

# **Volumetric Survey of Lake Kemp**

**January- March 2006 Survey**



Prepared by:

**The Texas Water Development Board**

September 2006

# Texas Water Development Board

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## Texas Water Development Board

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Prepared for:

**City of Wichita Falls**

**And**

**Wichita County Water Improvement District #2**

In cooperation with:

U.S Army Corps of Engineers, Tulsa District

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## **Executive Summary**

The Texas Water Development Board (TWDB) entered into agreement with the U.S. Army Corps of Engineers, Tulsa District, and the Wichita County Water Improvement District #2, for the purpose of performing a volumetric survey of Lake Kemp while the reservoir was near the top of the conservation pool elevation. This information was converted into updated Elevation-Volume and Elevation-Area Tables. Additionally, the sedimentation occurring in Lake Kemp as it relates to the Elevation-Volume and Elevation-Area Tables is examined. Sediment Range Lines have been established by the TWDB to examine the reservoir in cross-section and to facilitate future tracking of sedimentation in Lake Kemp.

**The results of the TWDB 2006 Survey indicate Lake Kemp has a volume of 245,434 acre-feet and encompasses 15,357 acres at the conservation pool elevation of 1,144 feet above mean sea level.** Data from the U.S. Army Corps of Engineers from 1971 indicates Lake Kemp had a capacity of 319,600 acre-feet and encompassed 16,540 acres at conservation pool elevation. This is a loss of 74,166 acre-feet, or 23.2%, and 1,183 acres, or 7.2%, between 1971 and 2006.

Sediment delivered to the reservoir by the Wichita River is causing a series of shallow deltas to form, dividing the upper end of the reservoir and isolating sections of the reservoir from the main body of water. Based on data collected during the 2006 TWDB Survey, approximately 6,400 ac-ft of water become unavailable to downstream diversion points, in an area of the reservoir south of the Wichita River, when the water surface elevation of Lake Kemp falls between 1.5 to 2.5 feet below conservation pool elevation. These diversion points authorized in Certificate of Adjudication 02-5123, are downstream of Lake Kemp Dam in the river and from Lake Diversion. An analysis examining the effects of sedimentation on water availability when the reservoir drops three feet and six feet below conservation pool elevation, based on the water surface elevations at the time of the 1995 and 2004 aerial photographs, is discussed in the report.

# Table of Contents

<b>Lake Kemp General Information</b> .....	<b>1</b>
Water Rights: Certificate of Adjudication No. 02-5123 .....	3
<b>Volumetric Survey of Lake Kemp</b> .....	<b>4</b>
Introduction.....	4
Bathymetric Survey .....	5
Datum.....	5
Survey Results .....	7
<b>Data Processing</b> .....	<b>7</b>
Model Boundary .....	7
Triangular Irregular Network (TIN) Model.....	11
<b>Sedimentation in Lake Kemp</b> .....	<b>11</b>
Sediment Range Lines .....	13
<b>References</b> .....	<b>13</b>

## List of Tables

**Table 1:** Pertinent Data for Lake Kemp Dam and Lake Kemp

## List of Figures

**Figure 1:** Location Map: Lake Kemp  
**Figure 2:** Map of TWDB 2006 Survey Data  
**Figure 3a & 3b:** Illustrations of Boundary Digitization Process  
**Figure 4:** Elevation Relief Map  
**Figure 5:** Depth Ranges Map  
**Figure 6:** Contour Map  
**Figure 7:** Delta Formation in Wichita River in 1953 Aerial Photographs  
**Figure 8:** Delta Formation in Wichita River in 1973 Aerial Photographs  
**Figure 9:** Delta Formation in Wichita River in 1995 Aerial Photographs  
**Figure 10:** Delta Formation in Wichita River in 2004 Aerial Photographs  
**Figure 11:** Elevation Relief Map of Water Available at Elevation 1,141ft  
**Figure 12:** Elevation Relief Map of Water Available at Elevation 1,138ft

## Appendices

**APPENDIX A:** 2006 LAKE KEMP VOLUME TABLE  
**APPENDIX B:** 2006 LAKE KEMP AREA TABLE  
**APPENDIX C:** 2006 ELEVATION-VOLUME GRAPH  
**APPENDIX D:** 2006 ELEVATION-AREA GRAPH  
**APPENDIX E:** VOLUME TABLE FOR WATER AVAILABLE AT ELEV. 1,141FT  
**APPENDIX F:** AREA TABLE FOR WATER AVAILABLE AT ELEV. 1,141FT  
**APPENDIX G:** VOLUME TABLE FOR WATER AVAILABLE AT ELEV. 1,138FT  
**APPENDIX H:** AREA TABLE FOR WATER AVAILABLE AT ELEV. 1,138FT  
**APPENDIX I:** VOLUME TABLE FOR WATER UNAVAILABLE AT ELEV. 1,141 FT & 1,138 FT  
**APPENDIX J:** AREA TABLE FOR WATER UNAVAILABLE AT ELEV. 1,141 FT & 1,138 FT  
**APPENDIX K:** VOLUME TABLE ACCOUNTING FOR SEDIMENTATION & POOL ISOLATION  
**APPENDIX L:** AREA TABLE ACCOUNTING FOR SEDIMENTATION & POOL ISOLATION  
**APPENDIX M:** ELEVATION-VOLUME GRAPH ACCOUNTING FOR SED. & POOL ISOLATION  
**APPENDIX N:** ELEVATION-AREA GRAPH ACCOUNTING FOR SED. & POOL ISOLATION  
**APPENDIX O:** SEDIMENT RANGE LINES

## Lake Kemp General Information

Illustrated below in Figure 1, Lake Kemp is located in Baylor County on the Wichita River, about 40 miles southwest of Wichita Falls, TX. Lake Kemp is within the boundary of Waggoner Ranch<sup>1</sup>, recognized as the nation's largest ranch under one fence, spanning approximately 520,000 acres.<sup>2</sup> Cara Blanca Park, the recreational park surrounding the reservoir, is owned by W.T. Waggoner Estate. The reservoir and park are open to the public and may be accessed through three toll gates.<sup>3</sup> Waggoner Ranch is run by W.T. Waggoner Estate, by Co-directors A.B. Wharton and Gene Willingham, with headquarters in Vernon, TX. The ranch is known for ranching, oil, cattle and horses, and also encompasses 26,000 acres in cultivation.<sup>4</sup>

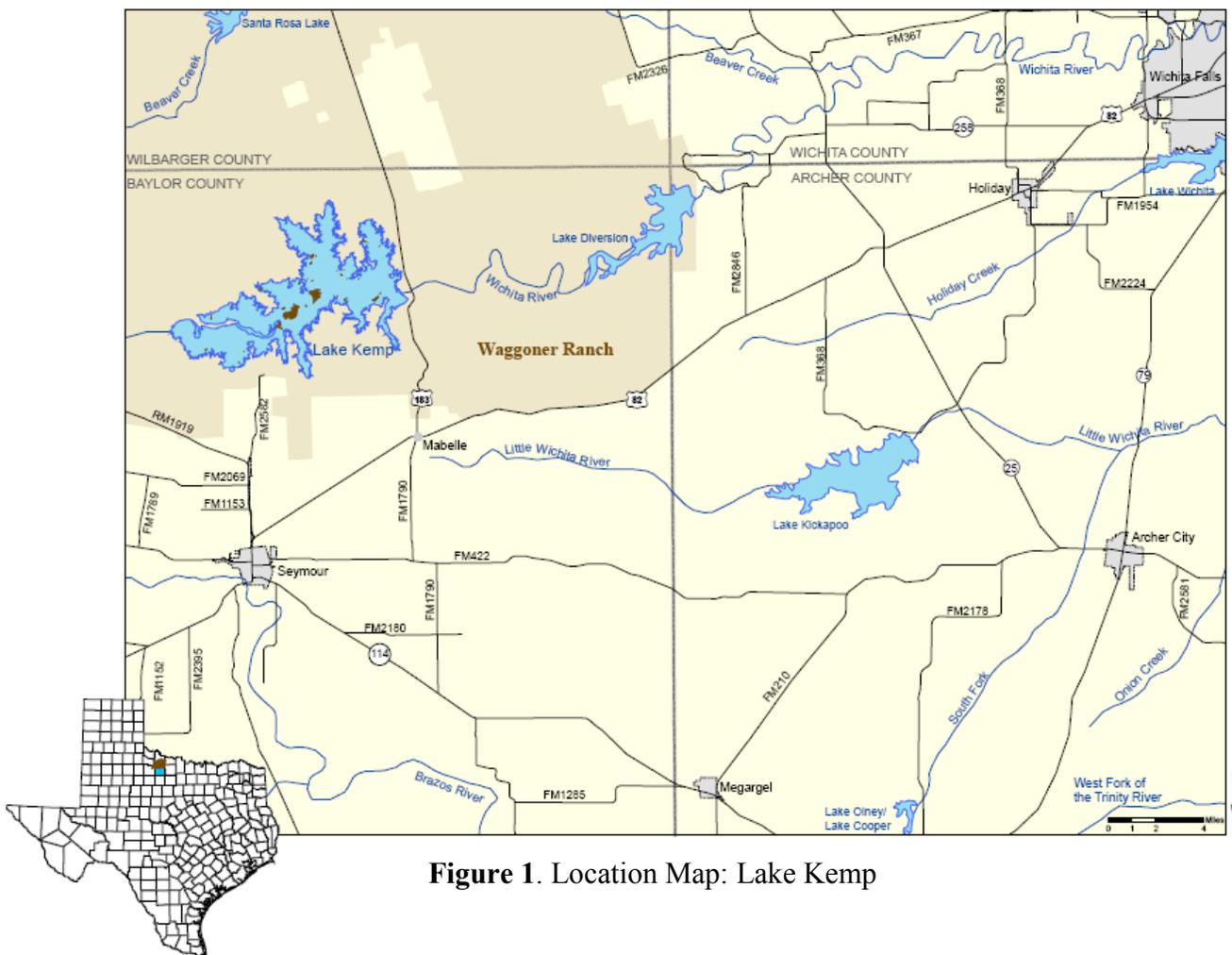


Figure 1. Location Map: Lake Kemp

Construction on Lake Kemp Dam began on February 25, 1922. Lake Kemp was originally impounded on October 1, 1922 and the dam was completed on August 25, 1923.<sup>5</sup> In May of 1969, work began on a U.S. Army Corps of Engineers design for a revised dam to raise the conservation pool and increase the storage of Lake Kemp.<sup>6</sup> The project became operational in October of 1972 when the new outlet works were completed. The reservoir is jointly owned by the City of Wichita Falls and the Wichita County Water Improvement District No.2 (WCWID#2). The WCWID#2 manages the conservation pool storage and the U.S. Army Corps of Engineers manages the flood control storage.<sup>7</sup>

Lake Kemp was originally built for flood control and water supply; however, soon after completion its water was deemed too saline to drink. Natural salt-water springs in Foard, King, and Knox Counties cause the water in the Big Wichita and Pease Rivers to be very difficult to treat for human consumption; consequently the water has historically been used mainly for irrigation and steam electric power purposes.<sup>8</sup> With chloride levels measuring between 750mg/L and 2,150 mg/L, Lake Kemp is classified as Class III–High Salinity Water under the U.S. Department of Agriculture's 1954 classification system, which limits its use as irrigation water. By definition Class III water cannot be used on soils with restricted drainage and even with adequate drainage, special management for salinity control may be required, and plants with good salt tolerance should be selected.<sup>9</sup>

High salinity in Lake Kemp prompted the Red River Authority to initiate the Wichita River Basin Chloride Control Project. By building brine lakes and low-flow dams on the Big Wichita River, the amount of dissolved solids and chlorides in the water has been reduced by approximately 25%.<sup>8,10</sup> Future proposed low flow diversions are expected to reduce the chloride loading into Lake Kemp even further.<sup>10</sup> As a result the water in Lake Kemp can be used to supplement current water supply in the City of Wichita Falls, where a 10 MGD reverse osmosis plant is being built to treat the water.<sup>8</sup> The plant is expected to be operational by 2007.<sup>11</sup>

Several water management strategies are proposed for Region B to meet its future water needs, including raising the conservation pool elevation of Lake Kemp to increase the conservation storage and provide a seasonal conservation pool.<sup>9</sup> During design and

reconstruction of Lake Kemp in 1973, engineers recognized the high rate of sedimentation and recommended raising the conservation pool after 40 years of operation.<sup>12</sup> To compensate for decreased capacity due to sedimentation in the reservoir, the design memorandum allows for an increase in conservation elevation to a maximum of 1,149.8 feet above msl. As an interim measure, Lake Kemp is currently allowed to store water up to elevation 1,145.5 ft, 1.5 ft above conservation pool elevation, during the months of April through October, when water is needed for irrigation.<sup>9</sup> Other pertinent data about Lake Kemp and Lake Kemp dam are presented in Table 1.

### **Water Rights: Certificate of Adjudication No. 02-5123**

Certificate of Adjudication no. 02-5123 authorizes the Wichita County Water Improvement District #2 and the City of Wichita Falls (owners) to maintain an existing dam and reservoir on the Wichita River (Lake Kemp) and impound therein no to exceed 318,000 acre-feet of water. The owners are also authorized to maintain an existing dam and reservoir on the Wichita River (Lake Diversion) and impound therein not to exceed 45,000 acre-feet of water. The owners are authorized to divert and use not to exceed 193,000 acre-feet of water per annum from the aforesaid reservoirs for use as follows: 25,150 ac-ft for municipal purposes, 40,000 ac-ft for industrial purposes, 2,000 ac-ft for mining purposes, 5,850 ac-ft for recreation purposes, and 120,000 ac-ft for irrigation purposes. The owners are authorized to directly divert and use not to exceed 16,660 ac-ft of the 120,000 ac-ft authorized for irrigation purposes from the Wichita River to irrigate land within the district's boundaries. The water impounded may also be used for recreation purposes. One authorized point of diversion is located on the Wichita River with a maximum combined diversion rate of 40.00 cfs and a second point is located on the perimeter of Lake Diversion with no specified rate of diversion. The time priority for all rights authorized through Certificate of Adjudication no. 02-5123 is October 2, 1920, except for the direct diversion of water from the Wichita River, which has a priority date of April 10, 1978. The complete certificate is on file in the Records Division of the Texas Commission on Environmental Quality.

**Table 1. Pertinent Data for Lake Kemp Dam and Lake Kemp<sup>6</sup>**

<b>Owner of Lake Kemp and Facilities</b>			
City of Wichita Falls and Wichita County Water Improvement District No. 2.			
<b>Engineer (Design)</b>			
U.S Army Corps of Engineers, Tulsa District for rebuilt dam.			
<b>Location</b>			
On the Wichita River at river mile 126.7 in Baylor County, about 6 miles northeast of Mabelle and 40 miles southwest of Wichita Falls, TX.			
<b>Drainage Area</b>			
2,086 square miles.			
<b>Dam</b>			
Type	Earthfill		
Length	8,890 ft		
Maximum Height	115 ft		
Top Width at outlet works	52 ft		
Top Width (typical embankment)	28 ft		
<b>Spillway</b>			
Type	Cut channel on right side		
Elevation	1,160 ft above msl		
Crest length	3,000 ft		
Control	None		
<b>Outlet Works</b>			
Type	Tower and 13-ft diameter conduit		
Control	2 gates, 5.66 ft by 13 ft		
Invert elevation	1,090.0 ft above msl		
Low flow outlet	Valve controlled 6-inch diameter pipe		
<b>Reservoir Data (Based on TWDB 2006 Volumetric Survey)</b>			
<b>Feature</b>	<b>Elevation (ft above msl)</b>	<b>Capacity (Acre-feet)</b>	<b>Area (Acres)</b>
Top of Dam	1,183.0	N/A	N/A
Spillway Crest	1,160.0	N/A	N/A
Top of flood control pool	1,156.0	N/A	N/A
Top of conservation pool	1,144.0	245,434	15,357
Outlet works invert	1,090.0	126	118

## Volumetric Survey of Lake Kemp

### Introduction

The Texas Water Development Board entered into agreement with the U.S. Army Corps of Engineers, Tulsa District, and the Wichita County Water Improvement District No. 2, for the purpose of performing a volumetric survey of Lake Kemp while the reservoir was at or near the top of the conservation pool elevation. This information was converted into updated Elevation-Volume and Elevation-Area Tables. Additionally, the sedimentation occurring in Lake Kemp as it relates to the Elevation-Volume and Elevation-Area Tables is examined. Sediment Range Lines have been established by the TWDB to examine sections of the reservoir in profile and to facilitate further tracking of sediment as it moves through the reservoir.

## **Bathymetric Survey**

Bathymetric data collection for Lake Kemp occurred between January 13<sup>th</sup> and March 3<sup>rd</sup> of 2006 while the water surface elevation was above the conservation pool elevation of 1,144.0 ft above mean sea level (msl). The water surface elevation varied between 1,143.73 ft and 1,144.60 ft above msl during the TWDB survey. The survey team used three boats equipped with depth sounders, velocity profilers, and integrated Differential Global Positioning System (DGPS) equipment to navigate along pre-planned range lines spaced approximately 250 feet apart in a perpendicular fashion to the original stream channel. Typically the TWDB conducts surveys at 500 ft intervals, however, the USACE, Tulsa District, desiring more detail, negotiated for survey intervals at 250 ft. During the 2006 survey, the team navigated over 688 miles of range lines and collected over 449,000 data points. Figure 2 shows the data points collected during the TWDB 2006 survey.

The depth sounders were calibrated each day using the velocity profilers to measure the speed of sound in the water column and a weighted tape or stadia rod to verify the depth reading. The average speed of sound through the water column varied between 4,709 and 4,749 feet per second during the 2006 survey.

