Volumetric Survey of LAKE JACKSONVILLE

May 2006 Survey

Prepared by:

The Texas Water Development Board

April 2007

Texas Water Development Board

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Prepared for:

City of Jacksonville

With Support Provided by:

U.S. Army Corps of Engineers, Fort Worth District

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Published and Distributed by the
Texas Water Development Board
P.O. Box 13231
Austin, TX 78711-3231

Executive Summary

In April of 2006, the Texas Water Development Board (TWDB) entered into agreement with the US Army Corps of Engineers, Fort Worth District, for the purpose of performing a volumetric survey of Lake Jacksonville while the reservoir was near the top of the conservation pool elevation. This information was converted into updated area-capacity tables. In addition, sediment range lines were established by TWDB to examine the reservoir in cross-section and to facilitate future tracking of any sedimentation in Lake Jacksonville.

The results of the TWDB 2006 Survey indicate Lake Jacksonville has a total reservoir capacity of 25,732 acre-feet and encompasses 1,164 acres at conservation pool elevation, 422.0 ft above msl. Dead Pool Storage is 62 acre-feet, at dead pool elevation, 372.0 ft above msl. Therefore, conservation storage capacity at conservation pool elevation is 25,670 acre-feet. Impoundment of Lake Jacksonville began in June of 1957. Original reservoir capacity, as per Certificate of Adjudication No. 06-3274, was 30,500 acre-feet. This indicates the reservoir has experienced a 15.6% decrease in total reservoir capacity, or 4,768 acre-feet loss, since it was first impounded. Information provided by the City of Jacksonville indicates the original surface area of the lake encompassed 1,320 acres. The TWDB 2006 survey indicates an 11.8%, or 156 acre, loss in surface area at the conservation pool elevation.

Table of Contents

List of Tables

List of Figures

Appendices

Lake Jacksonville General Information

Lake Jacksonville is located in the Neches River Basin on Gum Creek in Cherokee County, Figure 1. Construction on Buckner Dam and Lake Jacksonville began in 1956. The dam was completed and impoundment began in June of 1957.[1] Lake Jacksonville serves as a source of water supply for the City of Jacksonville as well as recreation.

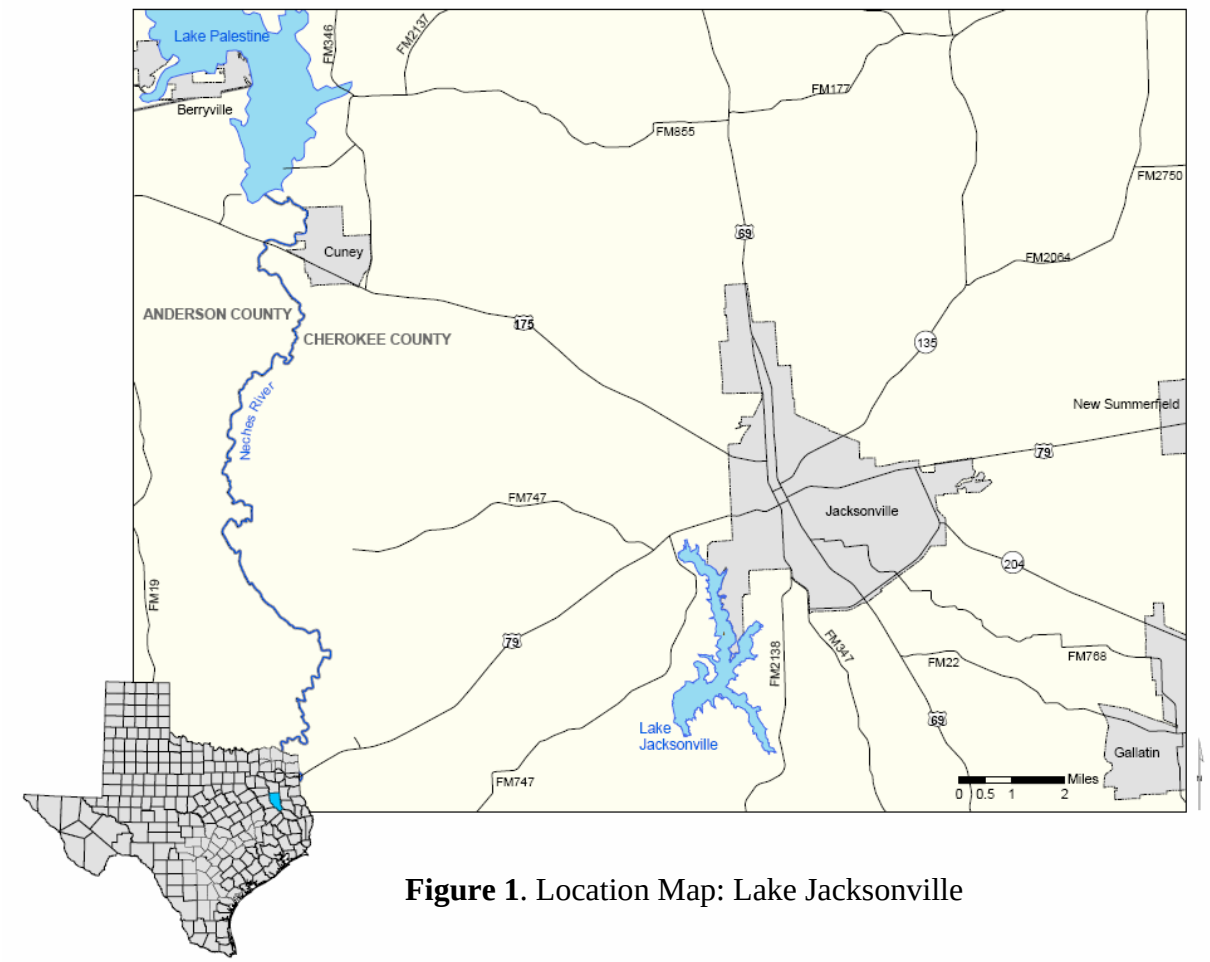


Figure 1. Location Map: Lake Jacksonville

Certificate of Adjudication No. 06-3274 authorizes the City of Jacksonville to maintain an existing dam and reservoir (Lake Jacksonville) on Gum Creek and impound therein not to exceed 30,500 acre-feet of water. The owner is authorized to divert and use not to exceed 5,000 acre-feet of water per annum from Lake Jacksonville for municipal purposes. The owner is also authorized to use the impounded waters for recreation purposes. The effective date of the owner's right is June 13, 1955, for the storage of 30,500 acre-feet of water in Lake Jacksonville and the diversion of 5,000 acre-feet of water. The owner is also required to maintain a suitable outlet to allow the free passage of water that the owner is not entitled to divert or impound.

Certificate of Adjudication No. 06-3274 also authorized the City of Jacksonville to maintain a dam and reservoir, known as Lake Acker, on Merritts Branch, a tributary of Gum Creek. However, with the removal of the dam forming Lake Acker, an Amendment to Certificate of Adjudication No. 06-3274A was granted on April 26, 2002. Amendment to Certificate of Adjudication No. 06-3274A authorizes the City of Jacksonville to divert and use the 1,200 acre-feet of water per annum originally authorized for diversion from Lake Acker for municipal use to be diverted from Lake Jacksonville. Therefore, the City of Jacksonville is authorized to divert and use not to exceed 6,200 acre-feet of water per annum from Lake Jacksonville for municipal use. In addition, the City of Jacksonville is authorized to make those diversions from any point on the perimeter of the lake. The effective date of the owner's right is March 24, 1923 for the use of 1,000 ac-ft of water per annum, December 21, 1940 for the use of 200 ac-ft of water per annum, and June 13, 1955 for the use of 5,000 ac-ft per annum. The City of Jacksonville is also required to update their water conservation plan every five years beginning February 28, 2007. The complete certificates are on file in the Records Division of the Texas Commission on Environmental Quality.

