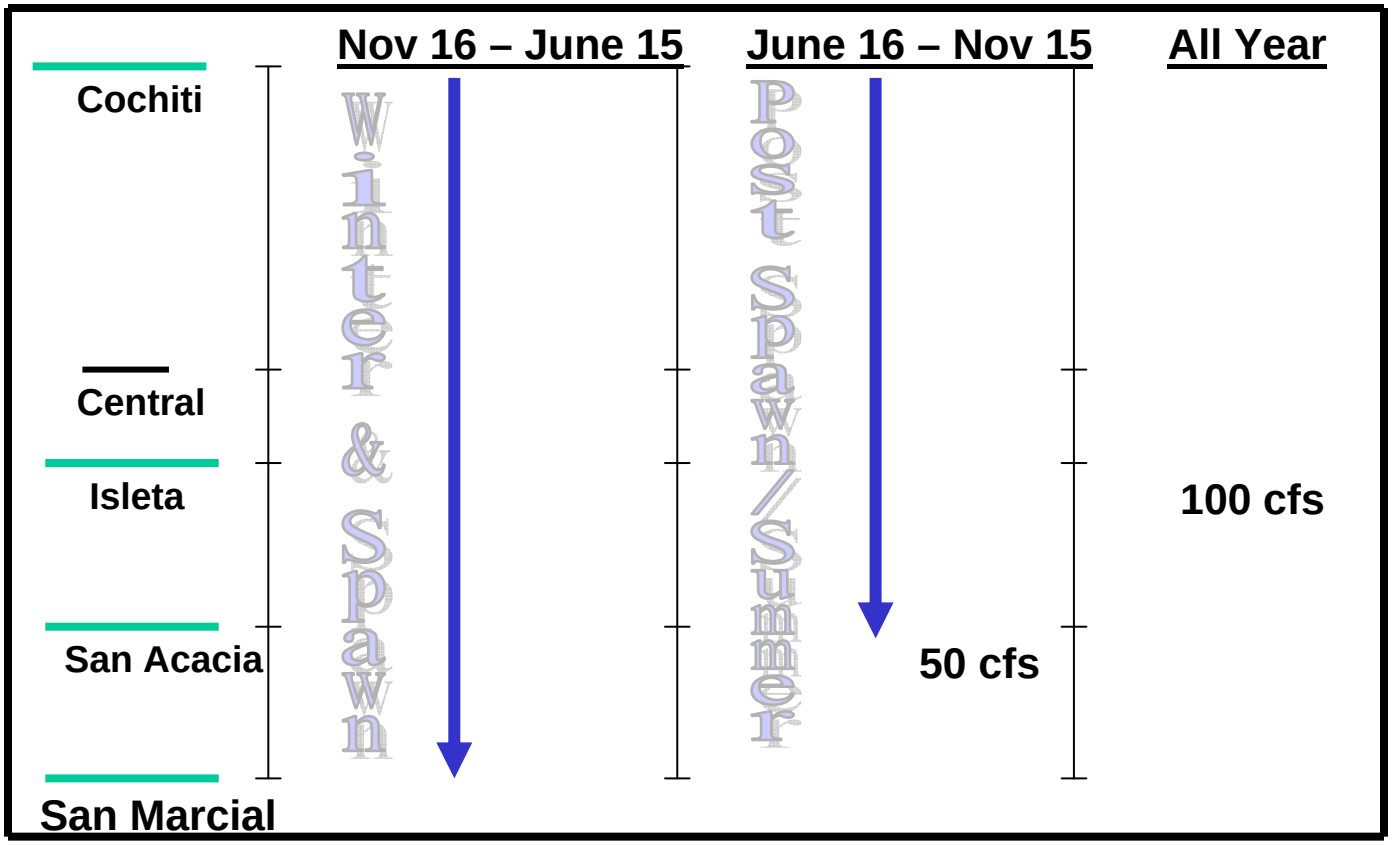
Target flows are based on the type of the hydrologic year: dry, average or wet.