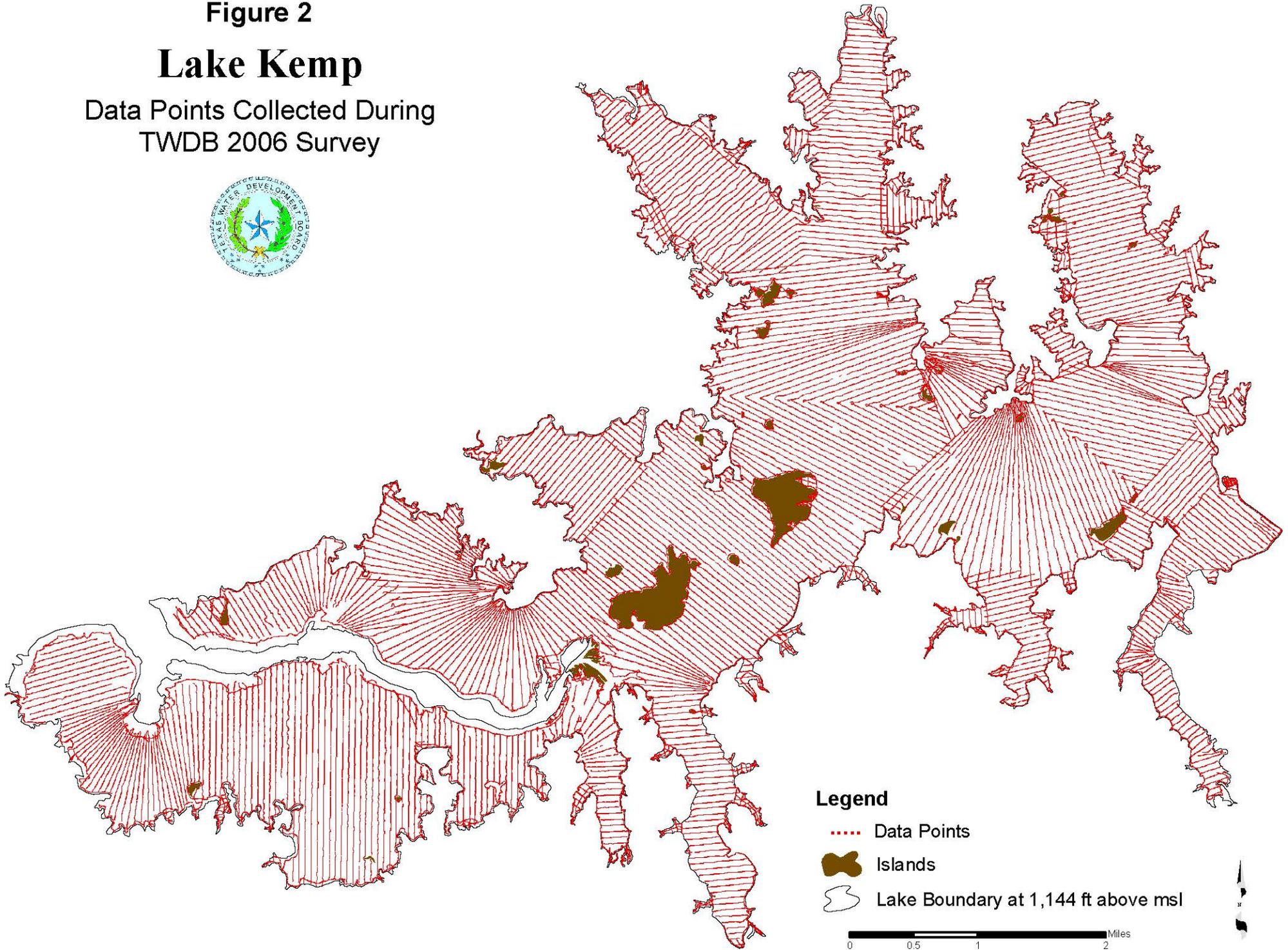
## **Datum**

The vertical datum used during this survey is that used by the United States Geological Survey (USGS) for the reservoir elevation gauge USGS 07312000 Lk Kemp nr Mabelle, TX.<sup>13</sup> The datum for this gage is reported as National Geodetic Vertical Datum 1929 (NGVD29) or mean sea level (msl), thus elevations reported here are in feet (ft) above msl. Volume and area calculations in this report are referenced to water levels provided by the Wichita County Water Improvement District #2 as taken from the USGS gage each morning and afternoon during the TWDB survey. The horizontal datum used for this report is NAD83 State Plane Texas North Central Zone.

Figure 2

# Lake Kemp

Data Points Collected During  
TWDB 2006 Survey



## **Survey Results**

The results of the TWDB 2006 Survey indicate Lake Kemp has a volume of 245,434 acre-feet and encompasses 15,357 acres at conservation pool elevation. Data from the U.S. Army Corps of Engineers from 1971, during reconstruction of Lake Kemp Dam to increase storage potential, indicates Lake Kemp had a capacity of 319,600 acre-feet and encompassed 16,540 acres at conservation pool elevation.<sup>6</sup> This is a loss of 74,166 acre-feet, or 23.2%, and 1,183 acres, or 7.2%, between 1971 and 2006.

Due to the methodological differences in computing the area and volume, direct comparisons of the TWDB 2006 survey with prior surveys of Lake Kemp are not recommended and are presented here for informational purposes only.<sup>14</sup> The TWDB considers the 2006 survey to be a significant improvement over previous methods and recommends that the same methodology be used to resurvey Lake Kemp in 5 to 10 years.

## **Data Processing**

### **Model Boundary**

The reservoir boundary was digitized from aerial photographs using Environmental Systems Research Institute's (ESRI) ArcGIS 9.1 software. The aerial photographs, or digital orthophoto quadrangle images (DOQs), used for Lake Kemp were Northwest Lake Kemp, Northeast Lake Kemp, Southwest Lake Kemp, and Southeast Lake Kemp. Two different sets of these aerial photographs were used to create three boundaries for modeling Lake Kemp. The most recent of these photographs<sup>15</sup>, dated October 16, 2004, were photographed while the water surface elevation of Lake Kemp was at 1,138.01 ft, approximately six feet below conservation pool elevation. The second set of photographs<sup>16</sup> were photographed on the following days: December 18, 1995, February 4, 1995, and December 17 and 18, 1994, while the water surface elevation measured 1,140.9 ft, 1,141.0 ft, and 1,140.9 ft, respectively, approximately three feet below conservation pool elevation. A boundary was digitized at the land water interface visible in each set of photographs and labeled 1,138 ft and 1,141 ft, corresponding to the water surface elevation at the time of the photographs.

Validating the boundary against the data collected was necessary in the upper reaches as active sedimentation and deltaic formation causes sections of the reservoir to

become isolated when the water level drops. As evidenced from the photographs and the data collected, the area south of the Wichita River becomes detached from the main body of water, near McDaniel Point, when the water surface elevation drops 1.5 to 2.5 feet below conservation pool elevation. Assuming very little water infiltrates the soil to drain into the main reservoir, and with water loss occurring only from evaporation, the actual water surface elevation in this area is higher than that recorded downstream at the dam gage, when the gage reads 1,142.5 to 1,141.5 ft or lower. Consequently, digitizing a boundary in the upper reaches from the land water interface visible in the photographs resulted in a boundary that did not accurately represent the measured topography or water surface elevation as measured at the dam gage. Therefore, each boundary was refined by comparing the digitized boundary to the actual data points collected during the survey to ensure an accurate representation of the topography measured.

A third boundary was digitized to represent conservation pool elevation, 1,144ft, for modeling purposes. During the survey, the TWDB survey team collected data along the shore around the entire reservoir. Using this information, an outer boundary was digitized between the data and the vegetation line evident in both sets of photographs. Digital hypsography, specifically, the contours at elevation 1,150ft, were also considered when digitizing the conservation pool boundary. Figures 3a and 3b, on the following pages, illustrate the processes used to digitize the various boundaries used for modeling Lake Kemp.



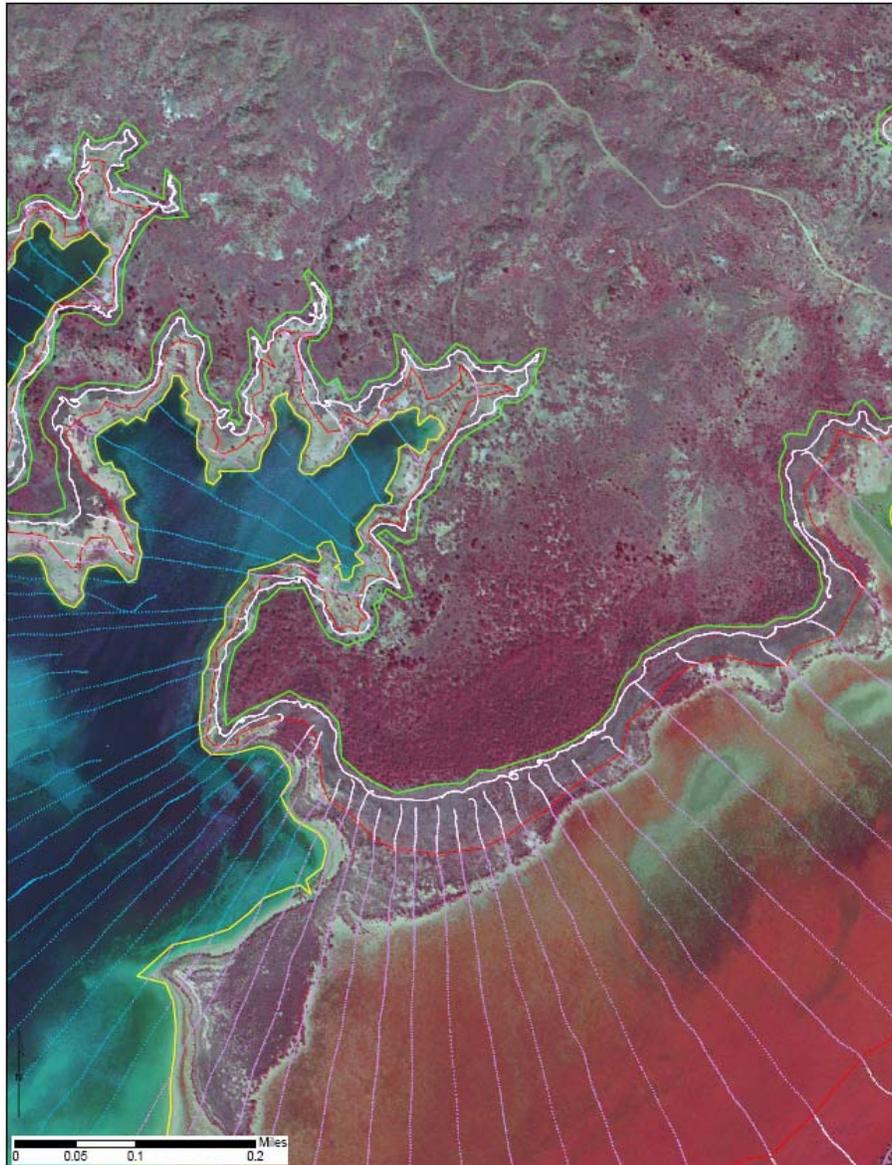
**Legend**

•••••	Data Points Collected by TWDB	—	Model Shore
•••••	Elevation $\geq$ 1,141ft	—	Model Shore
•••••	Remaining Data Points	—	Elevation 1,141ft
•••••	Collected by TWDB	—	Model Shore
		—	Elevation 1,144ft

Data of Photographs: 1995  
Water Surface Elevation: 1,141ft

**Figure 3a.** Digitizing boundaries with 1995 aerial photographs.

Data points in white, collected by the TWDB during the 2006 survey, represent elevations greater than or equal to 1,141ft, the elevation of the reservoir at the time of these photographs. In addition, the path of the boat while surveying the reservoir boundary is shown in white. Data points in blue represent the rest of the data collected by the TWDB. The red line is the boundary digitized from the land water interface visible in the 1995 photos and refined to match the collected data. The green line represents the reservoir boundary at elevation 1,144 ft, just outside the collected data.



**Figure 3b.** Digitizing boundaries with 2004 aerial photographs.

Here the boundaries are shown with the 2004 photographs. Again data points in white represent elevations greater than or equal to 1,141 ft, while, the data points in pink represent elevations between 1,138 ft and less than 1,141 ft. Data points in blue represent the balance of the survey data not meeting the constraints mentioned above. The yellow line represents the reservoir boundary at elevation 1,138 ft as digitized from the land water interface in the 2004 photographs and refined to match the data collected.

## **Triangular Irregular Network (TIN) Model**

Upon completion of data collection, the raw data files are edited in HYPACK MAX to remove any data anomalies. The water surface elevations for each respective day are applied and the depths are converted to corresponding elevations and exported as a MASS points file. The MASS points and boundary files are used to create a Triangulated Irregular Network (TIN) model, a function of the 3D Analyst Extension of ArcGIS. The model uses Delaunay's criteria for triangulation to place a triangle between three non-uniformly spaced points, including the boundary.<sup>17</sup> Using Arc/Info software, volumes and areas are calculated from the TIN Model for the entire reservoir at one-tenth of a foot intervals, from elevation 1,080.8 ft to elevation 1,144 ft. The Elevation-Volume and Elevation-Area Tables, updated for 2006, are presented in Appendices A and B, respectively. An Elevation-Volume graph and an Elevation-Area graph are presented in Appendices C and D, respectively. These updated tables and graphs represent the reservoir in its entirety, without accounting for the isolation of sections of the reservoir due to sedimentation and deltaic formation. Elevation-Volume and Elevation-Area Tables accounting for isolation of sections of the reservoir due to sedimentation are discussed in the following section.

The TIN Model was interpolated and averaged using a cell size of 10 ft and converted to a raster. The raster was used to produce Figure 4, an Elevation Relief Map representing the topography of the reservoir bottom, Figure 5, a map showing shaded depth ranges for Lake Kemp, and Figure 6, a 5-ft contour map.

## **Sedimentation in Lake Kemp**

It is apparent that Lake Kemp is experiencing major sediment deposition in the upper reaches. Sediment is being brought into the reservoir by the Wichita River. Figures 7-10, a series of aerial photographs from 1953, 1973, 1995, and 2004, illustrates the progression of the delta formations into Lake Kemp from the Wichita River as its high sediment load is deposited over time. As discussed earlier, due to the large build up of sediment, portions of the reservoir are cut off from the main body of water and become

inaccessible for use at current diversion points when the water surface elevation falls approximately 1.5- 2.5 feet below conservation pool elevation.

An analysis examining the effects of sedimentation on water availability when the reservoir is three feet and six feet below conservation pool elevation, based on the water surface elevations at the time of the 1995 and 2004 aerial photographs was conducted. Figure 11 shows the elevation relief for the main body of water available at water surface elevation 1,141 ft, three feet below the conservation pool, and shows the area of water unavailable due to isolation caused by deltaic formations of the Wichita River. The surface area of the section of the reservoir that is isolated due to sedimentation and deltaic formation is approximately 2,451 acres, or 16% of the total surface area of the reservoir at conservation pool. Figure 12 shows the elevation relief for the main body of water available at water surface elevation 1,138ft, six feet below conservation pool, and shows the areas of the reservoir that are unavailable due to sedimentation. The pools of water unavailable at water surface elevation 1,138 ft represent approximately 19% of the total surface area of the reservoir at conservation pool elevation.

Elevation-Volume and Elevation-Area Tables, presented in Appendices E-H, were calculated for the body of water available for diversion at water surface elevations 1,141 ft and 1,138 ft, and reflect the loss in volume and area due to sedimentation. To understand just how much water is unavailable for diversion downstream when the water surface elevation drops, Elevation-Volume and Elevation-Area Tables were generated for those areas of the reservoir that are isolated at water surface elevations 1,141 ft and 1,138 ft. These tables are in Appendices I-J. Elevation-Volume and Elevation-Area Tables, presented in Appendices K and L, were calculated for the entire reservoir accounting for the loss of water available for diversion downstream due to sedimentation and pool isolation as the water surface elevation drops to 1,141 ft and 1,138 ft by subtracting the tables of water unavailable at these elevations (Appendices I and J) from the area and volume tables for the entire reservoir (Appendices A and B). An Elevation-Volume graph and an Elevation-Area graph of the entire reservoir, accounting for sedimentation and pool isolation, are presented in Appendices M and N.

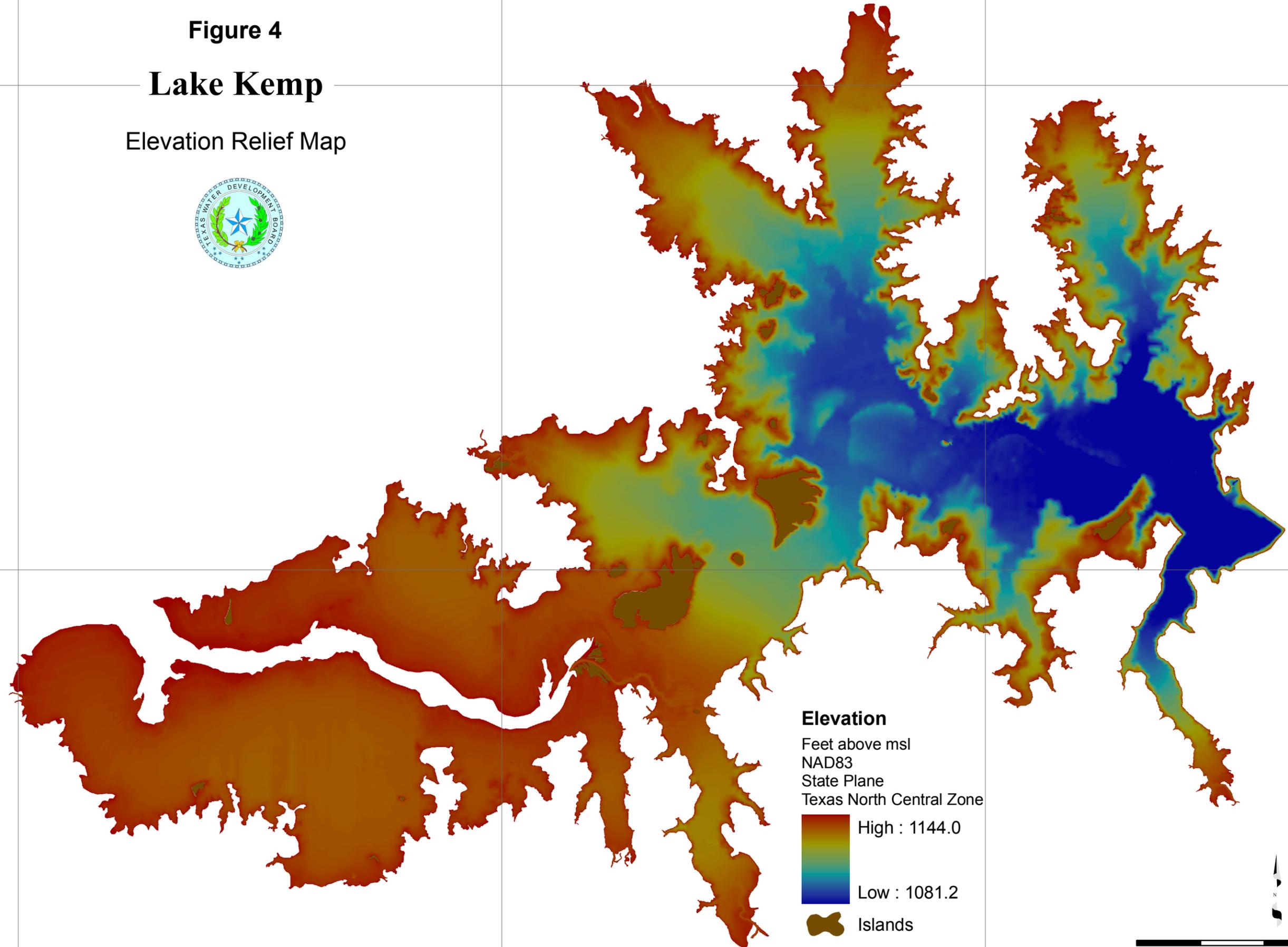
## Sediment Range Lines

The TWDB established 14 sediment range lines to examine the reservoir in cross-section and to facilitate future tracking of sedimentation in Lake Kemp. Prior studies of Lake Kemp were unavailable for comparison. Each cross-section is presented in Appendix O, along with a map showing the locations of the sediment range lines and a table listing the endpoint coordinates of each range line.

