

Lake O' the Pines Lake

Evaluation of the Effect of Environmental Releases on the Lake Elevation

January 21, 2010

- 1.0 **Purpose of study.** The purpose of the study is to evaluate how the addition of instream flows on the Big Cypress will affect Lake O' the Pines elevations over the period of record. These environmental releases are met as a low flow requirement out of Lake O' the Pines. Table 1 shows the instream flows that will be used for the low flow releases out of Lake O' the Pines. The environmental releases will vary per month and depends on whether the basin is in a wet, average, or dry period.
- 2.0 **Reservoir simulation model used.** The Fort Worth District's RiverWare Red Basin model that incorporates the Sulphur and Cypress Basins was used for this study. This is a daily model that encompasses the years 1938 through 2007. RiverWare has the capability to simulate a need to meet new downstream diversions or low flow requirements in a hydrologic system. For this study, a control point was added on the Big Cypress downstream of Lake O' the Pines that will contain a new low flow requirement to meet an environmental flow.
- 3.0 **Assumptions and parameters used.** The model assumes Lake O' the Pines bottom of conservation pool to be at elevation 200.0 ft. This means that the reservoir can be drawn down as low as elevation 200.0 ft. The model uses the 1980 deviation operating plan, which has been the operating plan used since 1980 to present. For this study, the instream flows will be met by a low flow release out of Lake O' the Pines. Pines pool elevation determines the condition the Cypress basin is in (wet, average, or dry) on a daily basis. When the reservoir's pool elevation is approximately one foot above the top of conservation pool to one foot below the top of conservation, wet year low flows are released. When the reservoir's pool elevation is approximately one foot to three foot below the top of conservation from 1 Oct.-20 May, and one foot to four foot below the top of conservation from 20 May – 1 Oct, then average year low flows are released. Dry year low flows are released when the reservoir's pool elevation is below the aforementioned elevations. This is shown in tables 2 and 3.
- 4.0 **Simulations performed.** One simulation was performed using the assumption and parameters set forth in paragraph 3.0. The RiverWare run simulates the hypothetical scenario with the new instream flows downstream of Lake O' the Pines. This run assumes water supply demands and low flow requirements from current conditions are met in addition to the new environmental flows. Results from this run are compared to the results from the baseline model, which represents the current conditions on the Cypress Basin.
- 5.0 **Comparison of runs.** Table 4 displays a period of record pool elevation comparison of the baseline run and the run with additional environmental releases. Table 5 shows the max annual frequency comparison between the two runs, and table 6 shows the duration curves of the two runs. As expected, the addition of a new environmental release downstream of Lake O' the Pines pulls the reservoir's pool elevation consistently lower over the period of record. This initial run with the environmental releases draws the reservoir below elevation 220.0 six times over the period of record, which compared to the baseline run the reservoir's lowest elevation is approximately 222.2ft.

Table 1												
Monthly Environmental Requirements Released as a Low Flow Requirement from Lake O' the Pines Lake												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Maintain biodiversity and connectivity (backwater and oxbows)											
Wet Year	396	500	536	445	264	140	70	41	40	49	94	275
	Pre-dam median		Benthic drift & dispersal, fish spawning				Fish habitat			Pre-dam median		
Avg Year	268	347	390	330	150	79	35	40	40	40	90	117
	Fish habitat		Spawning habitat				Maintain aquatic diversity			Fish habitat		
Dry Year	90	90	218	198	114	49	13	8.4	8.4	40	90	90

Table 2				
Reservoir Level vs. Low Flow Requirement Table				
Operating Levels	2.0 – 4.0 Dry Year	4.0 – 4.73 Avg. Year	4.73 – 5.70 Wet Year	5.70 – 14.0 Flood Releases
Low Flow cfs	cfs	cfs	cfs	cfs
Jan.	90	268	396	0
Feb.	90	347	500	0
Mar.	218	390	536	0
Apr.	198	330	445	0
May	114	150	264	0
Jun.	49	79	140	0
Jul.	13	35	70	0
Aug.	8.4	40	41	0
Sep	8.4	40	40	0
Oct.	40	40	49	0
Nov.	90	90	94	0
Dec.	90	117	275	0

Note: Bottom of Conservation is at level 2. Top of Conservation is at level 5.
This table is based on the Low Flow Requirement table in the Instream Flows control point in the RiverWare study model.
Low flow releases are not made below level 2, as this is considered sediment/dead pool.
Also these environmental low flow releases are not made above 1ft above top of conservation, because flood control operating plans take precedence.