Dry-year: *Snowmelt Runoff is less than 80% of 30 year average or in Article VII of Rio Grande Compact storage restrictions.*



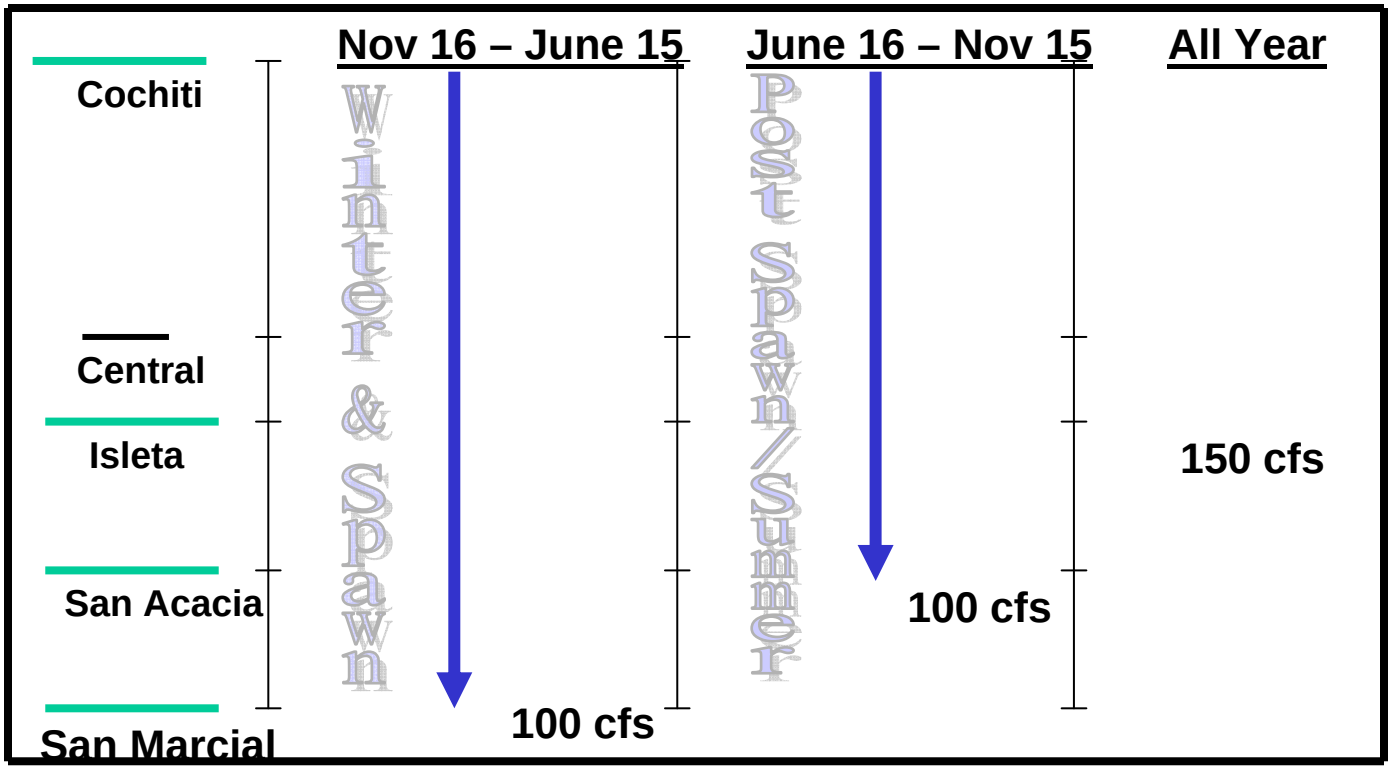
2003 BO

Average-year: *Snowmelt Runoff is between 80% and 120% of the 30 year average.*



2003 BO

Wet-year: *Snowmelt Runoff is greater than 120% of the 30 year average.*



Method

- *URGWOM model was used to evaluate the sustainability of meeting the target flows;*
- *Assumed an unlimited supplemental water supply;*
- *Three 10-year hydrologic sequences were used.*

	Dry Sequence				Average/Dry Sequence				Wet Sequence			
		Total	M-J	Ratio		Total	M-J	Ratio		Total	M-J	Ratio
1	1976	682,500	478,400	70%	1982	1,183,500	779,000	66%	1999	1,103,200	650,300	59%
2	1989	713,400	482,500	68%	1988	726,500	415,700	57%	1986	1,805,900	1,257,500	70%
3	1996	449,100	221,700	49%	1992	1,067,800	799,400	75%	1999	1,103,200	650,300	59%
4	1977	296,500	133,100	45%	1976	682,500	478,400	70%	1991	1,239,000	862,300	70%
5	1989	713,400	482,500	68%	1989	713,400	482,500	68%	1980	1,392,200	1,159,800	83%
6	1989	713,400	482,500	68%	1996	449,100	221,700	49%	1992	1,067,800	799,400	75%
7	1981	416,900	187,800	45%	1977	296,500	133,100	45%	1985	2,169,100	1,744,000	80%
8	1996	449,100	221,700	49%	1989	713,400	482,500	68%	1998	892,500	578,700	65%
9	1996	449,100	221,700	49%	1989	713,400	482,500	68%	1978	699,000	507,800	73%
10	1977	296,500	133,100	45%	1981	416,900	187,800	45%	1998	892,500	578,700	65%
Average		517,990	304,500			696,300	446,260			1,236,440	878,880	