## References

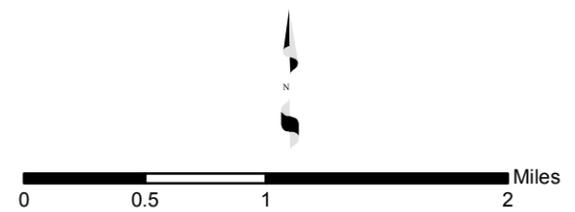
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**Figure 4**  
**Lake Kemp**  
Elevation Relief Map

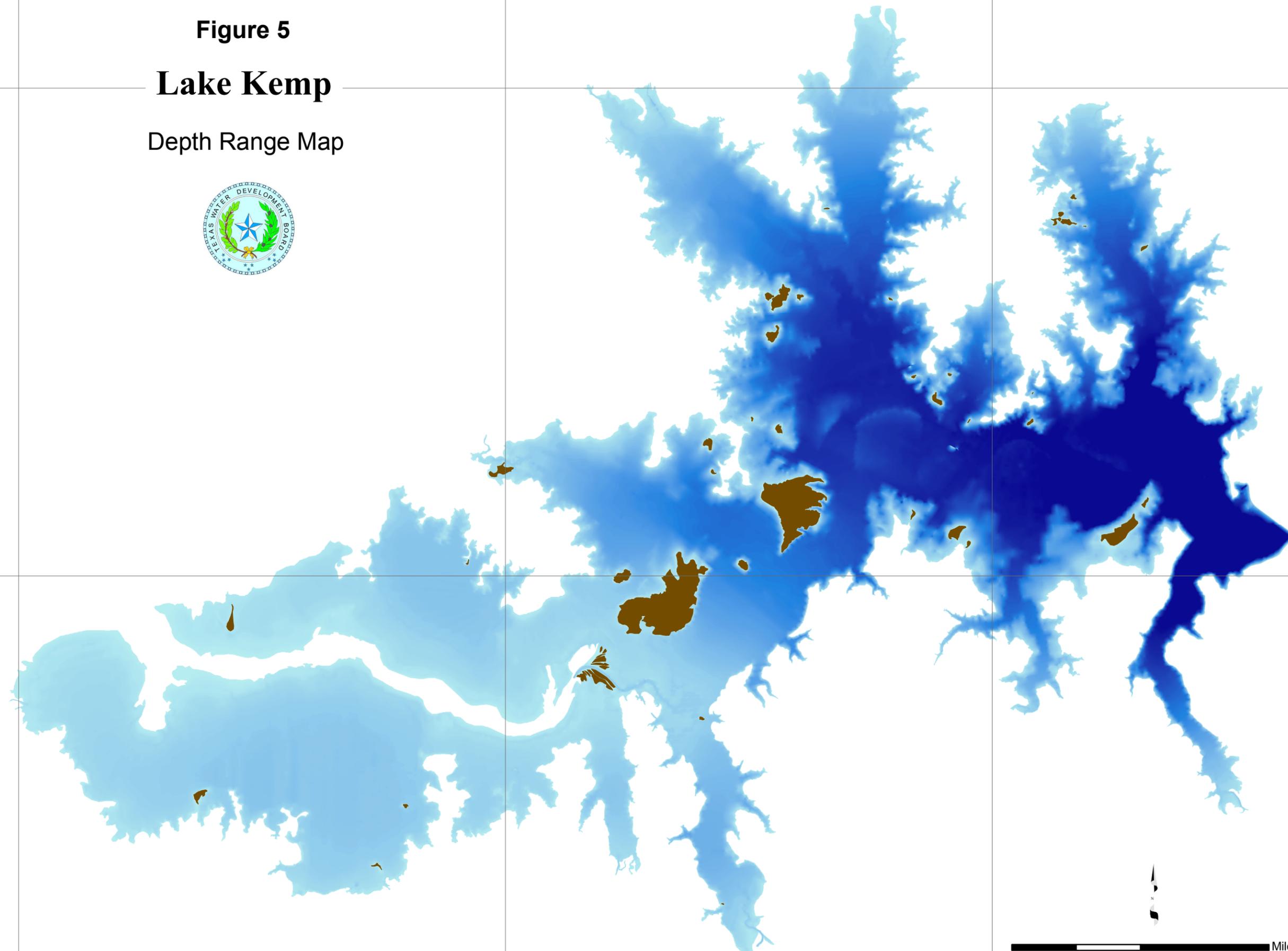


**Elevation**  
Feet above msl  
NAD83  
State Plane  
Texas North Central Zone

	High : 1144.0
	Low : 1081.2
	Islands



**Figure 5**  
**Lake Kemp**  
Depth Range Map

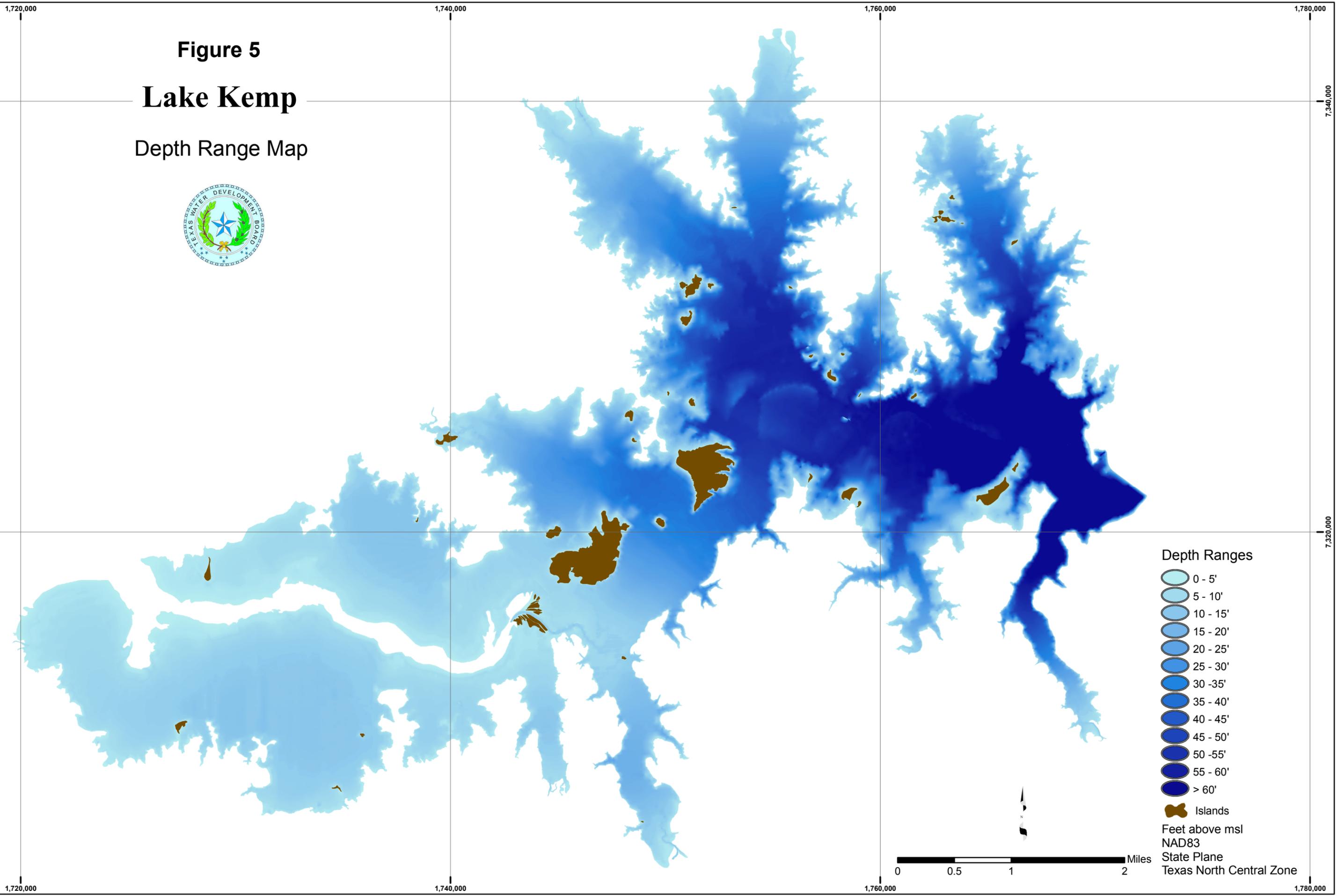


**Depth Ranges**

- 0 - 5'
- 5 - 10'
- 10 - 15'
- 15 - 20'
- 20 - 25'
- 25 - 30'
- 30 - 35'
- 35 - 40'
- 40 - 45'
- 45 - 50'
- 50 - 55'
- 55 - 60'
- > 60'

Islands

Feet above msl  
NAD83  
State Plane  
Texas North Central Zone



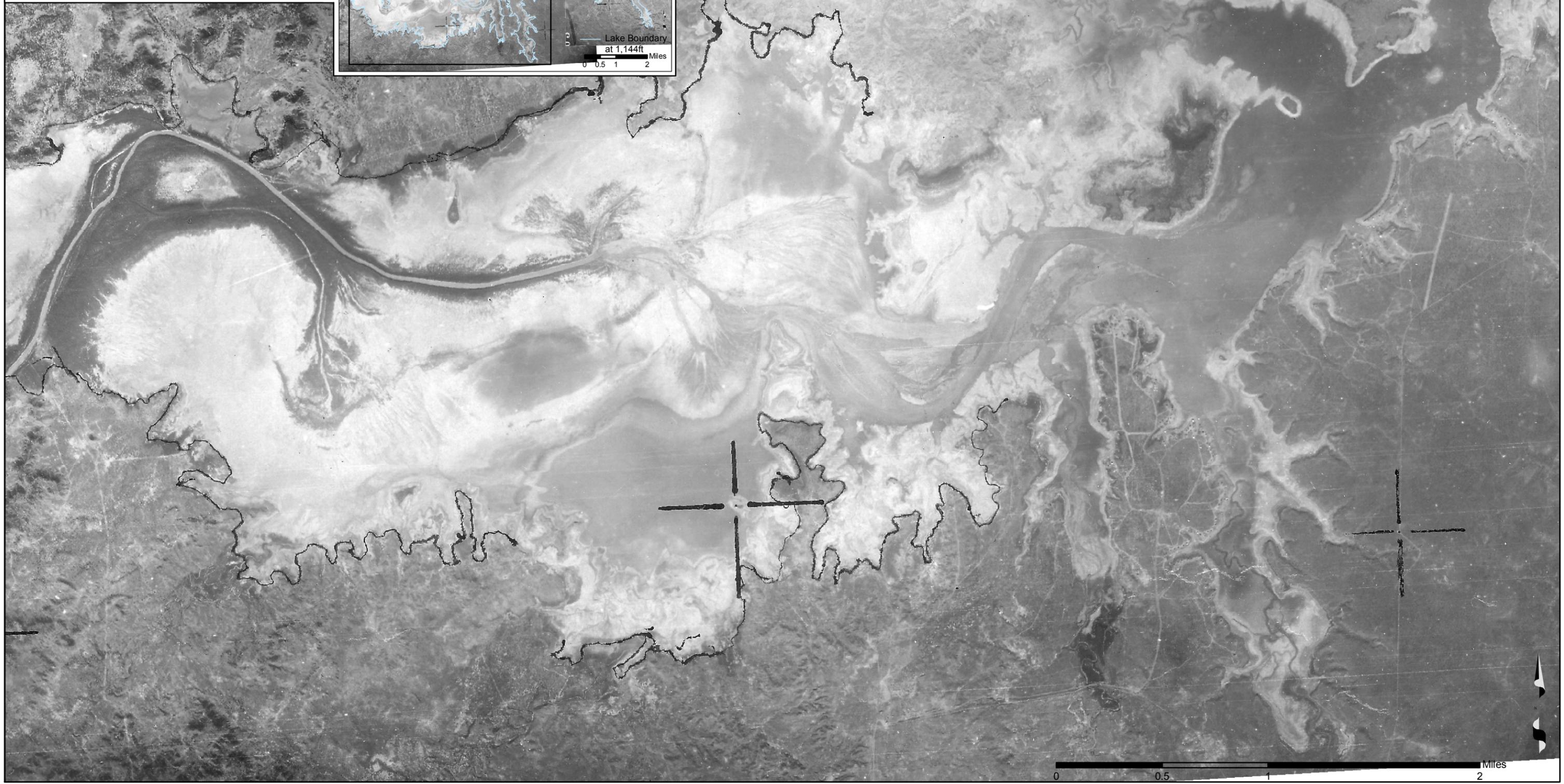
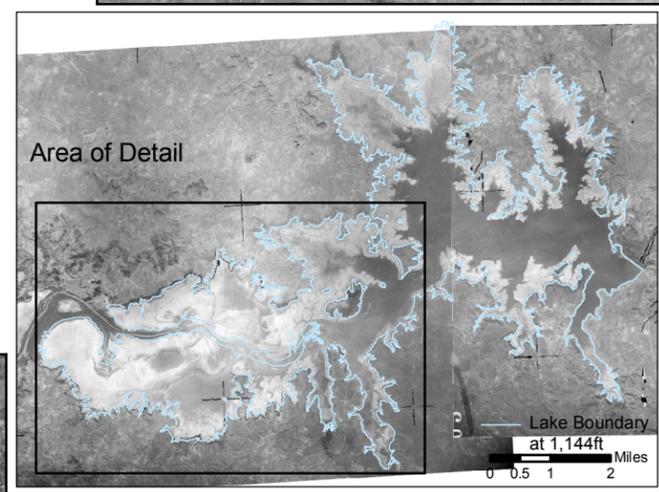
# Figure 7 Lake Kemp

## Delta Progression in Lake Kemp

Date of Photographs: 01/28/1953

Water Surface Elevation at  
time of photographs: 1,113.78ft

Conservation Pool Elevation: 1,144ft



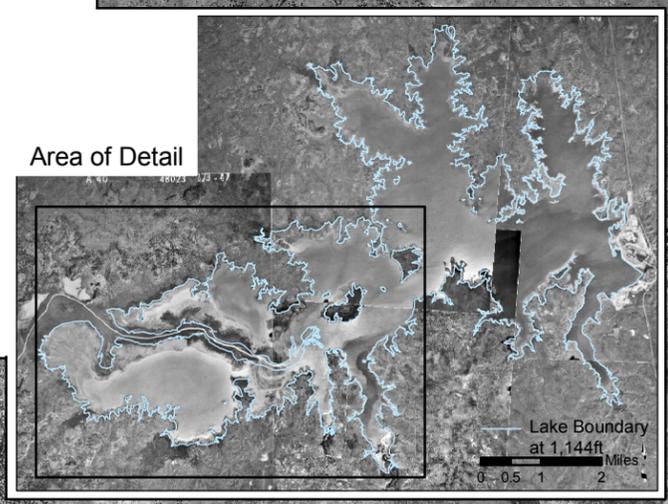
# Figure 8 Lake Kemp

## Delta Progression in Lake Kemp

Date of Photographs: 03/11/1973

Water Surface Elevation at  
time of photographs: 1,136.14ft

Conservation Pool Elevation: 1,144ft



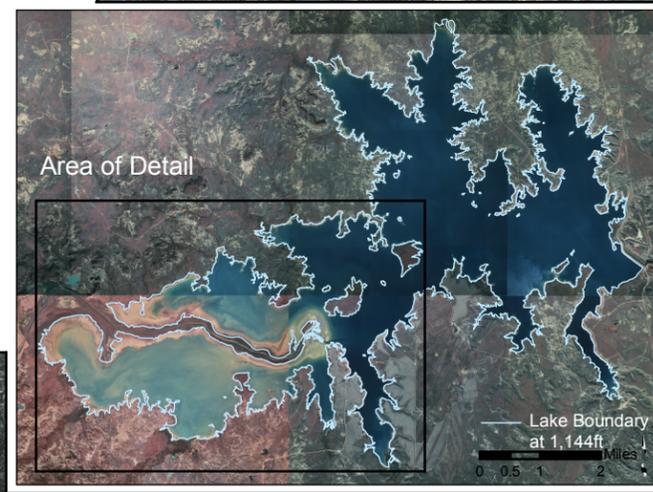
# Figure 9 Lake Kemp

## Delta Progression in Lake Kemp

Date of Photographs: 1995

Water Surface Elevation at  
time of photographs: 1,141ft

Conservation Pool Elevation: 1,144ft



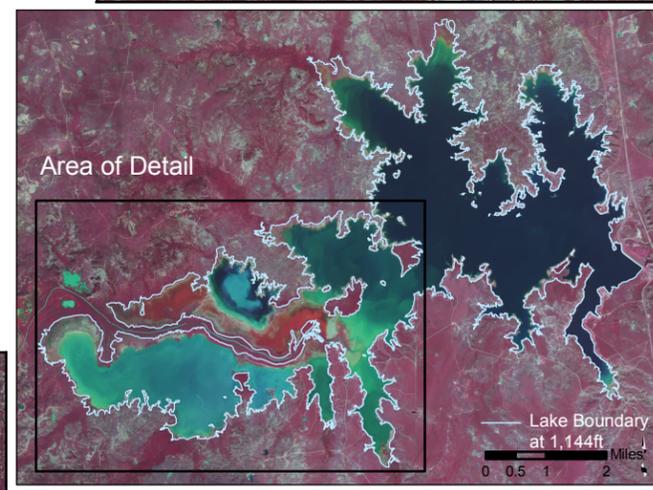
# Figure 10 Lake Kemp

## Delta Progression in Lake Kemp

Date of Photographs: 2004

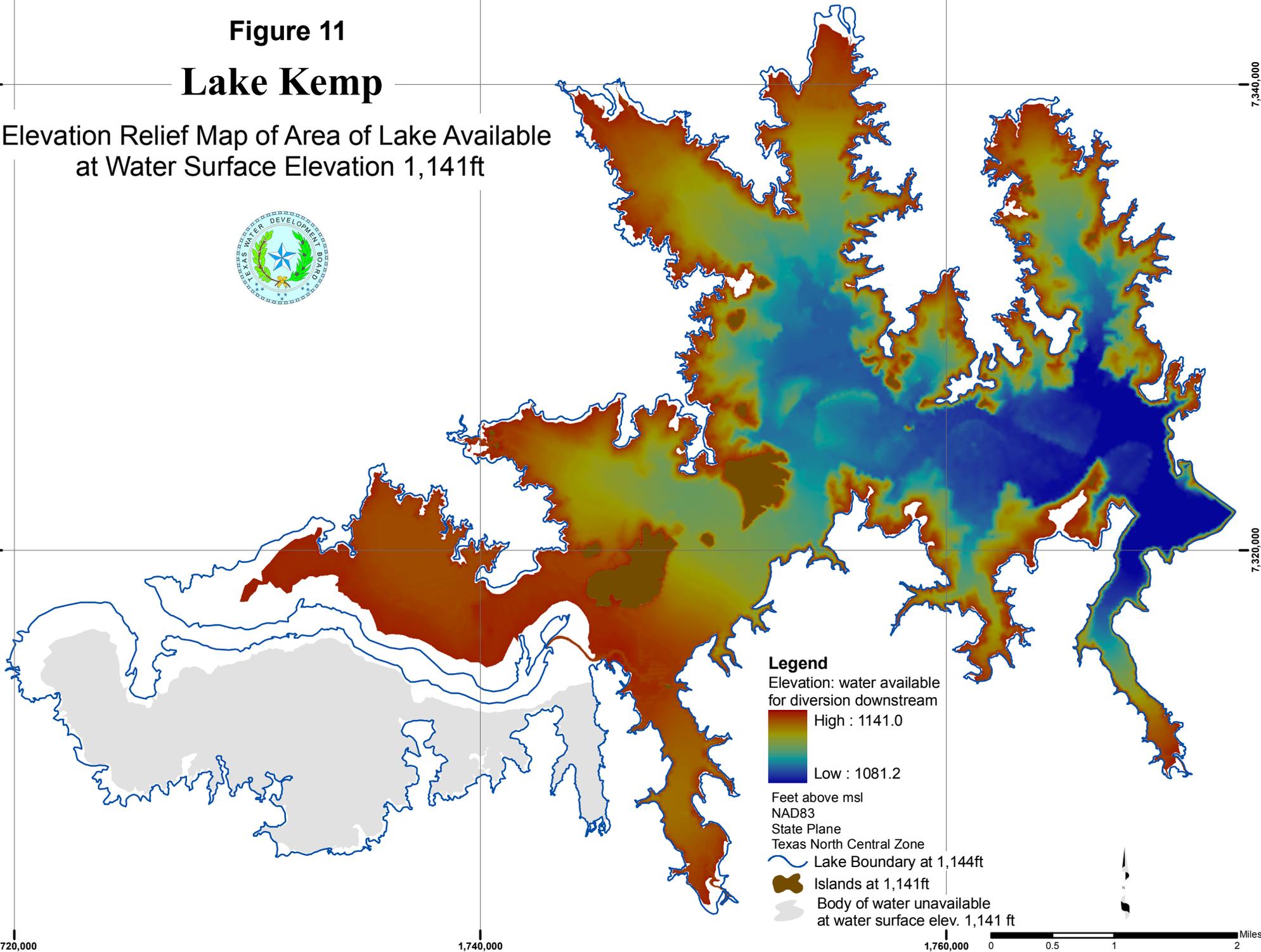
Water Surface Elevation at  
time of photographs: 1,138ft