Table 3

Lake O' the Pines Operating Level Table														
Operating Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14
May 19	183.0	200.0	223.0	225.5	228.5	230.04	231.48	232.85	234.15	236.56	240.85	244.57	247.93	249.5
May 20	183.0	200.0	223.0	226.0	230.0	231.38	232.68	233.93	235.12	237.34	241.32	244.83	248.01	249.5
Sep. 15	183.0	200.0	223.0	226.0	230.0	231.38	232.68	233.93	235.12	237.34	241.32	244.83	248.01	249.5
Sep. 30	183.0	200.0	223.0	225.5	228.5	230.04	231.48	232.85	234.15	236.56	240.85	244.57	247.93	249.5

Note: The Operating Level Table is based on Lake O' the Pines Water Control Manual's Operating Rule Curve.

Table 4

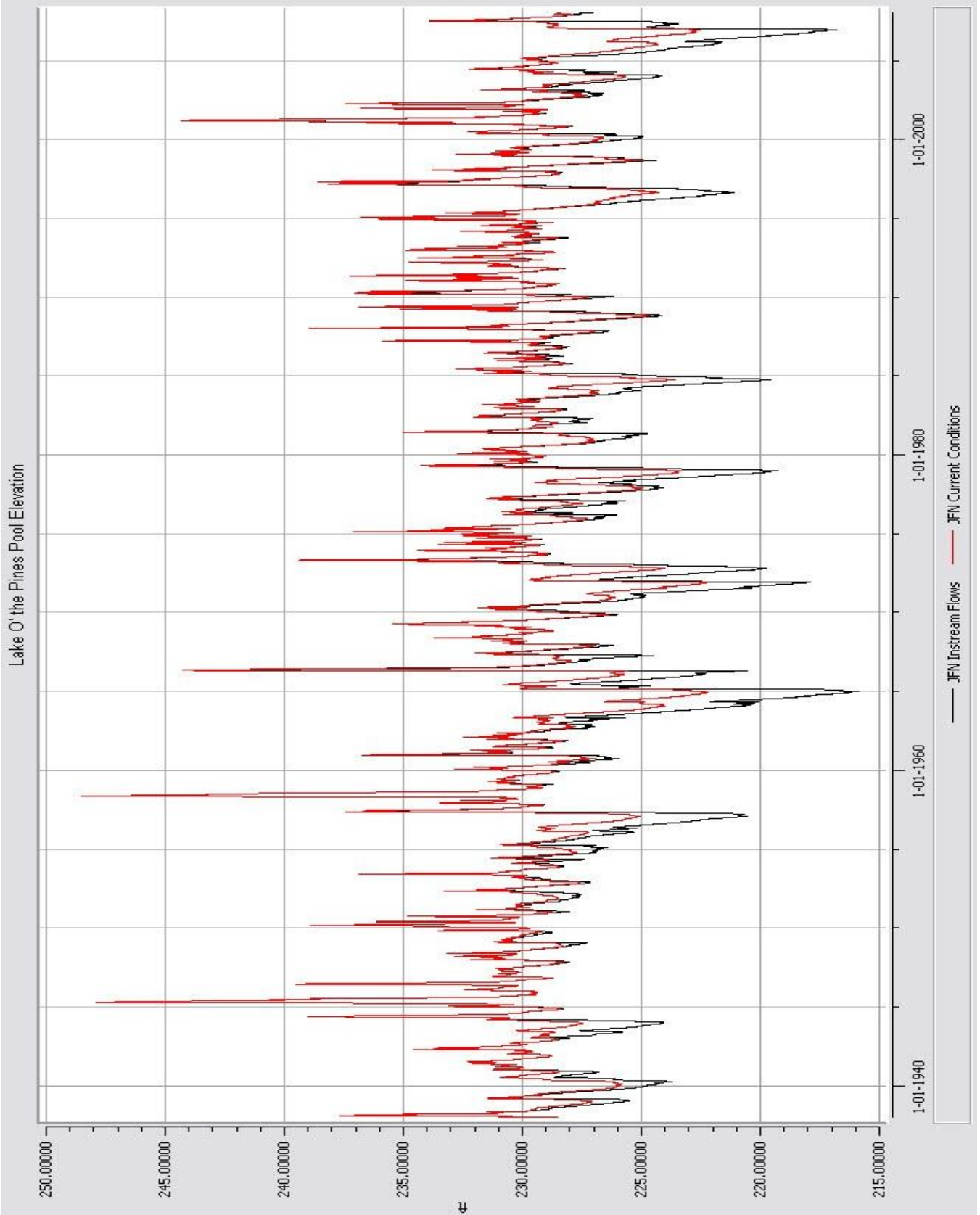


Table 5

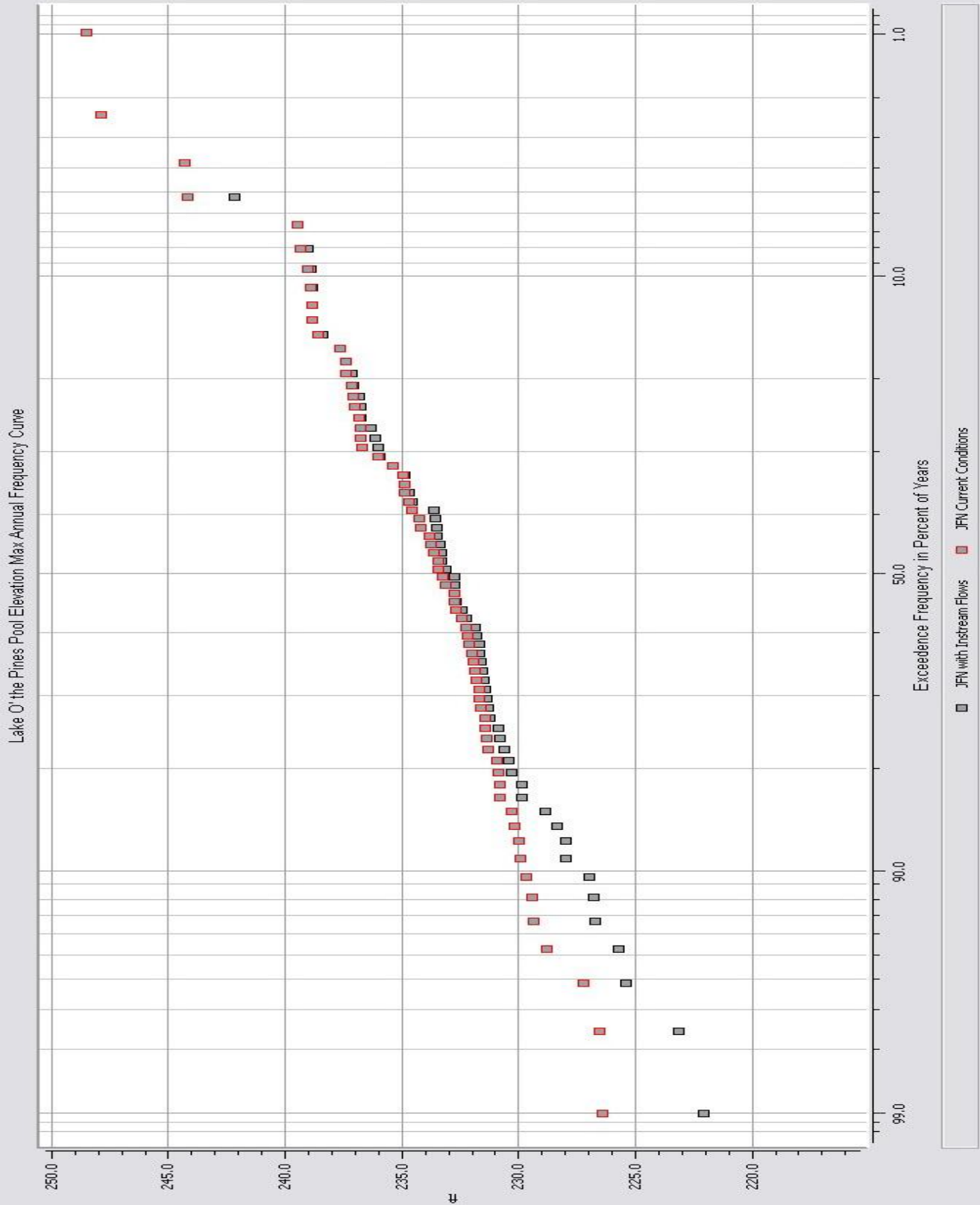


Table 6