Upper Rio Grande Water Operation Model (URGWOM)

- *Covers the basin area from CO/NM state line to El Paso, Tx;*
- *Links reservoir operations to downstream demand;*
- *Major water users;*
- *Comprehensive Water accounting system;*
- *Rio Grande compact and other legal constraints;*

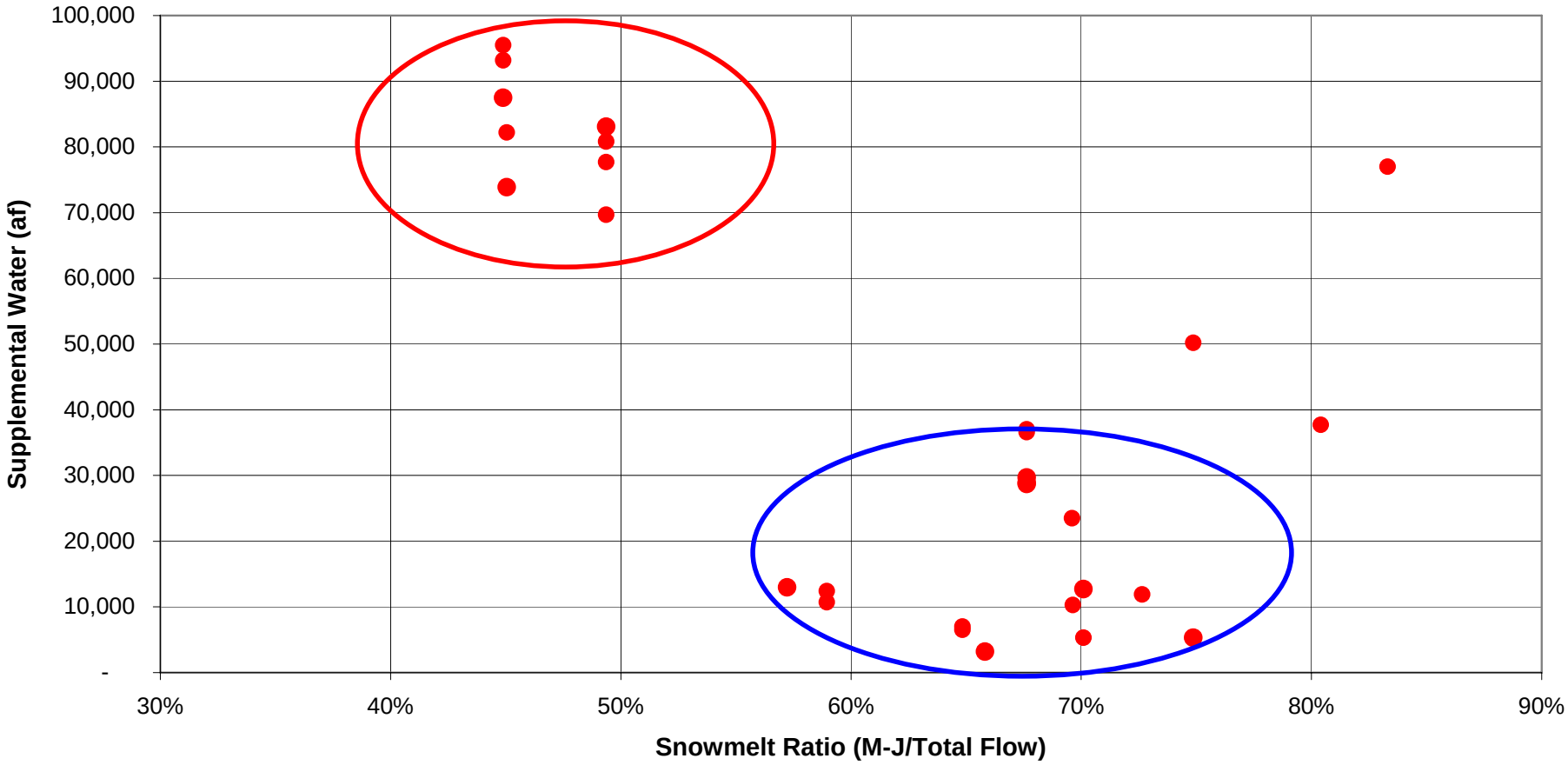
Upper Rio Grande Basin

Results