Conservation Pool Elevation: 1,144ft



# Figure 11 Lake Kemp

## Elevation Relief Map of Area of Lake Available at Water Surface Elevation 1,141ft



- Legend**  
Elevation: water available for diversion downstream  
High : 1141.0  
Low : 1081.2  
Feet above msl  
NAD83  
State Plane  
Texas North Central Zone  
Lake Boundary at 1,144ft  
Islands at 1,141ft  
Body of water unavailable at water surface elev. 1,141ft

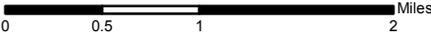
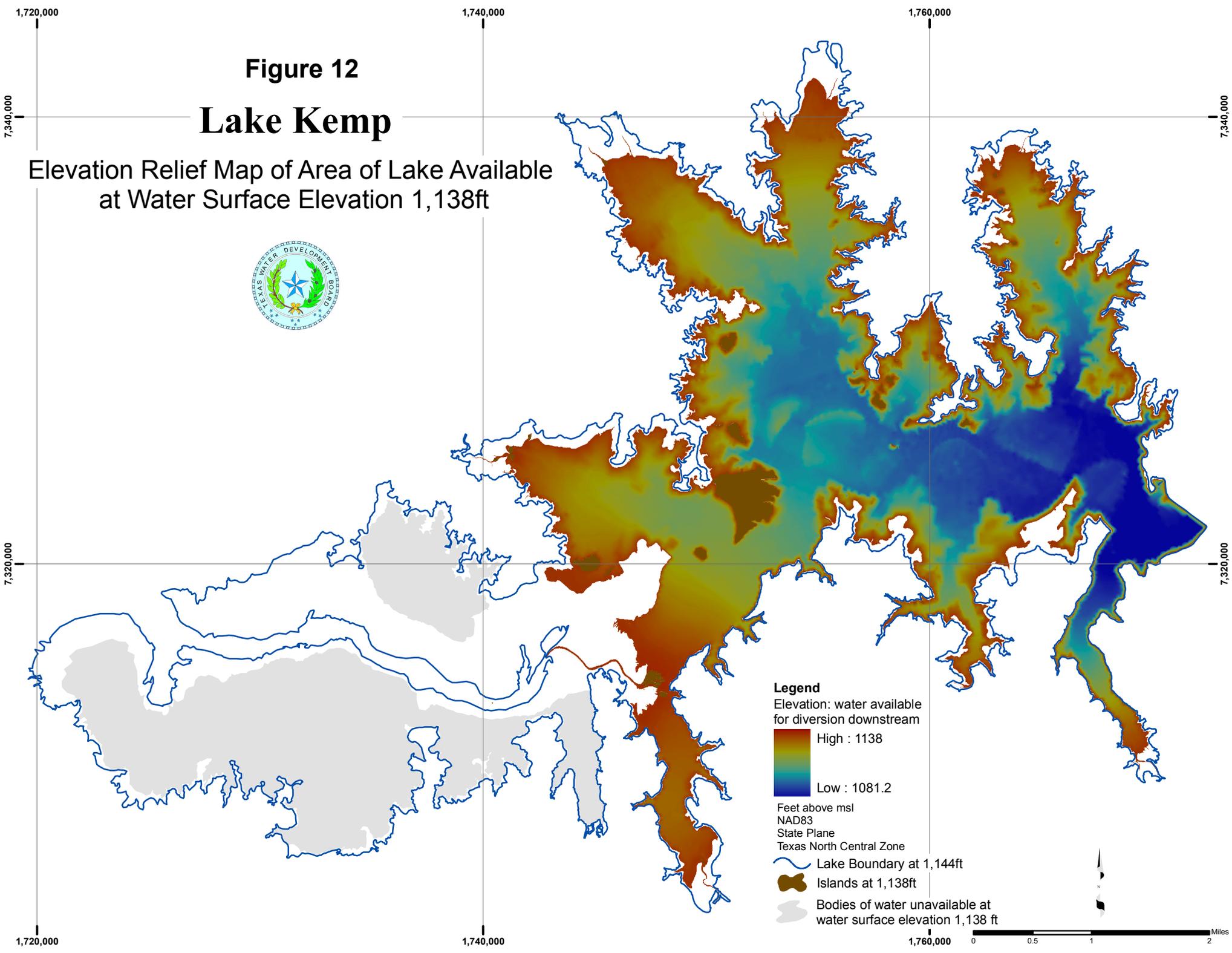


Figure 12

# Lake Kemp

Elevation Relief Map of Area of Lake Available  
at Water Surface Elevation 1,138ft



**Legend**

Elevation: water available  
for diversion downstream

High : 1138

Low : 1081.2

Feet above msl

NAD83

State Plane

Texas North Central Zone

— Lake Boundary at 1,144ft

— Islands at 1,138ft

— Bodies of water unavailable at  
water surface elevation 1,138 ft



Appendix A  
**Lake Kemp**  
**RESERVOIR VOLUME TABLE**

TEXAS WATER DEVELOPMENT BOARD

JANUARY- MARCH 2006 SURVEY

Conservation Pool Elevation 1,144.0'

Note: Table calculated for entire reservoir. Values do not account for the water unavailable for diversion downstream due to sedimentation and pool isolation.

ELEVATION in Feet	VOLUME IN ACRE-FEET									
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,080									0	0
1,081	0	0	0	0	0	0	0	0	0	0
1,082	0	0	0	0	0	0	0	0	0	0
1,083	0	0	0	0	0	0	0	0	0	0
1,084	0	0	0	0	0	0	0	0	0	0
1,085	0	0	0	0	0	0	0	0	0	0
1,086	1	1	1	1	1	1	1	1	1	1
1,087	1	1	1	1	1	1	1	2	2	2
1,088	2	3	3	5	7	9	13	17	22	27
1,089	33	39	47	55	64	73	83	93	104	115
1,090	126	138	151	164	178	192	208	224	241	259
1,091	277	297	318	339	361	384	408	432	458	484
1,092	512	540	570	601	633	667	701	736	773	810
1,093	848	887	926	966	1,007	1,049	1,091	1,135	1,179	1,224
1,094	1,271	1,318	1,367	1,416	1,466	1,517	1,569	1,622	1,676	1,731
1,095	1,786	1,843	1,900	1,959	2,018	2,079	2,141	2,205	2,269	2,336
1,096	2,403	2,473	2,544	2,616	2,690	2,765	2,841	2,919	2,998	3,079
1,097	3,160	3,242	3,326	3,410	3,495	3,581	3,667	3,755	3,843	3,932
1,098	4,022	4,112	4,204	4,296	4,390	4,484	4,579	4,676	4,773	4,872
1,099	4,971	5,072	5,173	5,276	5,380	5,485	5,592	5,699	5,808	5,919
1,100	6,030	6,143	6,257	6,372	6,488	6,606	6,726	6,846	6,968	7,092
1,101	7,216	7,341	7,467	7,594	7,721	7,850	7,980	8,110	8,242	8,374
1,102	8,507	8,642	8,777	8,914	9,052	9,191	9,331	9,473	9,616	9,761
1,103	9,908	10,058	10,210	10,365	10,524	10,687	10,851	11,018	11,186	11,356
1,104	11,528	11,701	11,876	12,053	12,232	12,413	12,596	12,780	12,966	13,154
1,105	13,342	13,533	13,725	13,919	14,114	14,311	14,510	14,710	14,912	15,116
1,106	15,322	15,529	15,738	15,950	16,163	16,378	16,594	16,812	17,033	17,254
1,107	17,477	17,702	17,929	18,157	18,386	18,617	18,849	19,083	19,318	19,554
1,108	19,792	20,031	20,272	20,514	20,757	21,001	21,247	21,494	21,743	21,993
1,109	22,244	22,497	22,751	23,006	23,263	23,520	23,779	24,039	24,301	24,564
1,110	24,828	25,093	25,359	25,627	25,896	26,166	26,437	26,710	26,984	27,258
1,111	27,534	27,811	28,090	28,369	28,650	28,932	29,215	29,499	29,785	30,072
1,112	30,360	30,649	30,939	31,231	31,524	31,818	32,114	32,411	32,709	33,009
1,113	33,310	33,612	33,915	34,220	34,526	34,833	35,141	35,451	35,763	36,076
1,114	36,390	36,706	37,022	37,340	37,659	37,979	38,301	38,623	38,947	39,272
1,115	39,598	39,925	40,253	40,583	40,913	41,245	41,577	41,911	42,247	42,584
1,116	42,921	43,260	43,601	43,943	44,286	44,630	44,975	45,322	45,671	46,020
1,117	46,371	46,723	47,077	47,433	47,791	48,151	48,512	48,875	49,240	49,606
1,118	49,975	50,345	50,718	51,093	51,470	51,849	52,230	52,612	52,997	53,384
1,119	53,772	54,163	54,555	54,950	55,347	55,745	56,145	56,547	56,952	57,357
1,120	57,765	58,174	58,585	58,999	59,413	59,830	60,248	60,668	61,090	61,513
1,121	61,938	62,364	62,792	63,222	63,653	64,086	64,521	64,957	65,396	65,836
1,122	66,278	66,722	67,168	67,616	68,065	68,516	68,969	69,424	69,882	70,341
1,123	70,802	71,264	71,729	72,196	72,664	73,134	73,606	74,081	74,557	75,035
1,124	75,514	75,996	76,479	76,964	77,451	77,939	78,429	78,921	79,415	79,911
1,125	80,408	80,907	81,408	81,912	82,417	82,924	83,433	83,945	84,459	84,975
1,126	85,493	86,013	86,536	87,061	87,588	88,118	88,649	89,184	89,721	90,261
1,127	90,802	91,347	91,893	92,443	92,995	93,549	94,105	94,664	95,226	95,790
1,128	96,357	96,926	97,497	98,072	98,648	99,227	99,808	100,392	100,978	101,566
1,129	102,157	102,749	103,344	103,942	104,542	105,144	105,748	106,354	106,963	107,574
1,130	108,187	108,802	109,419	110,040	110,661	111,285	111,911	112,539	113,170	113,802
1,131	114,437	115,073	115,712	116,353	116,996	117,642	118,289	118,939	119,592	120,248
1,132	120,906	121,568	122,232	122,900	123,569	124,242	124,917	125,595	126,276	126,960
1,133	127,646	128,335	129,027	129,722	130,420	131,121	131,824	132,530	133,240	133,952
1,134	134,667	135,385	136,105	136,830	137,556	138,286	139,018	139,753	140,493	141,234
1,135	141,977	142,724	143,474	144,227	144,982	145,740	146,501	147,265	148,033	148,803



Appendix B  
**Lake Kemp**  
**RESERVOIR AREA TABLE**

TEXAS WATER DEVELOPMENT BOARD

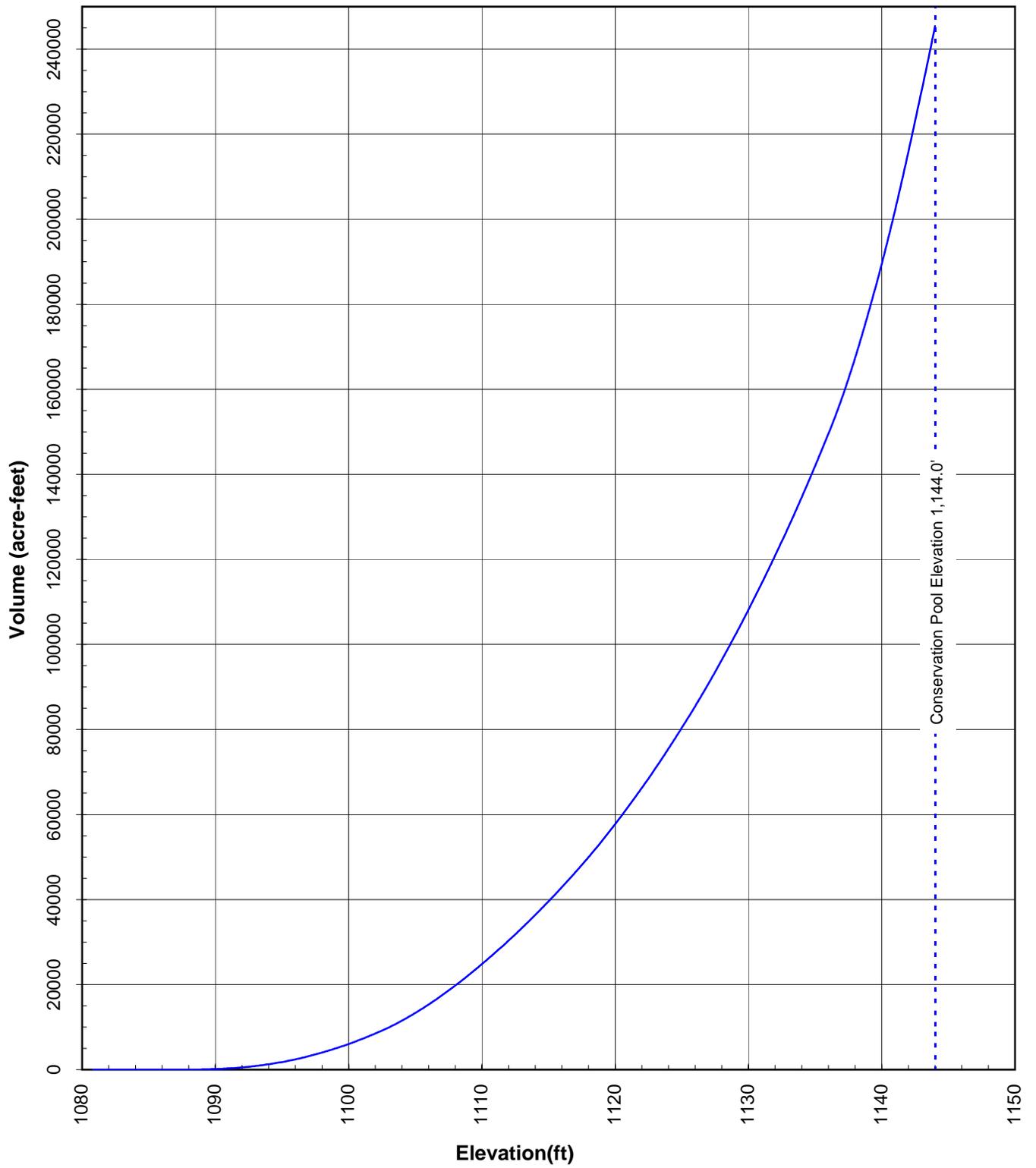
JANUARY- MARCH 2006 SURVEY

Conservation Pool Elevation 1,144.0'

Note: Table calculated for entire reservoir. Values do not account for the water unavailable for diversion downstream due to sedimentation and pool isolation.