The following table is a list of pertinent data about Buckner Dam and Lake Jacksonville.[1]

Table 1: Pertinent Data for Buckner Dam and Lake Jacksonville

Owner: City of Jacksonville
Engineer (Design): Wisenbaker, Fix, and Associates
Location: On Gum Creek in Cherokee County, 5 miles southwest of Jacksonville
Drainage Area: 34 square miles
Dam:

Type	Earthfill
Length	2,700 ft
Maximum Height	72 ft
Top Width	16 ft
Top Elevation	438.0 ft above msl

Spillway (Emergency):

Location	Right end of dam
Crest length	350 ft
Crest Elevation	431.0 ft above msl
Control	None

Table 1: Pertinent Data for Buckner Dam and Lake Jacksonville (continued)	
Spillway (Service):	
Type	Rectangular drop inlet, 52 by 96 ft
Conduit	6-ft square
Crest elevation	422.0 ft above msl
Outlet Works:	
Type	18-inch pipe through dam
Control	Valve on upstream side
Invert elevation	372.0 ft above msl

Volumetric Survey of Lake Jacksonville

Introduction

The TWDB Hydrographic Survey Program was authorized by the state legislature in 1991. The Texas Water Code authorizes the TWDB, at the request of a political subdivision, to perform a survey to determine reservoir storage capacity, sedimentation levels, rates of sedimentation, projected water supply availability, or potential mitigative measures, and to conduct other bathymetric studies.

In February of 2006, the Texas Water Development Board entered into agreement with the US Army Corps of Engineers, Fort Worth District, for the purpose of performing a volumetric survey of Lake Jacksonville while the reservoir was near the top of the conservation pool elevation. This information was converted into updated area-capacity tables. In addition, ten sediment range lines were established by the TWDB to examine the reservoir in cross-section and to facilitate future tracking of any sedimentation in Lake Jacksonville.

Datum

The vertical datum used during this survey is that used by the United States Geological Survey (USGS) for the reservoir elevation gauge USGS 08032200 Lk Jacksonville nr Jacksonville, TX.[2] The datum for this gauge 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 USGS gauge. The horizontal datum used for this report is NAD83 State Plane Texas Central Zone.

Bathymetric Survey

Bathymetric data collection for Lake Jacksonville occurred between May 8th and May 10th of 2006, while the water surface elevation was slightly below the conservation pool elevation of 422.0 ft. The water surface elevation varied between 421.42 ft and 421.44 ft during the TWDB survey. The survey team used two boats equipped with a depth sounder integrated with Differential Global Positioning System (DGPS) equipment to navigate along pre-planned range lines spaced approximately 500 feet apart in a perpendicular fashion to the original stream channel. During the 2006 survey, the team navigated over 26 miles of range lines and collected over 21,200 data points. Figure 2, on the following page, shows the data points collected during the TWDB 2006 survey.

The depth sounder was calibrated each day using the velocity profiler to measure the speed of sound in the water column and a modified bar check using a weighted tape or stadia rod was performed to verify the depth reading. The average speed of sound through the water column varied between 4,907 and 4,917 feet per second during the 2006 survey.