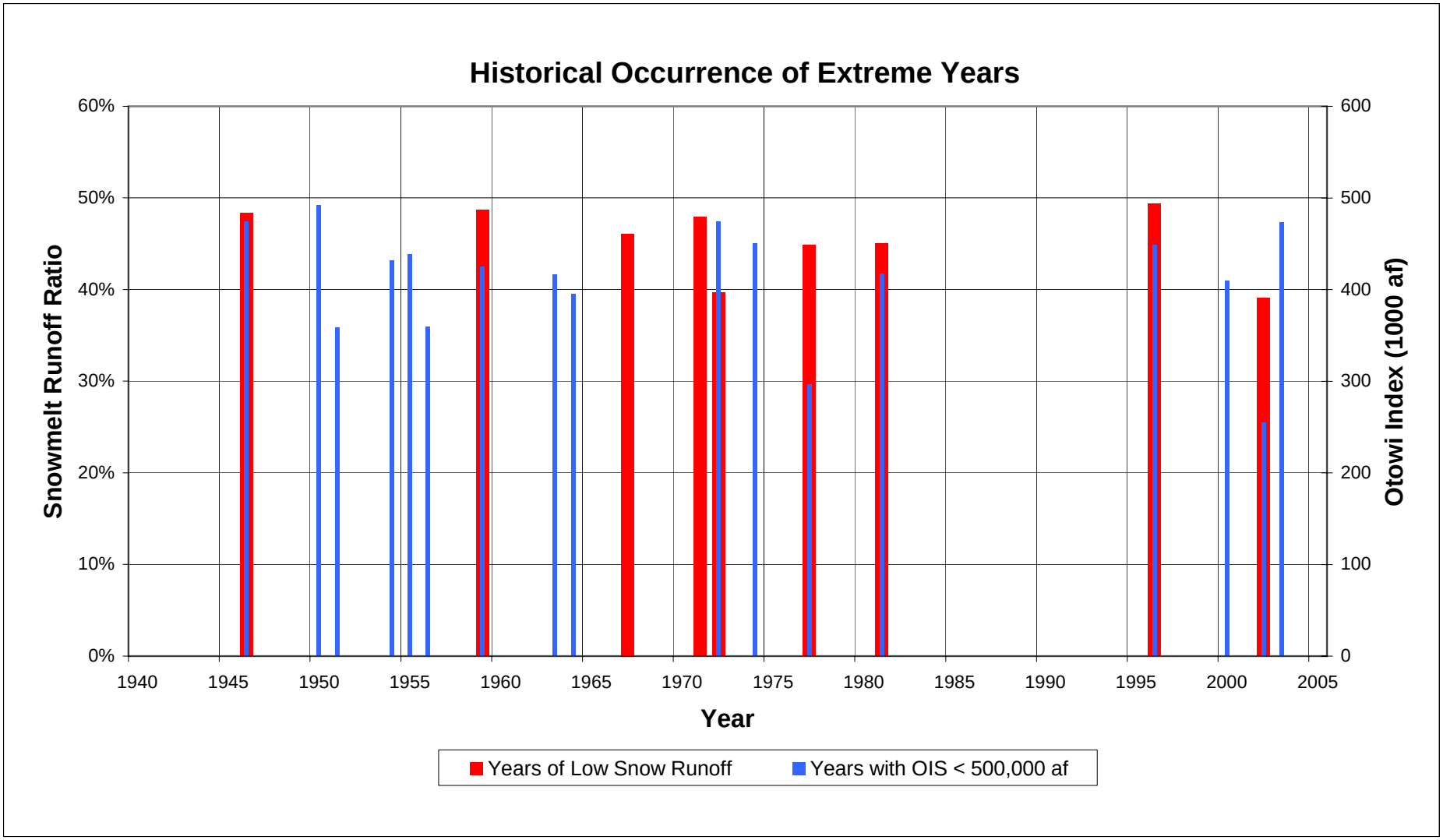
Simulated Supplemental Water Demand to Meet 2003 BO Target Flow

Year	Supplemental Water (acre-feet)		
	Dry	Average	Wet
1	5,300	3,200	12,400
2	29,600	13,000	10,300
3	80,800	5,300	10,700
4	93,200	12,700	23,500
5	37,000	28,700	77,000
6	36,600	83,100	50,200
7	82,200	87,500	37,700
8	77,700	28,900	6,500
9	69,700	29,700	11,900
10	95,500	73,900	7,000