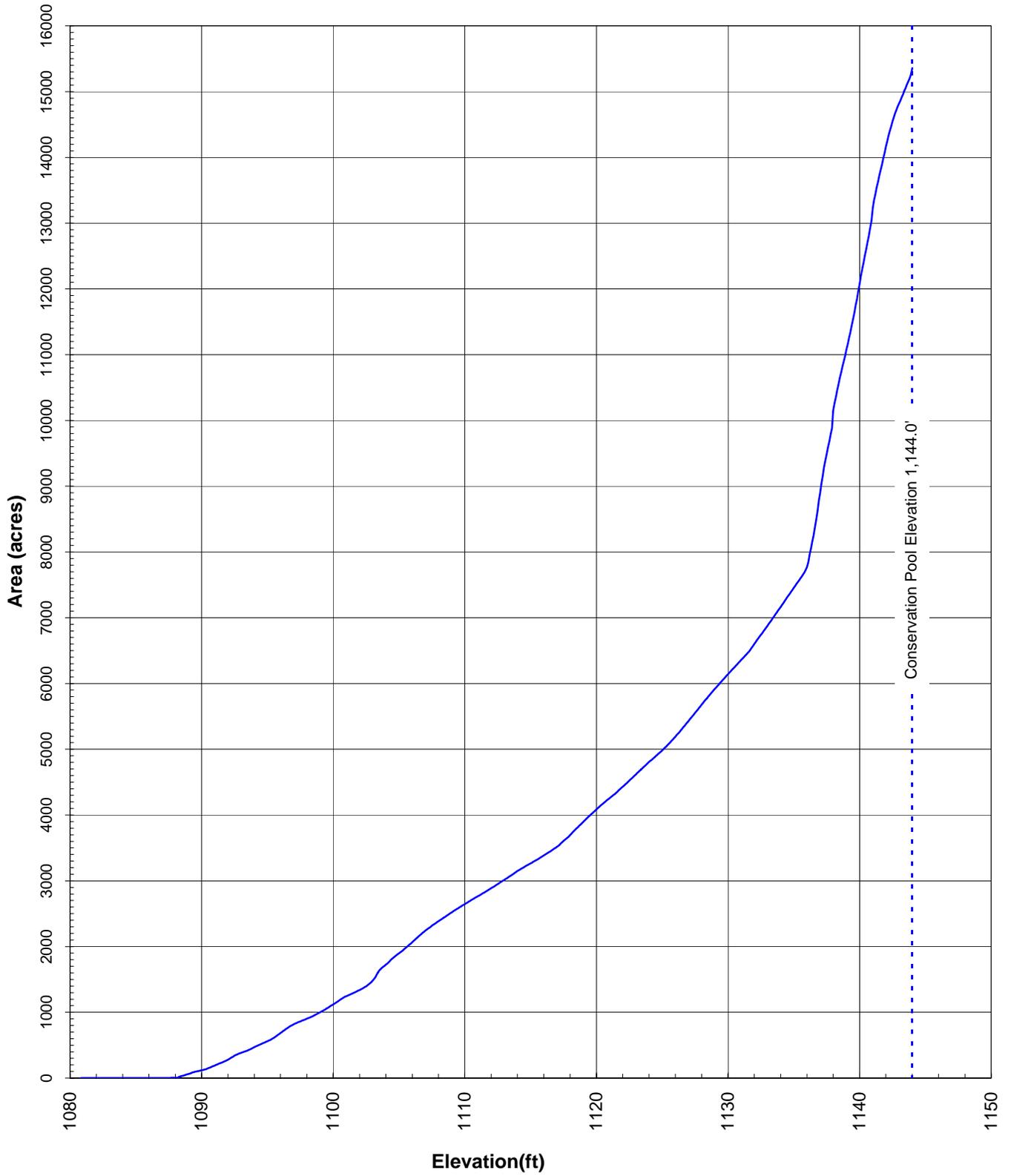
ELEVATION in Feet	AREA IN ACRES									
	ELEVATION INCREMENT IS ONE TENTH FOOT									
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,080									0	0
1,081	0	0	0	0	0	0	0	0	0	0
1,082	0	0	0	0	0	0	0	0	0	0
1,083	0	0	0	0	0	0	0	0	0	0
1,084	0	0	0	0	0	0	0	0	0	0
1,085	0	0	0	0	0	0	0	0	0	0
1,086	0	0	0	0	0	0	0	0	0	0
1,087	0	1	1	1	1	1	2	2	2	3
1,088	3	4	9	16	24	31	38	44	50	57
1,089	63	69	77	84	90	96	100	104	109	114
1,090	118	123	128	134	141	149	158	166	174	183
1,091	192	201	210	218	226	234	241	250	260	269
1,092	280	291	303	315	327	339	350	360	368	376
1,093	383	391	398	405	413	421	429	439	448	458
1,094	469	479	489	498	507	516	524	534	543	552
1,095	561	570	579	590	602	614	627	641	655	670
1,096	685	701	716	730	744	759	772	784	797	809
1,097	819	829	837	846	854	862	871	879	886	894
1,098	903	911	919	928	937	948	959	969	980	991
1,099	1,001	1,011	1,021	1,033	1,045	1,058	1,071	1,084	1,097	1,109
1,100	1,121	1,133	1,145	1,158	1,172	1,186	1,201	1,214	1,226	1,237
1,101	1,246	1,255	1,264	1,273	1,282	1,291	1,300	1,310	1,320	1,329
1,102	1,339	1,349	1,360	1,371	1,383	1,397	1,411	1,427	1,443	1,460
1,103	1,480	1,508	1,536	1,571	1,608	1,637	1,658	1,675	1,692	1,708
1,104	1,725	1,741	1,759	1,778	1,800	1,819	1,835	1,851	1,867	1,882
1,105	1,897	1,912	1,928	1,944	1,963	1,980	1,996	2,012	2,030	2,047
1,106	2,065	2,084	2,103	2,122	2,139	2,157	2,174	2,191	2,208	2,225
1,107	2,241	2,256	2,272	2,286	2,301	2,316	2,330	2,344	2,358	2,372
1,108	2,386	2,399	2,412	2,425	2,438	2,451	2,465	2,479	2,493	2,506
1,109	2,520	2,533	2,546	2,559	2,572	2,584	2,596	2,608	2,621	2,633
1,110	2,645	2,658	2,671	2,683	2,695	2,707	2,719	2,731	2,743	2,754
1,111	2,766	2,778	2,789	2,801	2,813	2,825	2,837	2,849	2,861	2,874
1,112	2,886	2,898	2,911	2,923	2,937	2,950	2,964	2,977	2,989	3,002
1,113	3,014	3,027	3,039	3,053	3,066	3,080	3,094	3,108	3,122	3,136
1,114	3,148	3,160	3,172	3,185	3,197	3,208	3,220	3,231	3,242	3,254
1,115	3,265	3,277	3,288	3,299	3,311	3,322	3,334	3,348	3,360	3,373
1,116	3,385	3,398	3,410	3,423	3,436	3,449	3,462	3,476	3,489	3,503
1,117	3,516	3,532	3,549	3,568	3,586	3,605	3,622	3,639	3,657	3,675
1,118	3,695	3,716	3,739	3,759	3,779	3,799	3,818	3,837	3,857	3,876
1,119	3,895	3,915	3,936	3,956	3,976	3,994	4,012	4,030	4,048	4,066
1,120	4,085	4,104	4,122	4,140	4,157	4,174	4,191	4,208	4,225	4,241
1,121	4,256	4,272	4,288	4,304	4,321	4,337	4,356	4,375	4,394	4,413
1,122	4,430	4,448	4,466	4,485	4,504	4,523	4,542	4,561	4,580	4,600
1,123	4,619	4,637	4,655	4,674	4,694	4,713	4,733	4,751	4,769	4,788
1,124	4,806	4,824	4,841	4,858	4,876	4,893	4,911	4,928	4,946	4,964
1,125	4,984	5,003	5,022	5,041	5,061	5,083	5,105	5,127	5,149	5,171
1,126	5,193	5,215	5,237	5,260	5,284	5,308	5,333	5,357	5,382	5,407
1,127	5,432	5,456	5,480	5,505	5,529	5,554	5,578	5,604	5,629	5,654
1,128	5,679	5,704	5,728	5,753	5,777	5,801	5,824	5,848	5,871	5,894
1,129	5,918	5,940	5,963	5,985	6,008	6,030	6,052	6,075	6,097	6,120
1,130	6,142	6,164	6,186	6,208	6,229	6,250	6,271	6,292	6,313	6,335
1,131	6,356	6,378	6,399	6,421	6,442	6,464	6,486	6,513	6,543	6,573
1,132	6,601	6,629	6,657	6,686	6,713	6,740	6,767	6,795	6,822	6,848
1,133	6,876	6,905	6,936	6,965	6,993	7,021	7,049	7,078	7,107	7,136
1,134	7,165	7,194	7,223	7,252	7,282	7,311	7,341	7,369	7,398	7,426
1,135	7,455	7,483	7,511	7,540	7,569	7,597	7,626	7,656	7,687	7,722





- - - - Conservation Pool Elevation 1,144.0'    
 — Total Volume 2006: Values do not account for sedimentation and pool isolation

**Lake Kemp**  
**March 2006**  
 Prepared by: TWDB



- - - - - Conservation Pool Elevation 1,144.0'     
 — Total Area 2006: Values do not account for sedimentation and pool isolation

Lake Kemp  
 March 2006  
 Prepared by: TWDB









Appendix I

**Lake Kemp**

**RESERVOIR VOLUME TABLE: Water Unavailable**

TEXAS WATER DEVELOPMENT BOARD

JANUARY- MARCH 2006 SURVEY

Conservation Pool Elevation 1,144.0'

VOLUME IN ACRE-FEET

ELEVATION INCREMENT IS ONE TENTH FOOT

Volume of water unavailable for diversion at elevation 1,141 ft (section A in map below)

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,135	0	0	0	0	0	0	0	0	1	1
1,136	3	5	9	15	24	37	56	81	114	158
1,137	210	269	337	413	496	584	676	773	874	979
1,138	1,087	1,200	1,316	1,438	1,565	1,696	1,832	1,972	2,116	2,265
1,139	2,417	2,574	2,736	2,902	3,072	3,247	3,427	3,611	3,800	3,994
1,140	4,192	4,395	4,603	4,815	5,031	5,251	5,476	5,704	5,938	6,175
1,141	6,417									

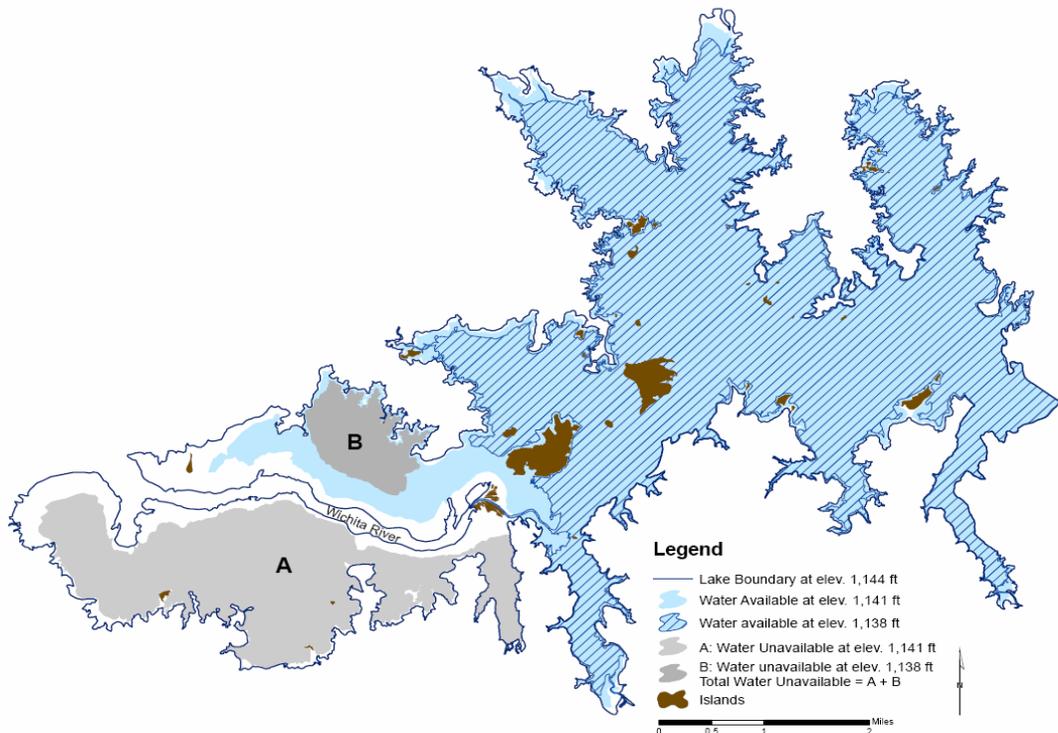
Volume of water unavailable for diversion at elevation 1,138 ft, north of Wichita River only (section B in map below)

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,135	0	0	0	0	0	0	0	0	0	0
1,136	1	4	11	24	42	61	83	107	133	160
1,137	190	221	254	288	324	361	399	438	478	520
1,138	563									

Note: It is assumed that when the water surface elevation drops enough to isolate section A, very little water infiltrates the soil to drain into the main body of the reservoir and water loss occurs only to evaporation. Therefore, the total volume of water unavailable for diversion at elevation 1,138 ft, in the table below, equals Section A plus Section B. The volume values above elevation 1,138 ft have been grayed out because these values are equal to the values for Section A alone, and represent estimates of how much volume remains available in Section A at those elevations even as the water surface elevation continues to fall from 1,141 ft to 1,138 ft.

Volume of total water unavailable at elevation 1,138 ft (sections A + B)

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,135	0	0	0	0	0	0	0	0	1	1
1,136	4	9	20	39	66	98	139	188	247	318
1,137	400	490	591	701	820	945	1,075	1,211	1,352	1,499
1,138	1,650	1,200	1,316	1,438	1,565	1,696	1,832	1,972	2,116	2,265
1,139	2,417	2,574	2,736	2,902	3,072	3,247	3,427	3,611	3,800	3,994
1,140	4,192	4,395	4,603	4,815	5,031	5,251	5,476	5,704	5,938	6,175
1,141	6,417									



Appendix J

**Lake Kemp**

**RESERVOIR AREA TABLE: Water Unavailable**

TEXAS WATER DEVELOPMENT BOARD

JANUARY 2006 SURVEY

Conservation Pool Elevation 1,144.0'

ELEVATION INCREMENT IS ONE TENTH FOOT

Area of water unavailable for diversion at elevation 1,141 ft (section A in map below)

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,135	0	0	0	0	0	0	1	2	4	9
1,136	18	34	52	71	107	155	215	291	383	479
1,137	559	640	719	792	853	906	950	989	1,026	1,064
1,138	1,104	1,148	1,191	1,240	1,290	1,337	1,381	1,422	1,463	1,505
1,139	1,549	1,595	1,639	1,682	1,724	1,770	1,820	1,868	1,913	1,960
1,140	2,007	2,053	2,099	2,142	2,184	2,223	2,264	2,310	2,353	2,394
1,141	2,451									

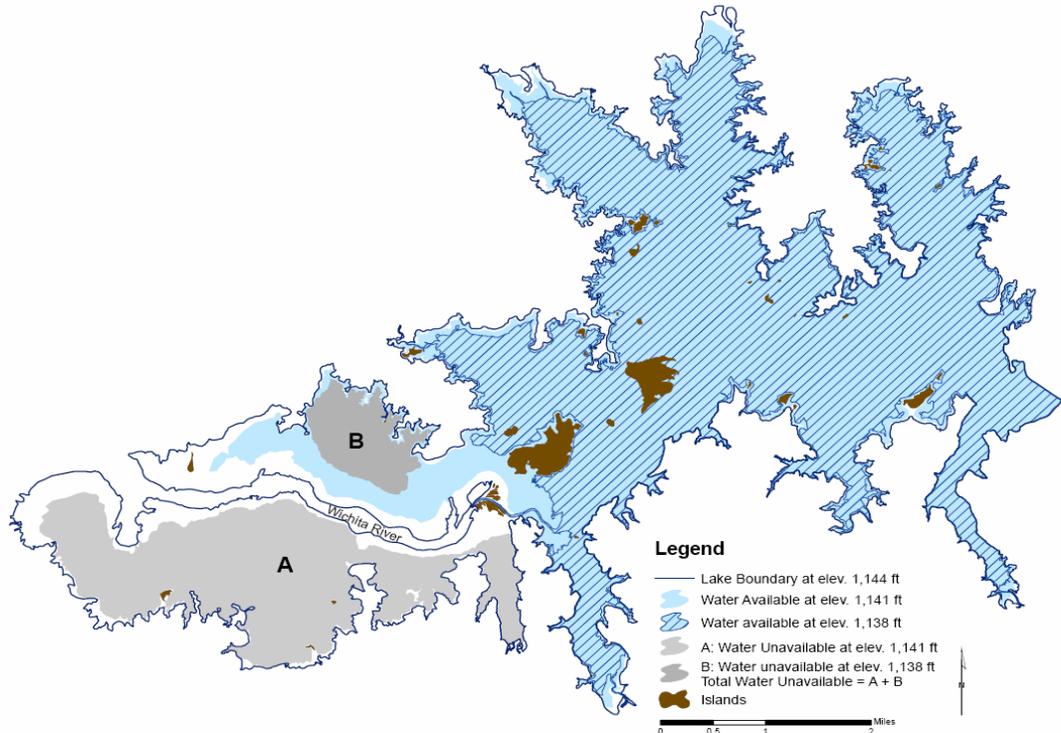
Area of water unavailable for diversion at elevation 1,138 ft, north of Wichita River only (section B in map below)

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,135	0	0	0	0	0	0	0	0	0	3
1,136	15	46	106	155	186	209	228	247	266	285
1,137	303	321	337	351	363	374	386	398	411	425
1,138	446									

Note: It is assumed that when the water surface elevation drops enough to isolate section A, very little water infiltrates the soil to drain into the main body of the reservoir and water loss occurs only to evaporation. Therefore, the total area of water unavailable for diversion at elevation 1,138 ft, in the table below, equals Section A plus Section B. The area values above elevation 1,138 ft have been grayed out because these values are equal to the values for Section A alone, and represent estimates of how much surface area remains available in Section A at those elevations even as the water surface elevation continues to fall from 1,141 ft to 1,138 ft.

Area of total water unavailable at elevation 1,138 ft (sections A + B)

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,135	0	0	0	0	0	0	1	2	4	12
1,136	33	80	158	226	293	364	443	538	649	764
1,137	862	961	1,056	1,143	1,216	1,280	1,336	1,387	1,437	1,489
1,138	1,550	1,148	1,191	1,240	1,290	1,137	1,381	1,422	1,463	1,505
1,139	1,549	1,595	1,639	1,682	1,724	1,770	1,820	1,868	1,913	1,960
1,140	2,007	2,053	2,099	2,142	2,184	2,223	2,264	2,310	2,353	2,394
1,141	2,451									



Appendix K  
**Lake Kemp**  
**RESERVOIR VOLUME TABLE**

TEXAS WATER DEVELOPMENT BOARD

JANUARY- MARCH 2006 SURVEY

Conservation Pool Elevation 1,144.0'

Note: Table calculated for entire reservoir accounting for the water unavailable for diversion downstream due to sedimentation and pool isolation at elevations 1,141 ft and 1,138 ft.