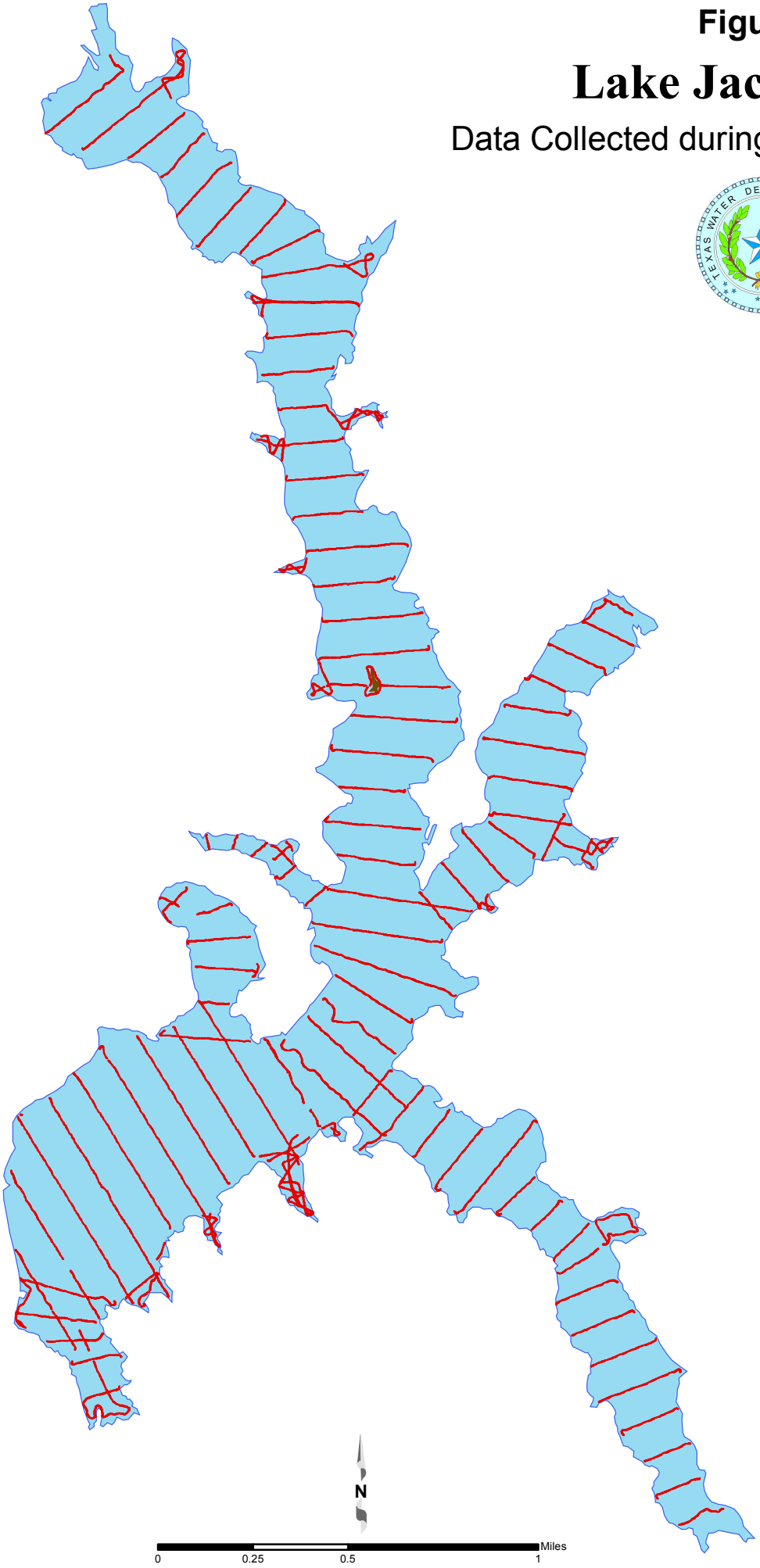
Survey Results

The results of the TWDB 2006 Survey indicate Lake Jacksonville has a volume of 25,732 acre-feet and encompasses 1,165 acres at conservation pool elevation, 422.0 ft. Dead pool storage is 62 acre-feet, at dead pool elevation, 372.0 ft. Therefore, conservation storage capacity at conservation pool elevation is 25,670 acre-feet. Original reservoir capacity, as per Certificate of Adjudication No. 06-3274, was 30,500 acre-feet. This indicates the reservoir has experienced a 15.6% decrease in total reservoir capacity, or 4,768 acre-feet loss, since it was designed. Information provided by the City of Jacksonville indicates the original surface area of the lake encompassed 1,320 acres. The TWDB 2006 survey indicates an 11.8%, or 156 acre, loss in surface area at the conservation pool elevation. Due to the differences in the methodologies used to calculate the reservoir's capacity between original impoundment and 2006, comparison of these values is not recommended and is presented here for informational purposes only.[3] TWDB considers the 2006 survey to be a significant improvement over previous methods.

Figure 2

Lake Jacksonville

Data Collected during TWDB 2006 Survey



Legend

- Data Points
- Islands
- Lake Boundary
  Elev. 422 ft above msl

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 quarter-quadrangle images (DOQQs), used for Lake Jacksonville were Jacksonville West quarter quads. These images were photographed on August 17, 2004 and September 20, 2004. At the time of the photographs the water surface elevation measured 421.44 and 421.84 ft above msl, respectively, just below the conservation pool elevation. At the scale of the photographs, the difference between 421.44 ft, 421.84 ft, and 422.0 ft is indiscernible; therefore the boundary was digitized at the land water interface from the photos, and assigned the conservation pool elevation of 422.0 ft.

The United States Department of Agriculture, Farm Service Agency's, Aerial Photography Field Office (APFO), National Agriculture Imagery Program (NAIP) acquires the photographic imagery during the agricultural growing seasons in the continental U.S.[4] The imagery resides in the public domain and can be downloaded from the Texas Natural Resources Information System (TNRIS) website at http://www.tnris.state.tx.us/. For more information visit the APFO website at http://www.apfo.usda.gov/NAIP.html or contact TNRIS.

Triangular Irregular Network (TIN) Model

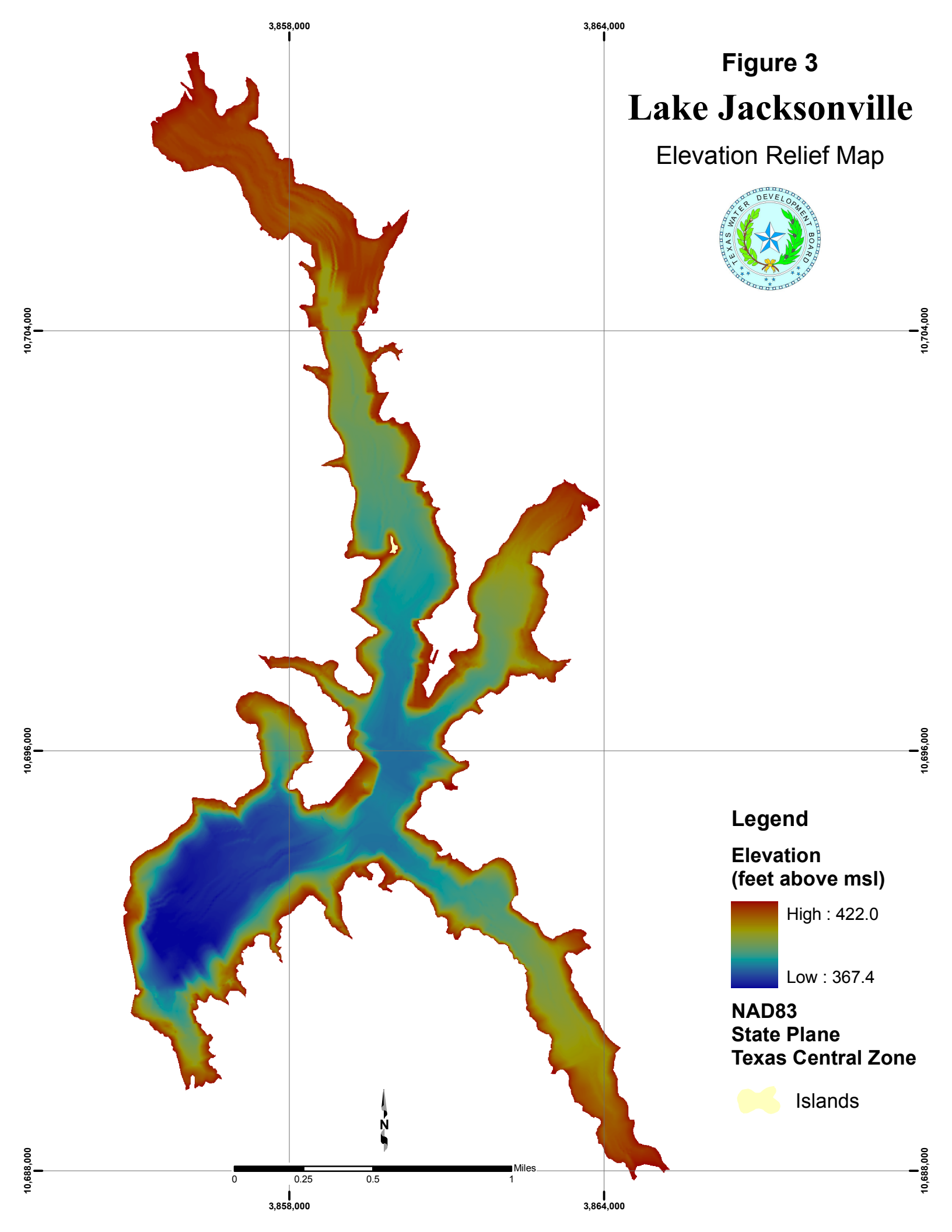
Upon completion of data collection, the raw data files were edited in HYPACK MAX to remove any data anomalies. The water surface elevations for each respective day were applied and the depths were converted to corresponding elevations and exported as a MASS points file. The MASS points and boundary files were 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.[5] The Lake Jacksonville TIN Model was enhanced through the use of a Self-Similar Interpolation routine developed by the TWDB. See the following section on Self-Similar Interpolation and the Shallow Area Problem for more information.