Snowmelt Runoff vs. Supplemental Water Demand



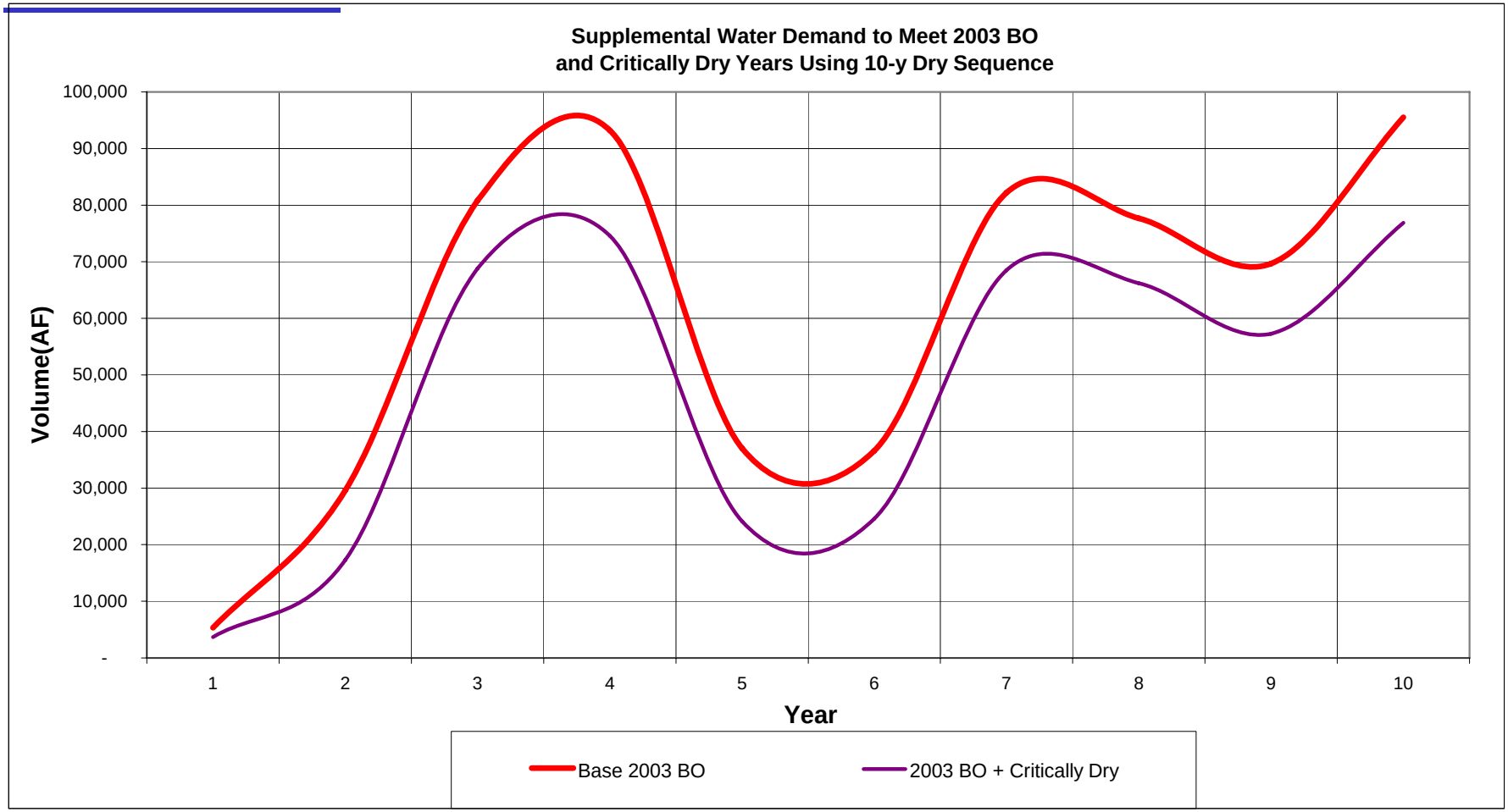
Historical Data Analysis



Next: Evaluation of Critically Dry Year

- *Critically dry year was defined as year with March through July native flow at Otowi gage was less than or equal 500,000 af.*
- *Target flows are the same as dry year but The Albuquerque continuous flow target was reduced from 100 cfs to 50 cfs.*
- *No requirement for continuous flow south of Albuquerque.*

Comparison of Supplemental Water Demand



Concluding Remarks

- *On average the required supplemental water to meet the current target flows over 10-year sequence:*
  - *Dry Sequence* *60,000 Af*
  - *Average Sequence* *40,000 AF*
  - *Wet Sequence* *25,000 AF*
- *Modeling results indicated that the supplemental water program is not sustainable;*
- *The additional insight gained through the application of URGWOM allows us to develop more viable alternatives.*