ELEVATION in Feet	VOLUME IN ACRE-FEET									
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,080									0	0
1,081	0	0	0	0	0	0	0	0	0	0
1,082	0	0	0	0	0	0	0	0	0	0
1,083	0	0	0	0	0	0	0	0	0	0
1,084	0	0	0	0	0	0	0	0	0	0
1,085	0	0	0	0	0	0	0	0	0	0
1,086	1	1	1	1	1	1	1	1	1	1
1,087	1	1	1	1	1	1	1	2	2	2
1,088	2	3	3	5	7	9	13	17	22	27
1,089	33	39	47	55	64	73	83	93	104	115
1,090	126	138	151	164	178	192	208	224	241	259
1,091	277	297	318	339	361	384	408	432	458	484
1,092	512	540	570	601	633	667	701	736	773	810
1,093	848	887	926	966	1,007	1,049	1,091	1,135	1,179	1,224
1,094	1,271	1,318	1,367	1,416	1,466	1,517	1,569	1,622	1,676	1,731
1,095	1,786	1,843	1,900	1,959	2,018	2,079	2,141	2,205	2,269	2,336
1,096	2,403	2,473	2,544	2,616	2,690	2,765	2,841	2,919	2,998	3,079
1,097	3,160	3,242	3,326	3,410	3,495	3,581	3,667	3,755	3,843	3,932
1,098	4,022	4,112	4,204	4,296	4,390	4,484	4,579	4,676	4,773	4,872
1,099	4,971	5,072	5,173	5,276	5,380	5,485	5,592	5,699	5,808	5,919
1,100	6,030	6,143	6,257	6,372	6,488	6,606	6,726	6,846	6,968	7,092
1,101	7,216	7,341	7,467	7,594	7,721	7,850	7,980	8,110	8,242	8,374
1,102	8,507	8,642	8,777	8,914	9,052	9,191	9,331	9,473	9,616	9,761
1,103	9,908	10,058	10,210	10,365	10,524	10,687	10,851	11,018	11,186	11,356
1,104	11,528	11,701	11,876	12,053	12,232	12,413	12,596	12,780	12,966	13,154
1,105	13,342	13,533	13,725	13,919	14,114	14,311	14,510	14,710	14,912	15,116
1,106	15,322	15,529	15,738	15,950	16,163	16,378	16,594	16,812	17,033	17,254
1,107	17,477	17,702	17,929	18,157	18,386	18,617	18,849	19,083	19,318	19,554
1,108	19,792	20,031	20,272	20,514	20,757	21,001	21,247	21,494	21,743	21,993
1,109	22,244	22,497	22,751	23,006	23,263	23,520	23,779	24,039	24,301	24,564
1,110	24,828	25,093	25,359	25,627	25,896	26,166	26,437	26,710	26,984	27,258
1,111	27,534	27,811	28,090	28,369	28,650	28,932	29,215	29,499	29,785	30,072
1,112	30,360	30,649	30,939	31,231	31,524	31,818	32,114	32,411	32,709	33,009
1,113	33,310	33,612	33,915	34,220	34,526	34,833	35,141	35,451	35,763	36,076
1,114	36,390	36,706	37,022	37,340	37,659	37,979	38,301	38,623	38,947	39,272
1,115	39,598	39,925	40,253	40,583	40,913	41,245	41,577	41,911	42,247	42,584
1,116	42,921	43,260	43,601	43,943	44,286	44,630	44,975	45,322	45,671	46,020
1,117	46,371	46,723	47,077	47,433	47,791	48,151	48,512	48,875	49,240	49,606
1,118	49,975	50,345	50,718	51,093	51,470	51,849	52,230	52,612	52,997	53,384
1,119	53,772	54,163	54,555	54,950	55,347	55,745	56,145	56,547	56,952	57,357
1,120	57,765	58,174	58,585	58,999	59,413	59,830	60,248	60,668	61,090	61,513
1,121	61,938	62,364	62,792	63,222	63,653	64,086	64,521	64,957	65,396	65,836
1,122	66,278	66,722	67,168	67,616	68,065	68,516	68,969	69,424	69,882	70,341
1,123	70,802	71,264	71,729	72,196	72,664	73,134	73,606	74,081	74,557	75,035
1,124	75,514	75,996	76,479	76,964	77,451	77,939	78,429	78,921	79,415	79,911
1,125	80,408	80,907	81,408	81,912	82,417	82,924	83,433	83,945	84,459	84,975
1,126	85,493	86,013	86,536	87,061	87,588	88,118	88,649	89,184	89,721	90,261
1,127	90,802	91,347	91,893	92,443	92,995	93,549	94,105	94,664	95,226	95,790
1,128	96,357	96,926	97,497	98,072	98,648	99,227	99,808	100,392	100,978	101,566
1,129	102,157	102,749	103,344	103,942	104,542	105,144	105,748	106,354	106,963	107,574
1,130	108,187	108,802	109,419	110,040	110,661	111,285	111,911	112,539	113,170	113,802
1,131	114,437	115,073	115,712	116,353	116,996	117,642	118,289	118,939	119,592	120,248
1,132	120,906	121,568	122,232	122,900	123,569	124,242	124,917	125,595	126,276	126,960
1,133	127,646	128,335	129,027	129,722	130,420	131,121	131,824	132,530	133,240	133,952
1,134	134,667	135,385	136,105	136,830	137,556	138,286	139,018	139,753	140,493	141,234
1,135	141,977	142,724	143,474	144,227	144,982	145,740	146,501	147,265	148,033	148,802



Appendix L  
**Lake Kemp**  
**RESERVOIR AREA TABLE**

TEXAS WATER DEVELOPMENT BOARD

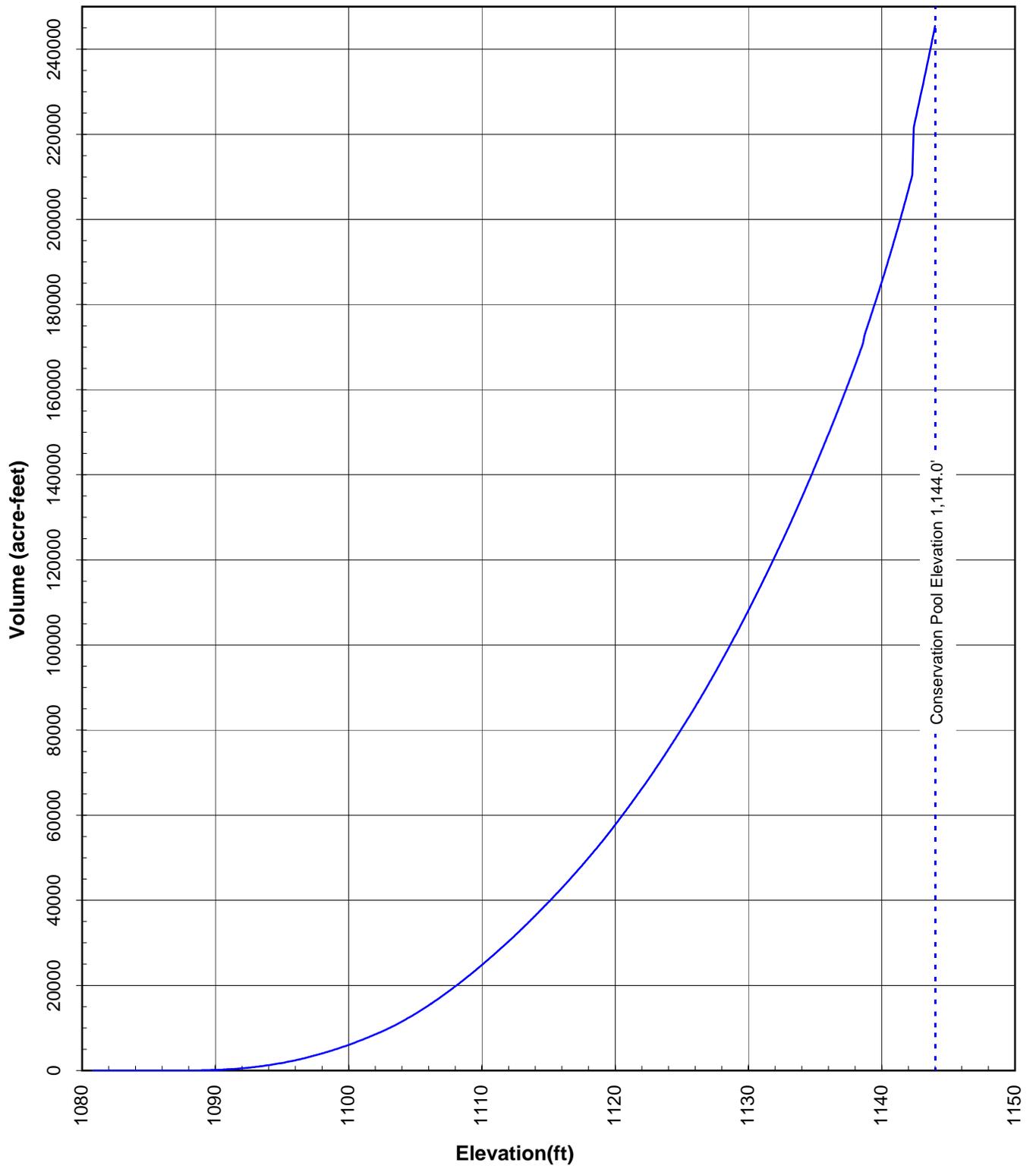
JANUARY- MARCH 2006 SURVEY

Conservation Pool Elevation 1,144.0'

Note: Table calculated for entire reservoir accounting for the water unavailable for diversion downstream due to sedimentation and pool isolation at elevations 1,141 ft and 1,138 ft.

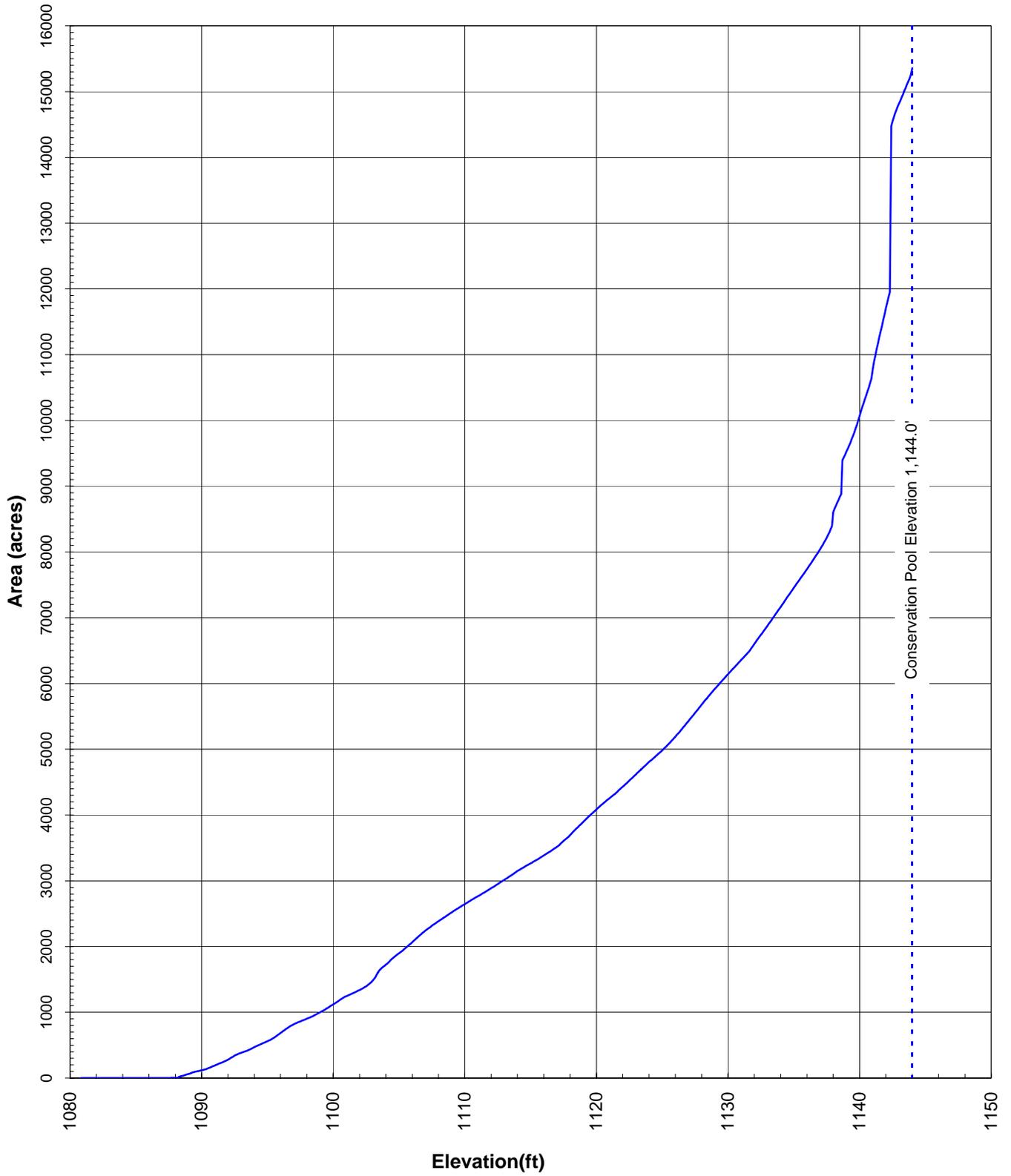
ELEVATION in Feet	AREA IN ACRES									
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1,080									0	0
1,081	0	0	0	0	0	0	0	0	0	0
1,082	0	0	0	0	0	0	0	0	0	0
1,083	0	0	0	0	0	0	0	0	0	0
1,084	0	0	0	0	0	0	0	0	0	0
1,085	0	0	0	0	0	0	0	0	0	0
1,086	0	0	0	0	0	0	0	0	0	0
1,087	0	1	1	1	1	1	2	2	2	3
1,088	3	4	9	16	24	31	38	44	50	57
1,089	63	69	77	84	90	96	100	104	109	114
1,090	118	123	128	134	141	149	158	166	174	183
1,091	192	201	210	218	226	234	241	250	260	269
1,092	280	291	303	315	327	339	350	360	368	376
1,093	383	391	398	405	413	421	429	439	448	458
1,094	469	479	489	498	507	516	524	534	543	552
1,095	561	570	579	590	602	614	627	641	655	670
1,096	685	701	716	730	744	759	772	784	797	809
1,097	819	829	837	846	854	862	871	879	886	894
1,098	903	911	919	928	937	948	959	969	980	991
1,099	1,001	1,011	1,021	1,033	1,045	1,058	1,071	1,084	1,097	1,109
1,100	1,121	1,133	1,145	1,158	1,172	1,186	1,201	1,214	1,226	1,237
1,101	1,246	1,255	1,264	1,273	1,282	1,291	1,300	1,310	1,320	1,329
1,102	1,339	1,349	1,360	1,371	1,383	1,397	1,411	1,427	1,443	1,460
1,103	1,480	1,508	1,536	1,571	1,608	1,637	1,658	1,675	1,692	1,708
1,104	1,725	1,741	1,759	1,778	1,800	1,819	1,835	1,851	1,867	1,882
1,105	1,897	1,912	1,928	1,944	1,963	1,980	1,996	2,012	2,030	2,047
1,106	2,065	2,084	2,103	2,122	2,139	2,157	2,174	2,191	2,208	2,225
1,107	2,241	2,256	2,272	2,286	2,301	2,316	2,330	2,344	2,358	2,372
1,108	2,386	2,399	2,412	2,425	2,438	2,451	2,465	2,479	2,493	2,506
1,109	2,520	2,533	2,546	2,559	2,572	2,584	2,596	2,608	2,621	2,633
1,110	2,645	2,658	2,671	2,683	2,695	2,707	2,719	2,731	2,743	2,754
1,111	2,766	2,778	2,789	2,801	2,813	2,825	2,837	2,849	2,861	2,874
1,112	2,886	2,898	2,911	2,923	2,937	2,950	2,964	2,977	2,989	3,002
1,113	3,014	3,027	3,039	3,053	3,066	3,080	3,094	3,108	3,122	3,136
1,114	3,148	3,160	3,172	3,185	3,197	3,208	3,220	3,231	3,242	3,254
1,115	3,265	3,277	3,288	3,299	3,311	3,322	3,334	3,348	3,360	3,373
1,116	3,385	3,398	3,410	3,423	3,436	3,449	3,462	3,476	3,489	3,503
1,117	3,516	3,532	3,549	3,568	3,586	3,605	3,622	3,639	3,657	3,675
1,118	3,695	3,716	3,739	3,759	3,779	3,799	3,818	3,837	3,857	3,876
1,119	3,895	3,915	3,936	3,956	3,976	3,994	4,012	4,030	4,048	4,066
1,120	4,085	4,104	4,122	4,140	4,157	4,174	4,191	4,208	4,225	4,241
1,121	4,256	4,272	4,288	4,304	4,321	4,337	4,356	4,375	4,394	4,413
1,122	4,430	4,448	4,466	4,485	4,504	4,523	4,542	4,561	4,580	4,600
1,123	4,619	4,637	4,655	4,674	4,694	4,713	4,733	4,751	4,769	4,788
1,124	4,806	4,824	4,841	4,858	4,876	4,893	4,911	4,928	4,946	4,964
1,125	4,984	5,003	5,022	5,041	5,061	5,083	5,105	5,127	5,149	5,171
1,126	5,193	5,215	5,237	5,260	5,284	5,308	5,333	5,357	5,382	5,407
1,127	5,432	5,456	5,480	5,505	5,529	5,554	5,578	5,604	5,629	5,654
1,128	5,679	5,704	5,728	5,753	5,777	5,801	5,824	5,848	5,871	5,894
1,129	5,918	5,940	5,963	5,985	6,008	6,030	6,052	6,075	6,097	6,120
1,130	6,142	6,164	6,186	6,208	6,229	6,250	6,271	6,292	6,313	6,335
1,131	6,356	6,378	6,399	6,421	6,442	6,464	6,486	6,513	6,543	6,573
1,132	6,601	6,629	6,657	6,686	6,713	6,740	6,767	6,795	6,822	6,848
1,133	6,876	6,905	6,936	6,965	6,993	7,021	7,049	7,078	7,107	7,136
1,134	7,165	7,194	7,223	7,252	7,282	7,311	7,341	7,369	7,398	7,426
1,135	7,455	7,483	7,511	7,540	7,569	7,597	7,625	7,654	7,682	7,710





----- Conservation Pool Elevation 1,144.0'
 ——— Volume 2006 Accounting for Sedimentation and Pool Isolation

**Lake Kemp**  
**March 2006**  
 Prepared by: TWDB



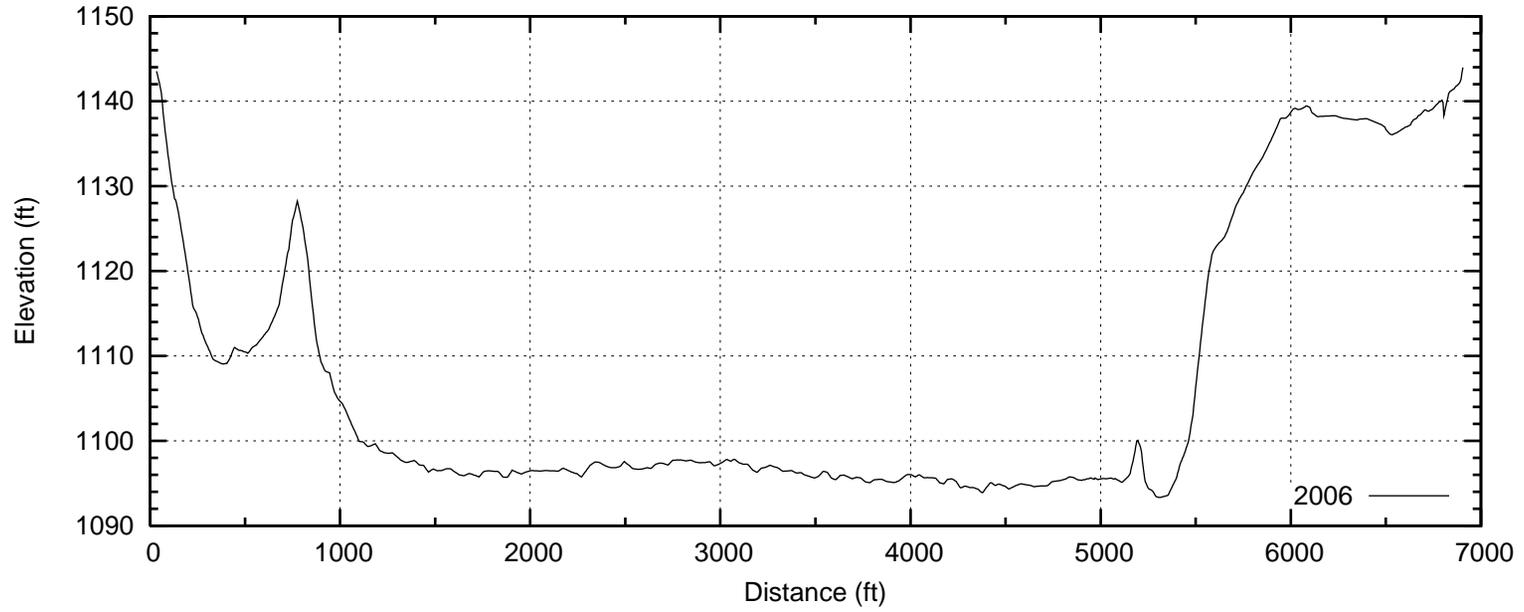
----- Conservation Pool Elevation 1,144.0'
 ——— Area 2006 Accounting for Sedimentation and Pool Isolation