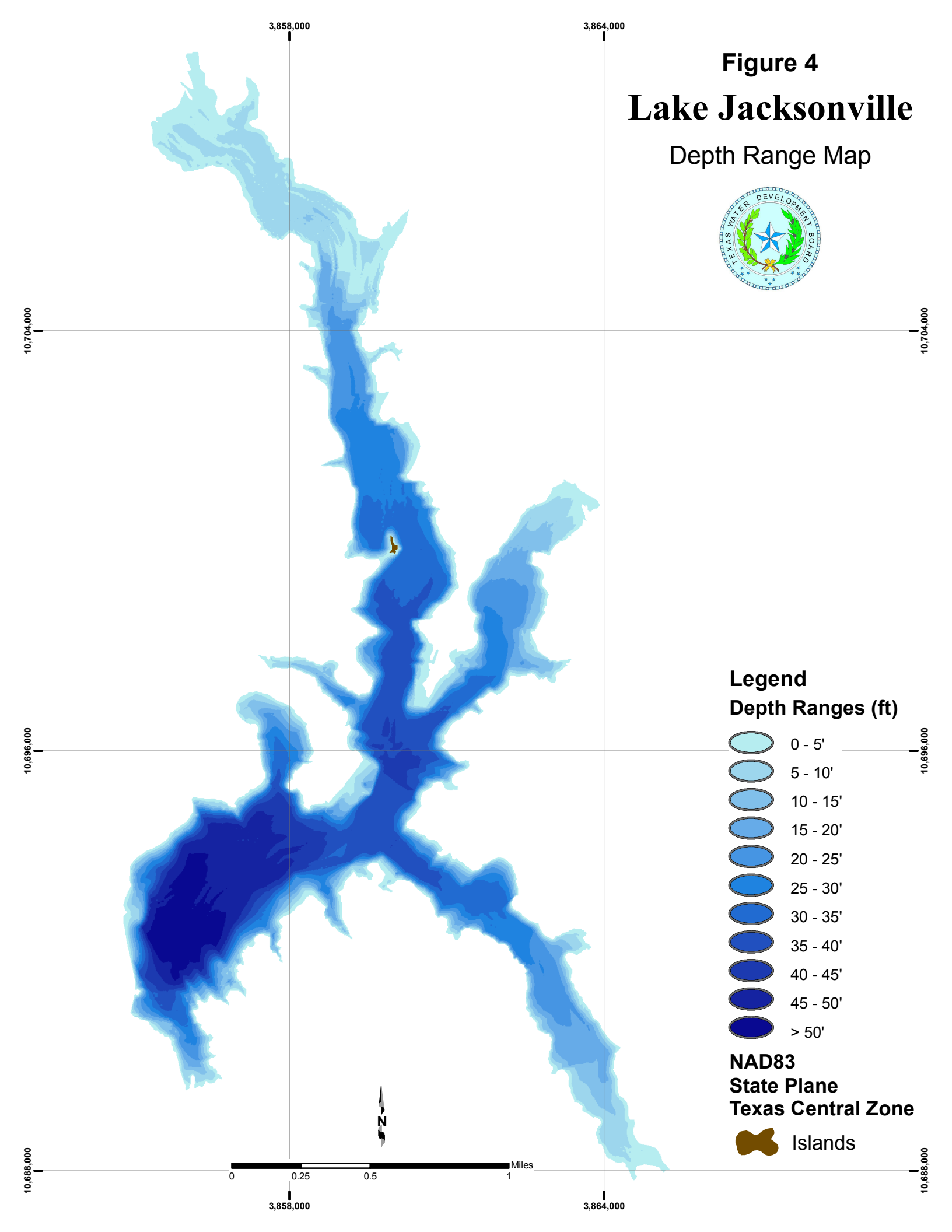
Using Arc/Info software, volumes and areas were calculated from the TIN Model for the entire reservoir at one-tenth of a foot intervals, from elevation 367.0 ft to elevation 422.0 ft. The Elevation-Capacity and Elevation-Area Tables, updated for 2006, are presented in Appendices A and B, respectively. The Area-Capacity curves are presented in Appendix C.

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 3, an Elevation Relief Map representing the topography of the reservoir bottom, Figure 4, a map showing shaded depth ranges for Lake Jacksonville, and Figure 5, a 5-ft contour map (attached).

Self-Similar Interpolation and the Shallow Area Problem

A limitation of the Delaunay method for triangulation in the TIN Model results in artificially-curved contour lines extending into the reservoir where the reservoir walls are steep and the reservoir is relatively narrow. These curved contours are likely a poor representation of the true reservoir bathymetry in these areas. To ameliorate this problem, a Self-Similar Interpolation routine (developed by the TWDB) was used to interpolate the bathymetry in between many 500 ft-spaced survey lines to increase the density of points input into the TIN Model. The increased point density alters the mean triangle shape from long and skinny to more equilateral, thus providing better representations of reservoir topography.[6] In areas where obvious geomorphic features indicate a high-probability of cross-section shape changes (e.g. incoming tributaries, significant widening/narrowing of channel, etc.), this self-similar assumption is not likely to be valid; therefore, self-similar interpolation was not used in areas of Lake Jacksonville where a high probability of change between cross-sections exists.[6] Figure 6 illustrates this problem.


3,858,000
3,864,000
10,704,000
10,696,000
10,688,000
Figure 3
Lake Jacksonville
Elevation Relief Map
TEXAS WATER DEVELOPMENT BOARD
Legend
Elevation
(feet above msl)
High : 422.0
Low : 367.4
NAD83
State Plane
Texas Central Zone
Islands
N
0
0.25
0.5
1
Miles


3,858,000
3,864,000
10,704,000
10,696,000
10,688,000
Figure 4
Lake Jacksonville
Depth Range Map
TEXAS WATER DEVELOPMENT BOARD
Legend
Depth Ranges (ft)
0 - 5'
5 - 10'
10 - 15'
15 - 20'
20 - 25'
25 - 30'
30 - 35'
35 - 40'
40 - 45'
45 - 50'
> 50'
NAD83
State Plane
Texas Central Zone
Islands
N
0
0.25
0.5
1
Miles

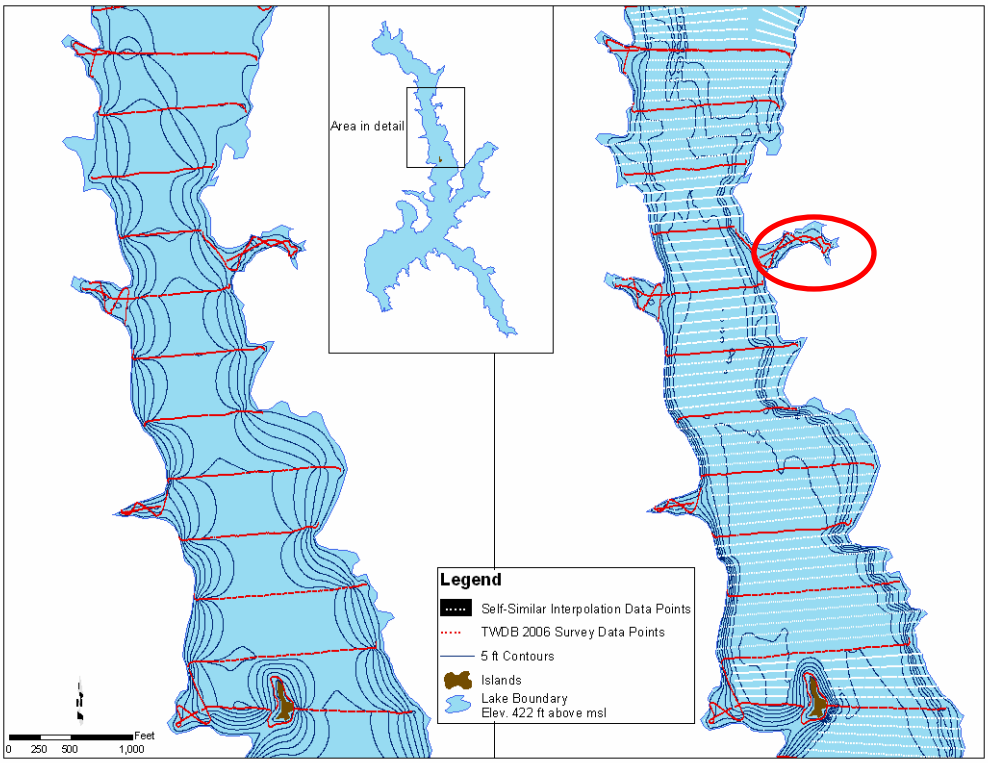


Figure 6. The image on the left illustrates the artificially-curved contour lines, a function of the TIN generation process, extending into the reservoir every 500 feet and corresponding with the TWDB survey data. The image on the right illustrates how the increased density of points, from the Self-Similar Interpolation Routine, results in contours that are more representative of the reservoir bathymetry. The red circle highlights an area of the reservoir where a high probability of change between cross-sections is likely; therefore, the Self-Similar Interpolation routine was not used here.

