

Appendix 4E
Impact of Recent Drought on Region F Water Supplies



Region F Water Planning Group

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Appendix 4E: Impacts of Recent Drought on Water Supply

TWDB authorized an analysis of the impact of recent drought conditions on Region F as part of the supplemental funding for the 2006 Region F Water Plan. Since 1998 most of Region F has experienced a significant drought. Indications are that for many reservoirs the recent drought may be more severe than previous droughts, potentially lowering the available supply from the reservoirs. The Colorado WAM uses naturalized flows from 1940 through 1998. As a result, the WAM may over-estimate yields of Region F reservoirs.

To assess the potential impact of the recent drought on water supplies in Region F, historical inflows into Region F reservoirs and at the City of Junction's diversion point were developed covering the period from 1999 through 2003. Table 4E-1 is a summary of the methodology used to calculate these flows. These flows were incorporated into a special simplified version of the Colorado WAM, the MiniWAM, developed for the subordination strategy. The MiniWAM includes only major reservoirs in Region F and the City of Junction's run-of-the-river right. More detailed information on the MiniWAM may be found in Appendix 4C. Flows from 1940 through 1998 are based on the modeled flows available to these water rights using the subordination analysis.

Table 4E-2 compares firm yields with and without the extended hydrology. (Lake Brownwood is not included in this analysis because it does not appear that the reservoir has experienced drought-of-record conditions.) All yields assume that the subordination strategy is in place. A description of the subordination strategy may be found in Section 4.2.3. The flows used for the period of 1940 through 1998 have been adjusted to assume that water is passed downstream for water rights not included in the subordination analysis. Flows after 1998 do not include any adjustments for downstream senior water rights. Therefore, yields may be somewhat higher than they could be if a significant number of senior water rights would make priority calls under similar conditions.

**Table 4E-1
Methodologies Used to Calculate Reservoir Inflows 1999 through 2004**

Reservoir	Period of Record	Method	Stations or Reservoir Upstream of Incremental Area	Station Downstream of Incremental Area
Thomas	1/1998-12/2004	DAR	None	Colorado River near Gail
Colorado City	1/1998-12/2004	DAR	None	Colorado River near Gail
Champion	1/1998-12/2004	DAR	None	Colorado River near Gail
Spence	1/1998-12/2004	DAR	Lake Thomas	Colorado River above Silver
			Colorado City	
			Champion	
Oak Creek	1/1998-12/2004	DAR	Colorado River at Robert Lee	Colorado River near Ballinger
Ballinger	1/1998-12/2004	DAR	Colorado River at Robert Lee	Colorado River near Ballinger
Elm Creek	1/1998-12/2004	DAR	Elm Creek Reservoir	Elm Creek at Ballinger
Twin Buttes	1/1998-9/2001	Mass balance	n/a	n/a
	10/2001-12/2004	DAR	None	Middle Concho above Tankersley
			None	Spring Creek above Twin Buttes
			None	South Concho at Christoval
Nasworthy	1/1998-9/2001	DAR	None	Twin Buttes
	10/2001-12/2004	DAR	None	Pecan Bayou near San Angelo
O.C. Fisher	1/1998-12/2004	COE data	n/a	n/a
O.H. Ivie	1/1998-12/2004	DAR	Colorado River at Robert Lee	Colorado River near Ballinger
			Elm Creek Reservoir	Elm Creek at Ballinger
			Concho River at San Angelo	Concho River at Paint Rock
Hords Creek	1/1998-12/2004	COE data	n/a	n/a
Coleman	1/1998-12/2004	DAR with Hords Creek	n/a	n/a
Brady Creek	1/1998-12/2004	Mass balance *	See note	See Note

DAR – drainage area ratio method

* Used 80 % of the average of incremental flows between San Saba and Menard gauges on the San Saba River and the Stacy and Winchell gauges on the Colorado River when spilling.

Table 4E-2
Comparison of Yields with and without Extended Hydrology
(Values in Acre-Feet per Year)

Reservoir	Firm Yield 1940-1998	Firm Yield 1940-2004	Reduction in Yield
Lake Thomas	13,300	12,540	760
Lake Colorado City	4,520	4,040	480
Champion Creek Reservoir	2,760	2,380 **	380
Spence Reservoir	38,760	34,360	4,400
Oak Creek Reservoir	3,920	2,900	1,020
Lake Ballinger	1,380	1,380	0
Lake Winters	1,260	1,180	80
Twin Buttes Reservoir	19,900	15,320	4,580
Lake Nasworthy	0	0	0
O.C. Fisher Reservoir	8,920	5,420	3,500
O.H. Ivie Reservoir	98,560	84,120	14,400
Lake Coleman	9,000	9,000	0
Hords Creek Reservoir	1,860	1,860	0
Brady Creek Reservoir	3,560	3,560	0
<i>Total</i>	<i>207,700</i>	<i>178,060</i>	<i>29,640</i>

All values use area-capacity relationship estimated for the year 2000.

Yields are limited to permitted amount (if yield greater than permit)

(**) Firm yield considers dead storage.

Table 4E-2 shows that most of the Colorado Basin reservoirs in the Region F have experienced new drought-of-record conditions with the current drought. The most severely impacted reservoir is Ivie Reservoir. Altogether, the drought has resulted in about a 14 percent reduction in supplies in the region.