Lake Kemp  
 March 2006  
 Prepared by: TWDB

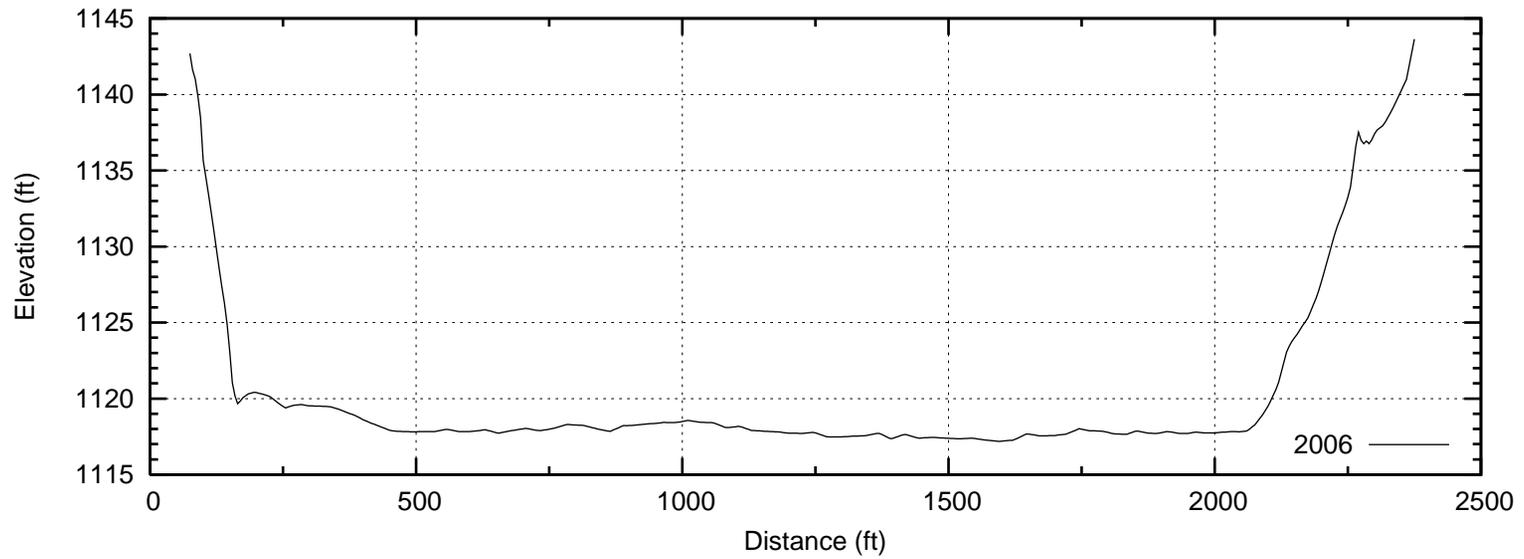


# Lake Kemp

## Range Line SR01

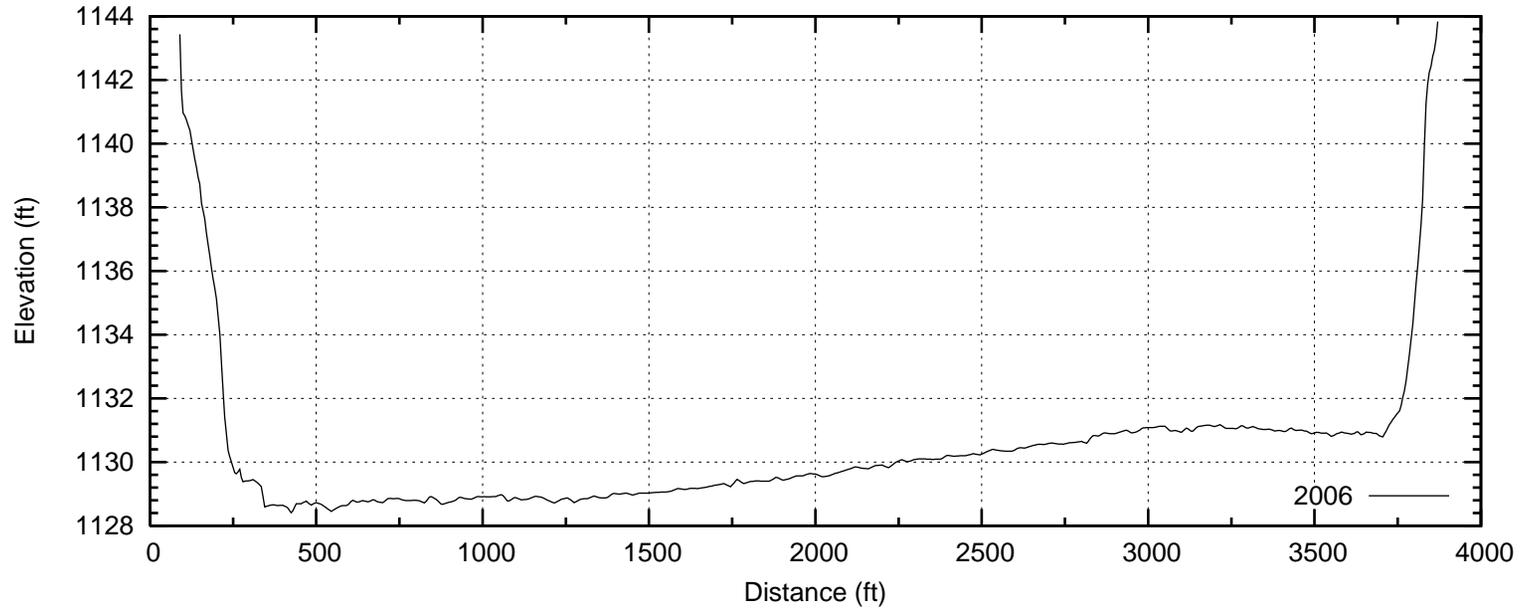


## Range Line SR02

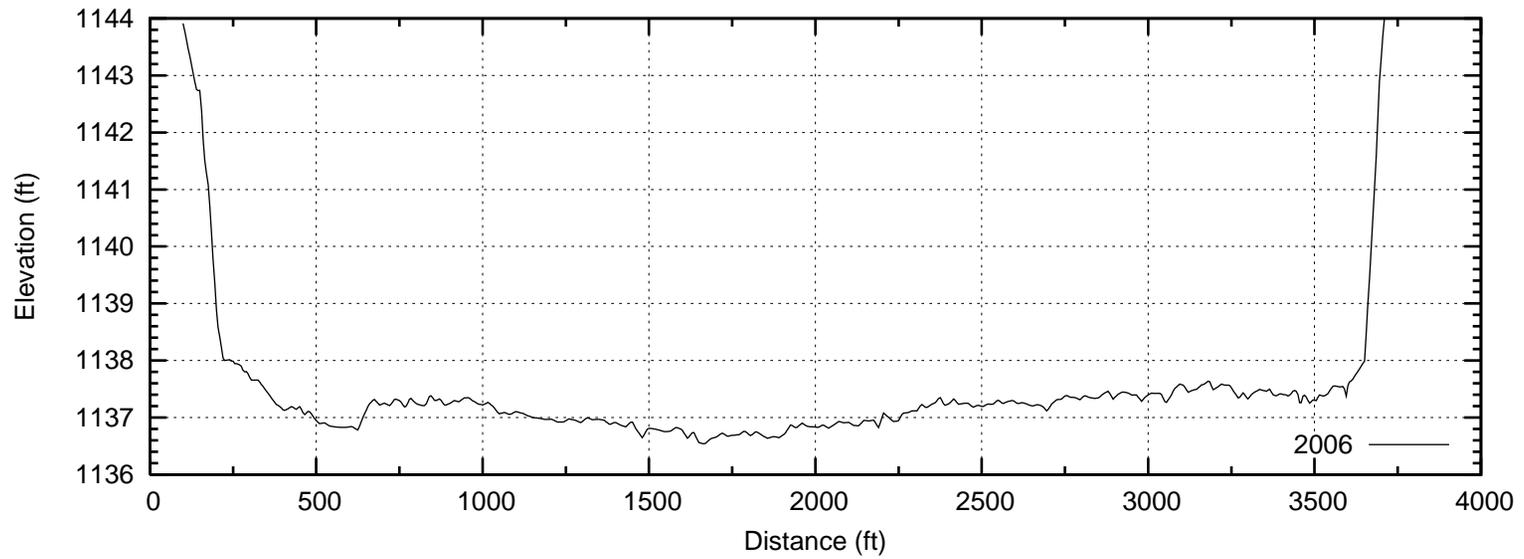


# Lake Kemp

## Range Line SR03

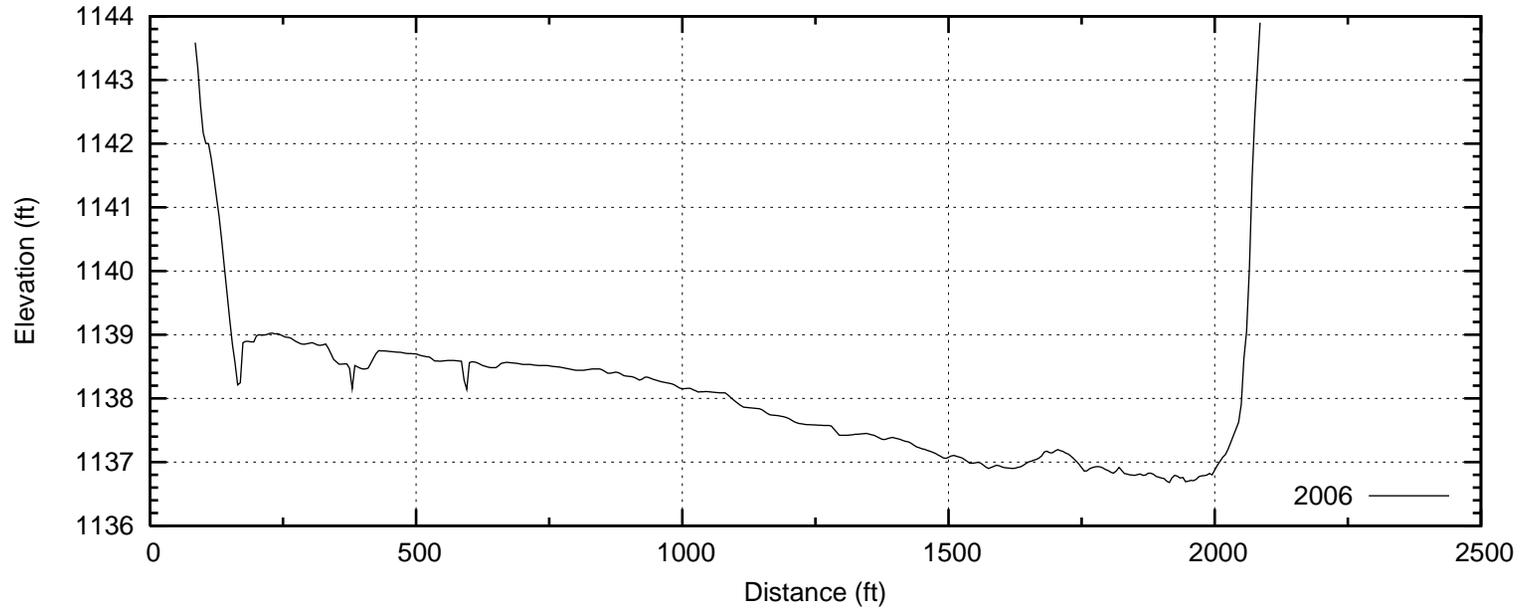


## Range Line SR04

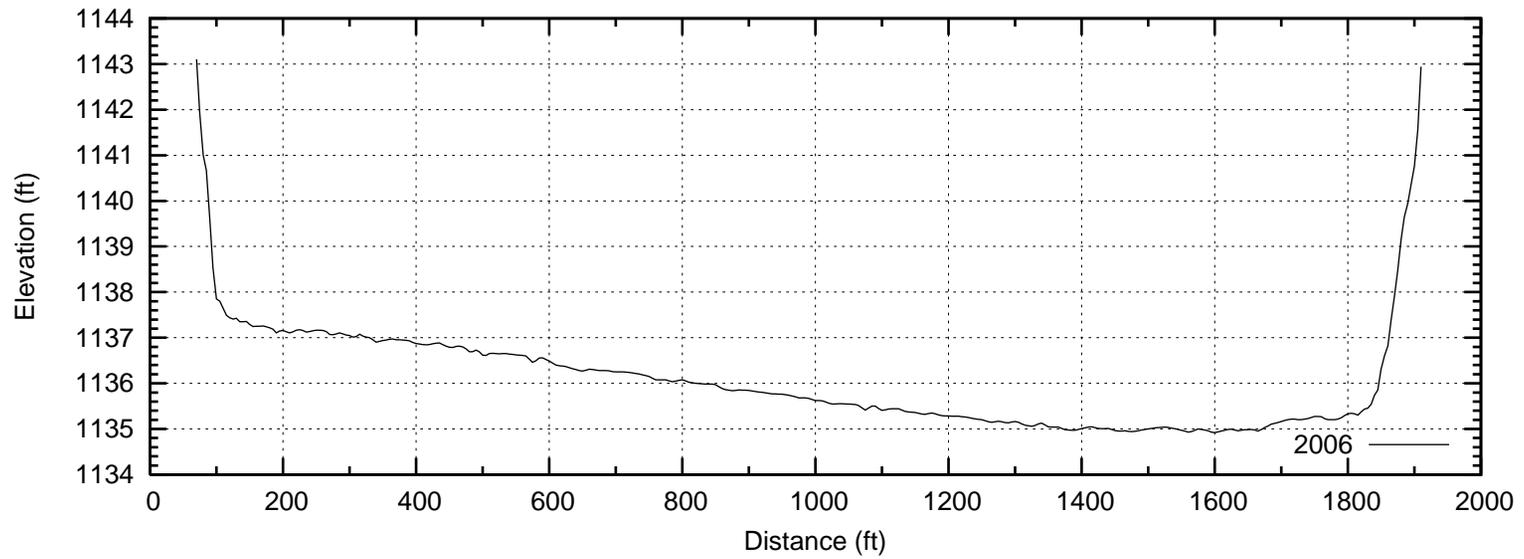


# Lake Kemp

## Range Line SR05

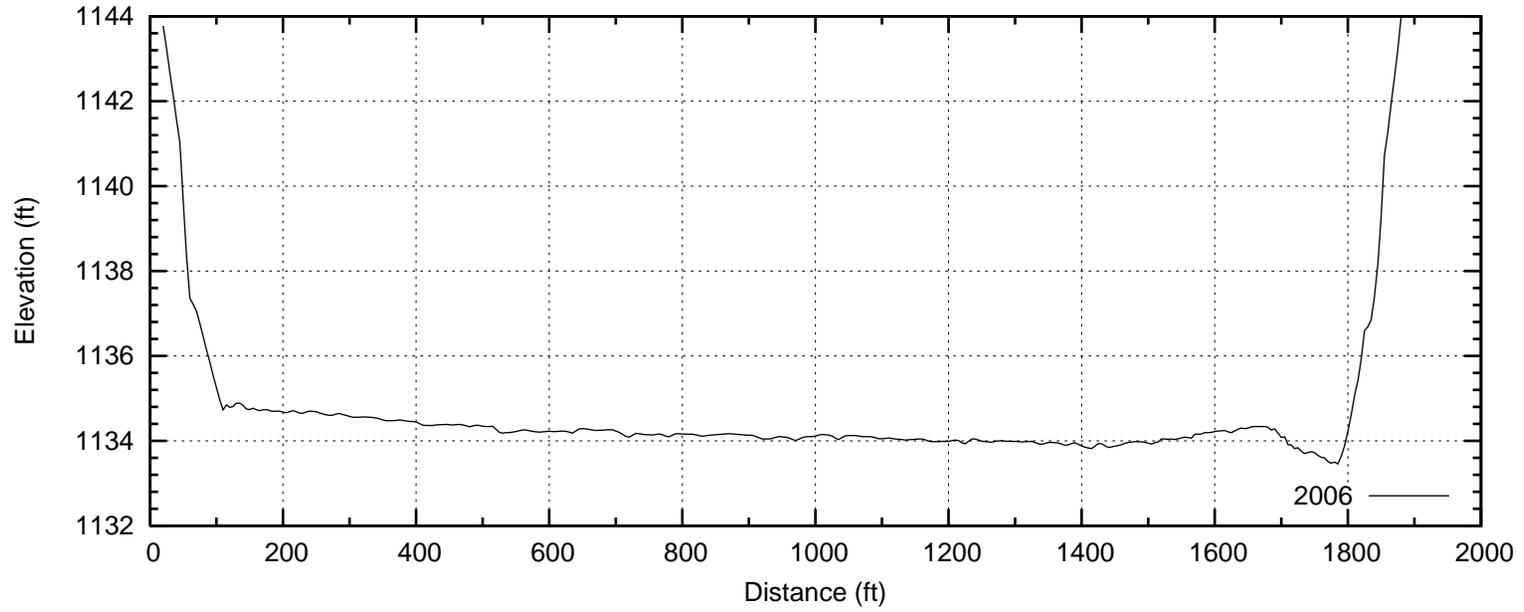


## Range Line SR06

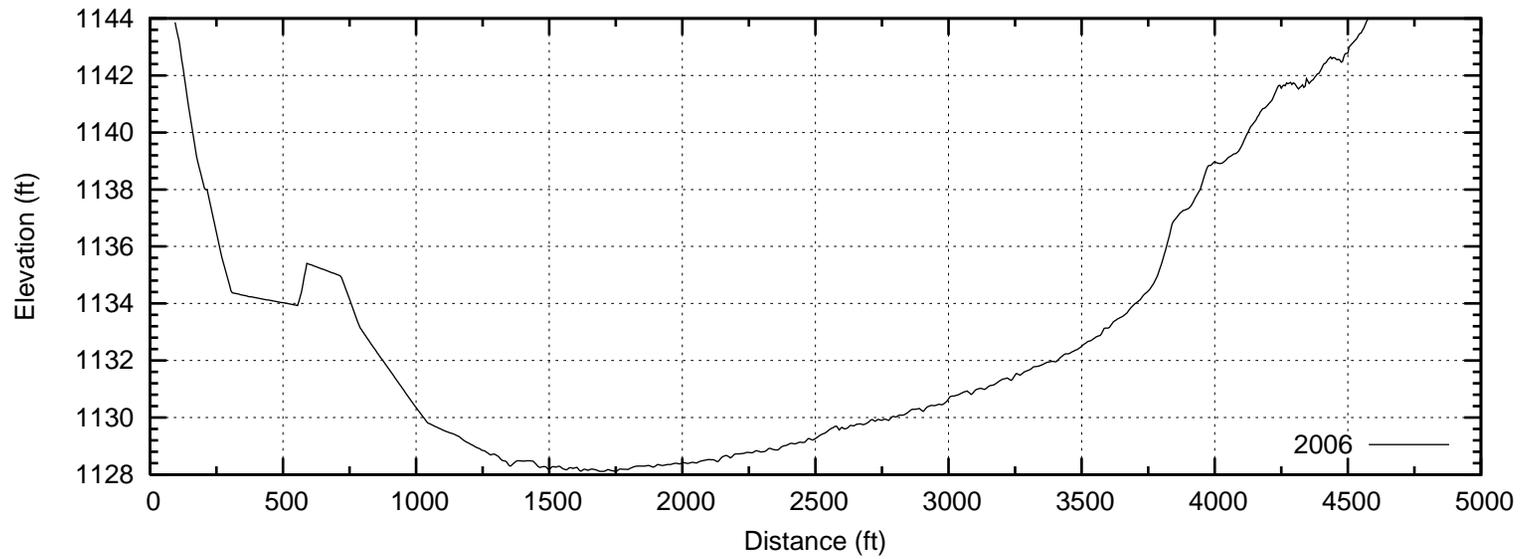


# Lake Kemp

## Range Line SR07

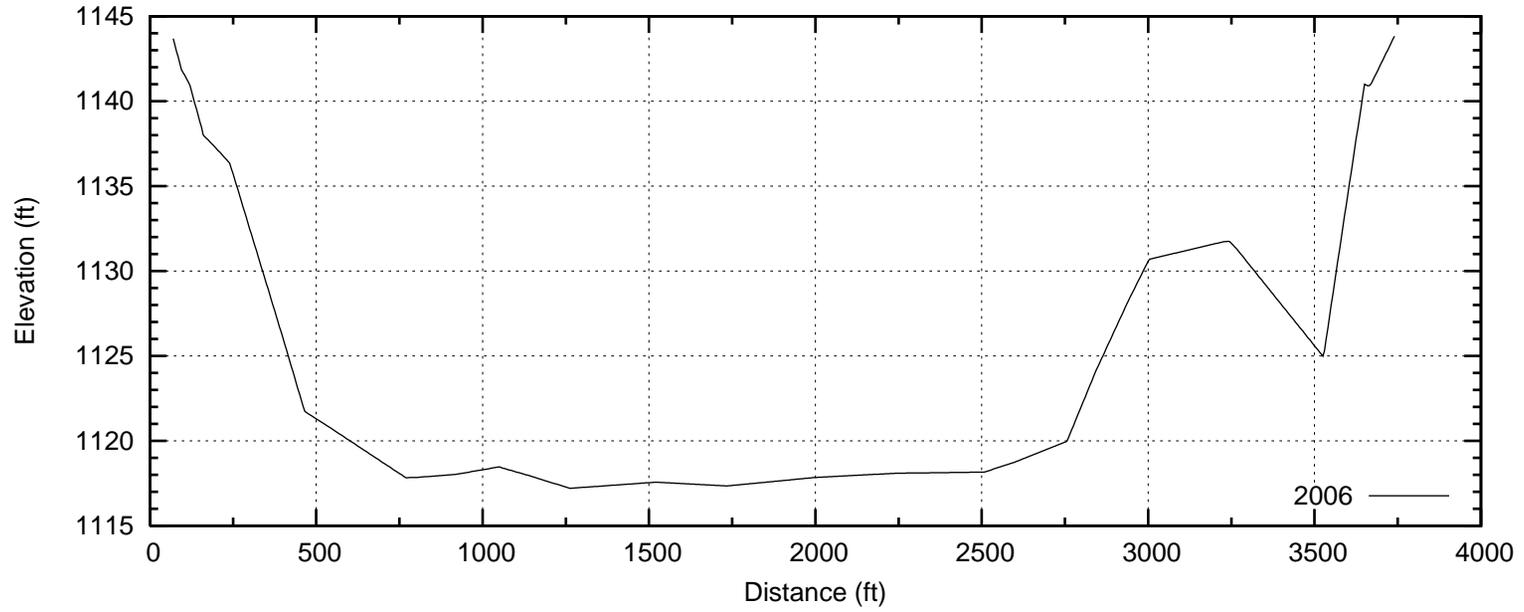


## Range Line SR08

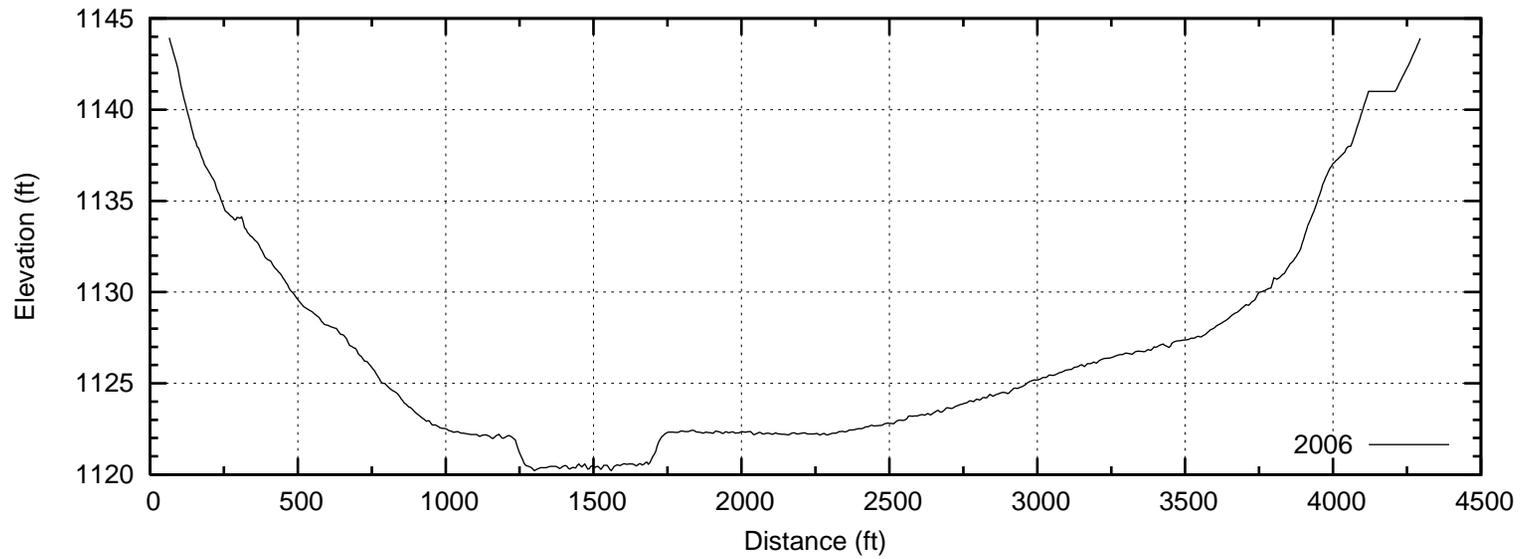


# Lake Kemp

## Range Line SR09

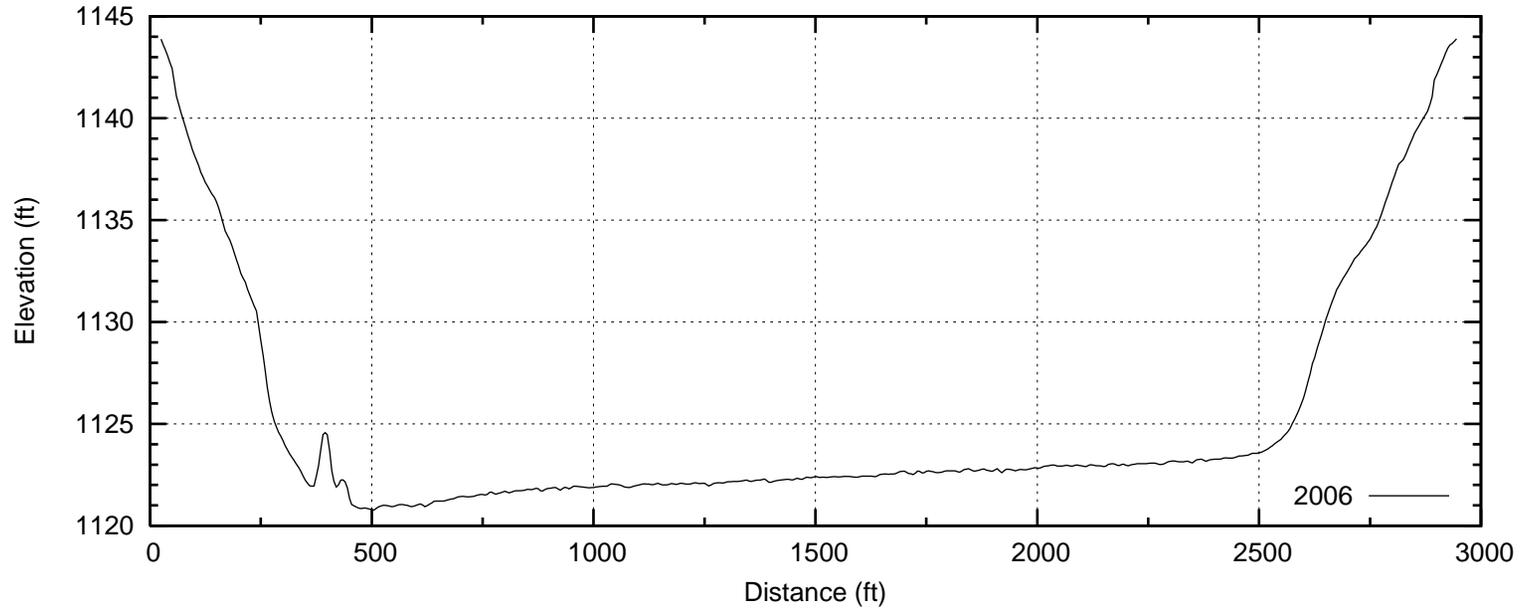


## Range Line SR10

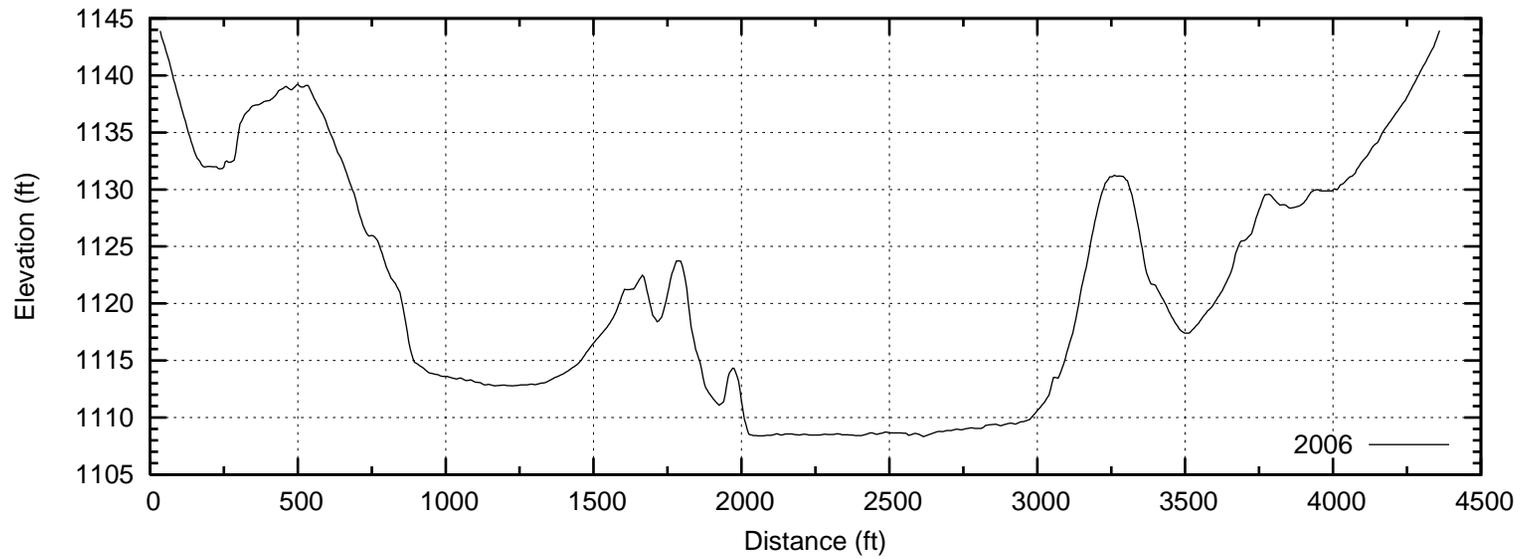