Another limitation of the Delaunay method of TIN generation involves the calculation of areas and volumes in sections of the reservoir that were too shallow for bathymetric data collection by boat. This "shallow area problem," as identified by the TWDB, is corrected using the HydroEdit interpolation routines developed by the TWDB. The Delaunay triangulation method, within ArcGIS, creates large flat triangles throughout these un-surveyed areas for which each corner of the triangle lies on the reservoir boundary. These triangles do not suggest any change in slope along the boundary and are assigned zero depths, causing an artificial spike in the elevation-area graphs at the last elevation interval for which reservoir areas/volumes are calculated. To correct this, the HydroEdit software program linearly interpolates elevations along connecting lines between the digitized reservoir boundary points and their closest sounding points. These interpolated data points are used in conjunction with the surveyed sounding points and the Self-Similar Interpolated points to generate the TIN model. The additional data points result in a model with a more realistic representation of the reservoir bathymetry[6] and better defined steeply

sloped shorelines and shallow areas. Figure 7, below, illustrates the "Shallow Area Problem". Figure 8 shows the resulting point density after the Self-Similar Interpolation and "Shallow Area Problem" routines were employed. The Self-Similar Interpolation and "Shallow Area Problem" routines were applied to approximately 98% of the reservoir area, at conservation pool elevation.

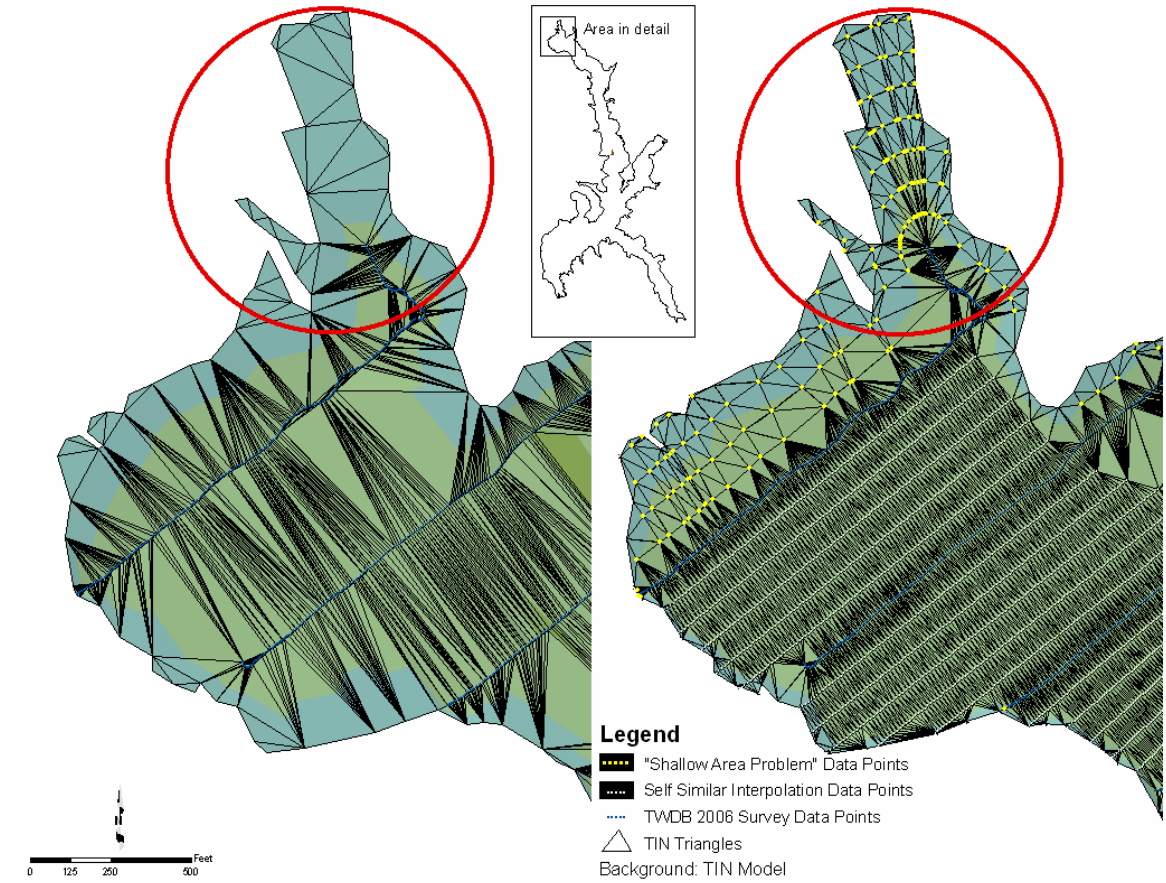


Figure 7. The image on the left illustrates how triangles form during the TIN generation without the Self-Similar and "Shallow Area Problem" data points. The red circle highlights those triangles where all three vertices are on the boundary, creating flat triangles. The image on the right illustrates how the TIN triangles are formed after the Self-Similar and "Shallow Area Problem" data points are added. Notice the flat triangles no longer exist.