# Lake Kemp

## Range Line SR11

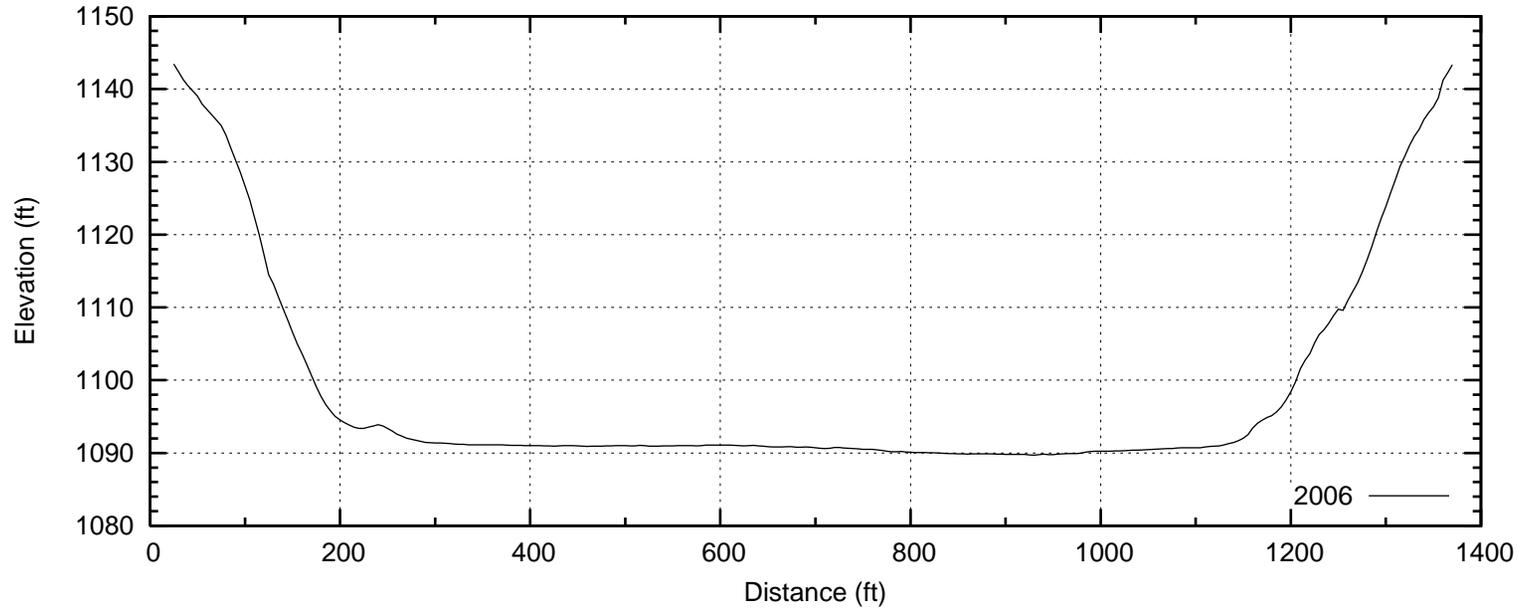


## Range Line SR12



# Lake Kemp

## Range Line SR13



## Range Line SR14

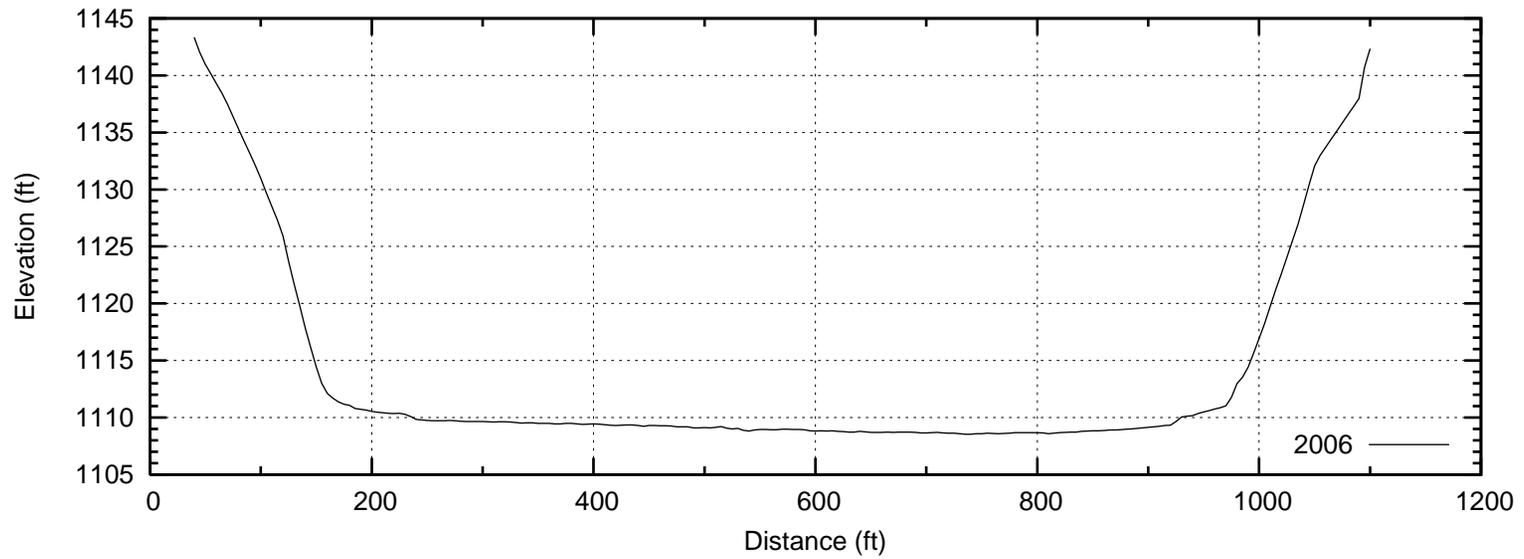


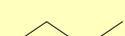
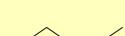
Figure 6



# Lake Kemp

## 5' - Contour Map

### CONTOURS

-  1,085
-  1,090
-  1,095
-  1,100
-  1,105
-  1,110
-  1,115
-  1,120
-  1,125
-  1,130
-  1,135
-  1,138
-  1,140
-  1,141

-  Islands
  -  Lake Boundary  
Elevation: 1,144 ft
- Projection: NAD83  
State Plane  
Texas North Central Zone



This map is the product of a survey conducted by the Texas Water Development Board's Hydrographic Survey Program to determine the capacity of Lake Kemp. The Texas Water Development Board makes no representation or assumes any liability.