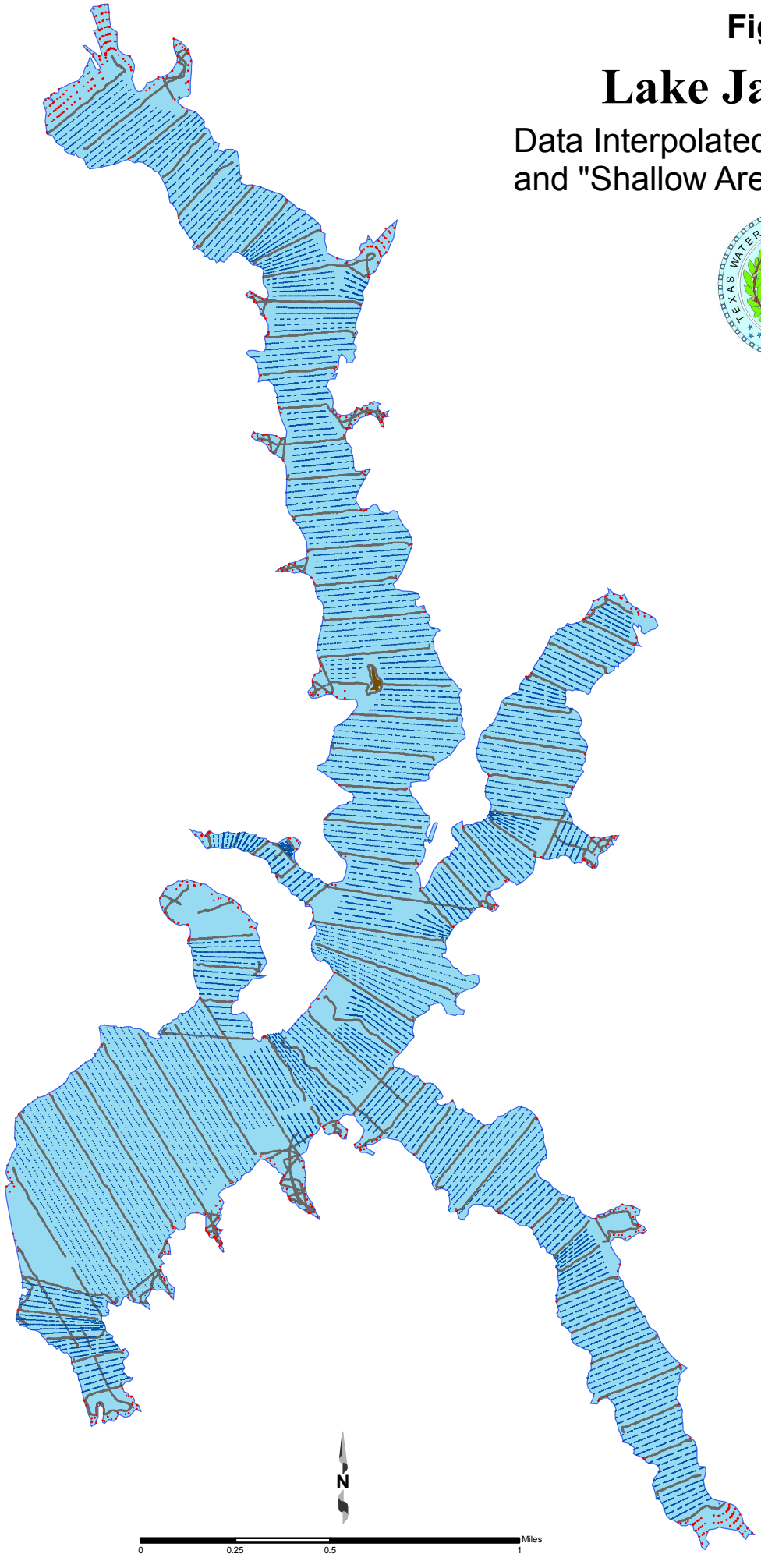
Sediment Range Lines

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

Figure 8

Lake Jacksonville

Data Interpolated Using Self-Similar and "Shallow Area Problem" Routines



Legend

- Data Points Collected During TWDB 2006 Survey
- Data Points Added Using the HydroEdit Self-Similar Interpolation Routine
- Data Points Added Using the HydroEdit "Shallow Area Problem" Routine
- Islands
- Lake Boundary

TWDB Contact Information

More information about the Hydrographic Survey Program can be found at: http://www.twdb.state.tx.us/assistance/lakesurveys/volumetricindex.asp. Any questions regarding the TWDB Hydrographic Survey Program may be addressed to Barney Austin, Director of Surface Water Resources Division, at 512-463-8856, or by email at: Barney.Austin@twdb.state.tx.us.

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1. Texas Water Development Board, Report 126, Engineering Data on Dams and Reservoirs in Texas, Part I, October 1974.
2. United States Geological Survey, http://tx.usgs.gov/ 07 June 2006.
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4. U.S Department of Agriculture, Farm Service Agency, Aerial Photography Field Office, National Agriculture Imagery Program, http://www.apfo.usda.gov/NAIP.html, 2/10/06.
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Appendix A

Lake Jacksonville

RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD
CAPACITY IN ACRE-FEET
ELEVATION INCREMENT IS ONE TENTH FOOT

MAY 2006 SURVEY
Conservation Pool Elevation 422.0'
Dead Pool Elevation 372.0'

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
367	0	0	0	0	0	0	0	0	0	0
368	0	0	0	0	0	0	0	0	0	0
369	0	0	1	1	1	2	2	3	4	5
370	6	8	9	11	13	15	17	19	21	24
371	26	29	32	35	39	42	46	49	53	57
372	62	66	71	76	81	86	91	96	102	107
373	113	119	125	131	137	144	150	157	164	171
374	178	185	193	200	208	215	223	231	239	248
375	256	264	273	282	290	299	308	318	327	337
376	347	356	366	377	387	398	408	419	430	441
377	452	464	475	486	498	510	522	534	546	558
378	570	583	595	608	621	633	646	659	672	686
379	699	712	726	739	752	766	780	793	807	821
380	835	848	862	876	890	905	919	933	947	962
381	976	990	1,005	1,019	1,034	1,049	1,063	1,078	1,094	1,109
382	1,125	1,141	1,158	1,174	1,191	1,209	1,226	1,244	1,262	1,281
383	1,300	1,319	1,338	1,358	1,378	1,398	1,419	1,440	1,461	1,482
384	1,504	1,525	1,547	1,570	1,592	1,615	1,638	1,661	1,684	1,707
385	1,731	1,755	1,779	1,804	1,828	1,853	1,878	1,903	1,928	1,954
386	1,979	2,005	2,031	2,058	2,084	2,111	2,138	2,165	2,193	2,220
387	2,248	2,276	2,304	2,332	2,361	2,390	2,419	2,448	2,478	2,507
388	2,537	2,567	2,598	2,628	2,659	2,690	2,721	2,752	2,783	2,815
389	2,847	2,879	2,911	2,943	2,976	3,009	3,042	3,075	3,109	3,142
390	3,176	3,210	3,245	3,279	3,314	3,349	3,385	3,420	3,456	3,492
391	3,528	3,565	3,601	3,638	3,675	3,713	3,750	3,788	3,826	3,865
392	3,903	3,942	3,981	4,020	4,060	4,099	4,139	4,180	4,220	4,261
393	4,302	4,343	4,384	4,426	4,468	4,510	4,552	4,595	4,637	4,680
394	4,723	4,767	4,810	4,854	4,898	4,943	4,987	5,032	5,077	5,123
395	5,168	5,214	5,260	5,306	5,353	5,399	5,446	5,493	5,541	5,588
396	5,636	5,684	5,732	5,781	5,829	5,878	5,927	5,977	6,026	6,076
397	6,126	6,176	6,226	6,276	6,327	6,378	6,429	6,481	6,532	6,584
398	6,636	6,689	6,741	6,794	6,847	6,900	6,954	7,007	7,061	7,116
399	7,170	7,225	7,280	7,335	7,390	7,446	7,502	7,558	7,614	7,671
400	7,728	7,785	7,842	7,900	7,958	8,016	8,074	8,132	8,191	8,250
401	8,309	8,368	8,428	8,488	8,548	8,608	8,668	8,729	8,789	8,850
402	8,911	8,973	9,034	9,096	9,158	9,220	9,283	9,345	9,408	9,471
403	9,534	9,598	9,661	9,725	9,789	9,853	9,918	9,983	10,047	10,112
404	10,177	10,243	10,308	10,374	10,440	10,506	10,572	10,639	10,705	10,772
405	10,839	10,906	10,973	11,041	11,108	11,176	11,244	11,312	11,380	11,449
406	11,517	11,586	11,655	11,724	11,794	11,864	11,933	12,003	12,073	12,144
407	12,214	12,285	12,356	12,427	12,498	12,569	12,640	12,712	12,784	12,856
408	12,928	13,000	13,072	13,145	13,218	13,291	13,364	13,437	13,510	13,584
409	13,657	13,731	13,805	13,879	13,954	14,028	14,103	14,178	14,253	14,329
410	14,404	14,480	14,556	14,632	14,708	14,785	14,862	14,938	15,016	15,093
411	15,170	15,248	15,326	15,404	15,482	15,561	15,639	15,718	15,797	15,877
412	15,956	16,036	16,116	16,196	16,277	16,358	16,439	16,520	16,601	16,683
413	16,765	16,848	16,930	17,013	17,096	17,179	17,263	17,347	17,431	17,516
414	17,601	17,686	17,771	17,857	17,943	18,029	18,116	18,203	18,290	18,377
415	18,465	18,554	18,642	18,731	18,821	18,911	19,001	19,092	19,183	19,275
416	19,367	19,459	19,552	19,646	19,740	19,835	19,930	20,025	20,122	20,218
417	20,316	20,414	20,512	20,612	20,712	20,812	20,913	21,015	21,118	21,221
418	21,324	21,428	21,533	21,638	21,743	21,849	21,955	22,062	22,169	22,276
419	22,383	22,491	22,598	22,707	22,815	22,924	23,033	23,142	23,251	23,361
420	23,471	23,582	23,692	23,803	23,914	24,026	24,137	24,249	24,362	24,474
421	24,587	24,700	24,814	24,927	25,041	25,156	25,270	25,385	25,500	25,616
422	25,732									

Appendix B

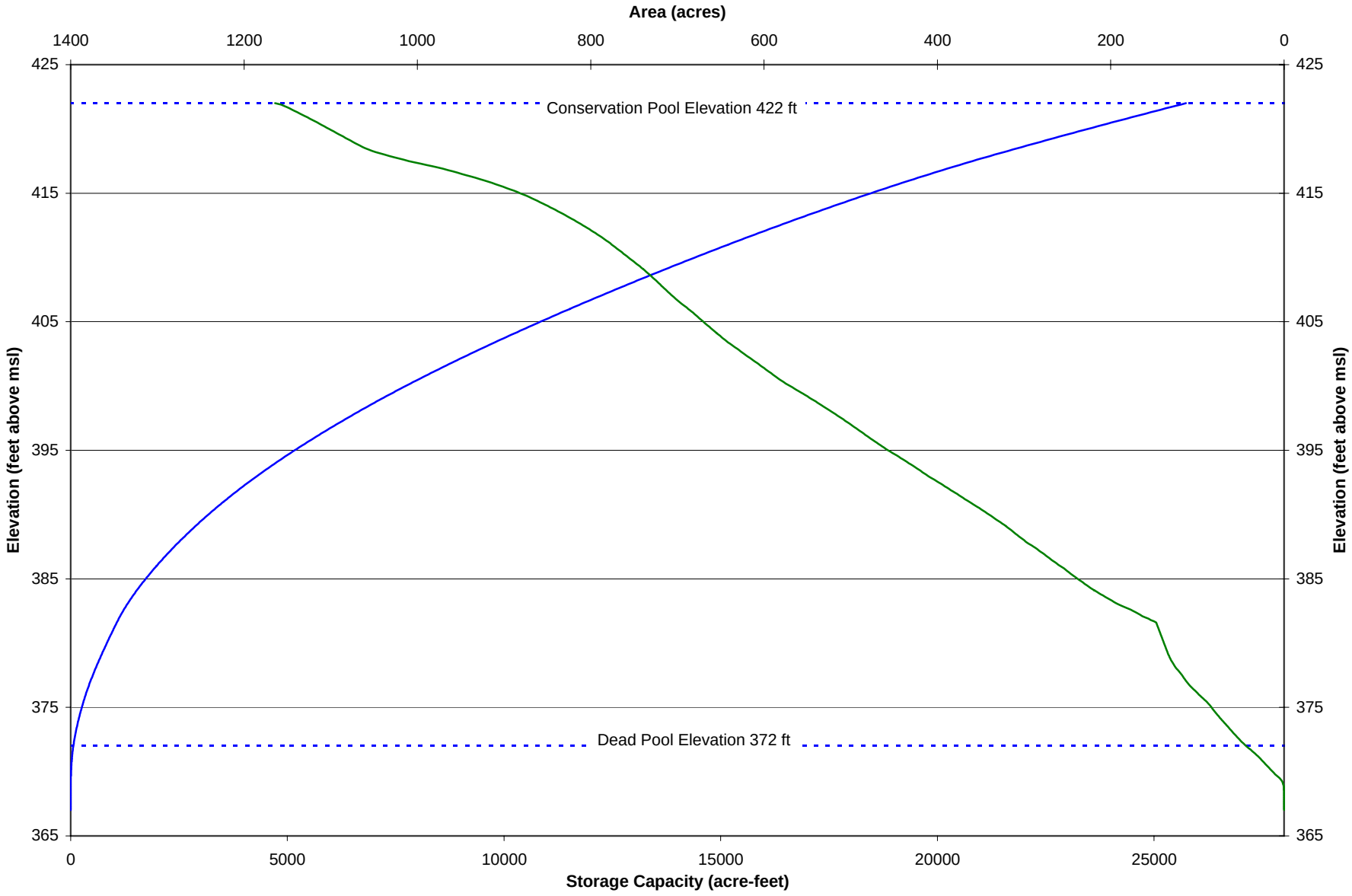
Lake Jacksonville

RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD
AREA IN ACRES
ELEVATION INCREMENT IS ONE TENTH FOOT

MAY 2006 SURVEY
Conservation Pool Elevation 422.0'
Dead Pool Elevation 372.0'

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
367	0	0	0	0	0	0	0	0	0	0
368	0	0	0	0	0	0	0	0	0	1
369	1	1	2	3	4	5	7	9	10	12
370	13	15	16	17	19	20	22	23	24	26
371	27	29	30	32	34	35	37	39	40	42
372	44	45	47	49	50	52	53	54	56	57
373	58	60	61	62	64	65	66	68	69	70
374	72	73	74	75	77	78	79	80	82	83
375	84	85	86	87	89	90	92	94	95	97
376	98	100	101	103	104	106	107	109	110	111
377	112	113	115	116	117	118	119	120	121	123
378	124	125	126	127	128	129	130	131	131	132
379	133	133	134	135	135	136	136	137	137	138
380	139	139	140	140	141	141	142	142	143	144
381	144	145	145	146	146	147	148	150	154	156
382	160	164	166	169	171	174	177	180	184	188
383	191	194	196	199	201	204	206	209	212	214
384	217	219	221	223	226	228	230	232	234	236
385	238	240	242	244	246	248	250	252	254	256
386	258	260	263	265	267	269	271	273	275	277
387	279	281	283	285	287	289	291	294	296	298
388	300	302	304	306	308	310	311	313	315	317
389	319	321	323	325	327	330	332	334	336	338
390	340	343	345	347	349	352	354	356	359	361
391	363	366	368	370	373	375	377	380	382	384
392	387	389	391	394	396	398	401	403	406	408
393	411	413	415	417	419	422	424	426	428	431
394	433	435	438	440	442	445	447	449	452	454
395	457	459	461	464	466	468	470	472	475	477
396	479	481	483	485	487	489	491	494	496	498
397	500	502	504	506	509	511	513	515	517	520
398	522	524	527	529	531	534	536	538	541	543
399	545	548	550	553	555	557	560	563	565	568
400	570	572	575	577	580	582	584	586	588	590
401	592	594	596	598	600	602	604	606	608	610
402	612	615	617	619	621	623	625	627	629	631
403	633	635	637	639	642	644	645	647	649	651
404	653	654	656	658	660	661	663	665	667	668
405	670	672	673	675	677	679	680	682	684	686
406	687	689	691	693	695	697	699	701	702	704
407	706	707	709	710	712	714	715	717	718	720
408	721	723	725	726	728	729	731	733	734	736
409	738	740	741	743	745	747	749	751	753	755
410	756	758	760	762	764	766	768	770	772	774
411	776	778	780	782	784	786	788	790	792	795
412	797	799	802	804	807	809	811	814	816	819
413	822	824	827	830	832	835	838	841	844	846
414	849	852	855	858	861	865	868	871	874	878
415	881	885	889	893	897	901	905	910	914	919
416	923	928	933	938	944	949	954	959	965	970
417	976	982	989	997	1,003	1,010	1,016	1,021	1,027	1,032
418	1,038	1,043	1,048	1,052	1,056	1,060	1,063	1,066	1,069	1,072
419	1,075	1,077	1,080	1,083	1,086	1,088	1,091	1,094	1,096	1,099
420	1,102	1,105	1,107	1,110	1,113	1,116	1,118	1,121	1,124	1,127
421	1,130	1,133	1,136	1,139	1,142	1,145	1,148	1,151	1,154	1,157
422	1,164									



Lake Jacksonville
May 2006 Survey
Prepared by: TWDB

Appendix C: Area and Capacity Curves

APPENDIX D

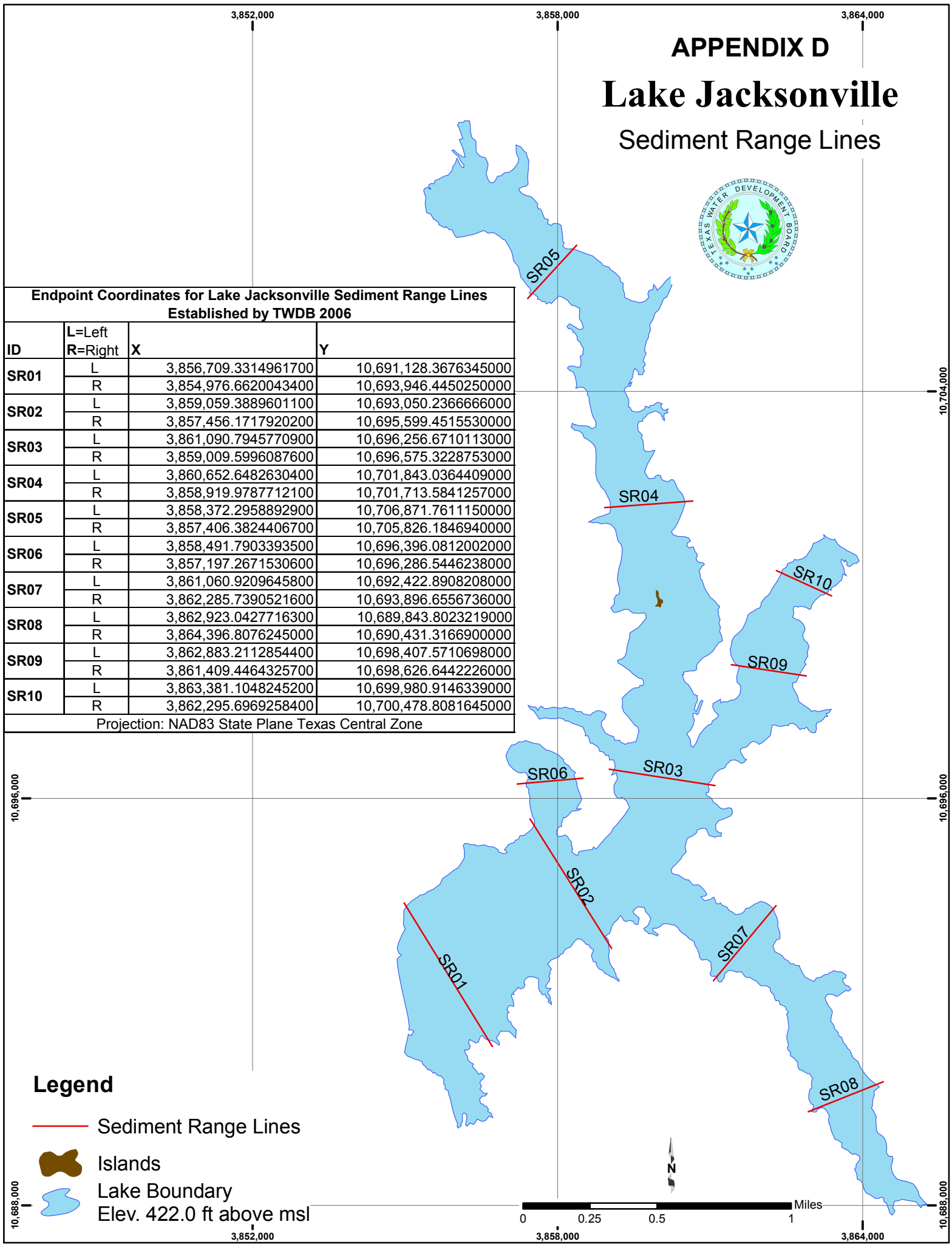
Lake Jacksonville

Sediment Range Lines

Endpoint Coordinates for Lake Jacksonville Sediment Range Lines Established by TWDB 2006

ID	L=Left R=Right	X	Y
SR01	L	3,856,709.3314961700	10,691,128.3676345000
	R	3,854,976.6620043400	10,693,946.4450250000
SR02	L	3,859,059.3889601100	10,693,050.2366666000
	R	3,857,456.1717920200	10,695,599.4515530000
SR03	L	3,861,090.7945770900	10,696,256.6710113000
	R	3,859,009.5996087600	10,696,575.3228753000
SR04	L	3,860,652.6482630400	10,701,843.0364409000
	R	3,858,919.9787712100	10,701,713.5841257000
SR05	L	3,858,372.2958892900	10,706,871.7611150000
	R	3,857,406.3824406700	10,705,826.1846940000
SR06	L	3,858,491.7903393500	10,696,396.0812002000
	R	3,857,197.2671530600	10,696,286.5446238000
SR07	L	3,861,060.9209645800	10,692,422.8908208000
	R	3,862,285.7390521600	10,693,896.6556736000
SR08	L	3,862,923.0427716300	10,689,843.8023219000
	R	3,864,396.8076245000	10,690,431.3166900000
SR09	L	3,862,883.2112854400	10,698,407.5710698000
	R	3,861,409.4464325700	10,698,626.6442226000
SR10	L	3,863,381.1048245200	10,699,980.9146339000
	R	3,862,295.6969258400	10,700,478.8081645000

Projection: NAD83 State Plane Texas Central Zone

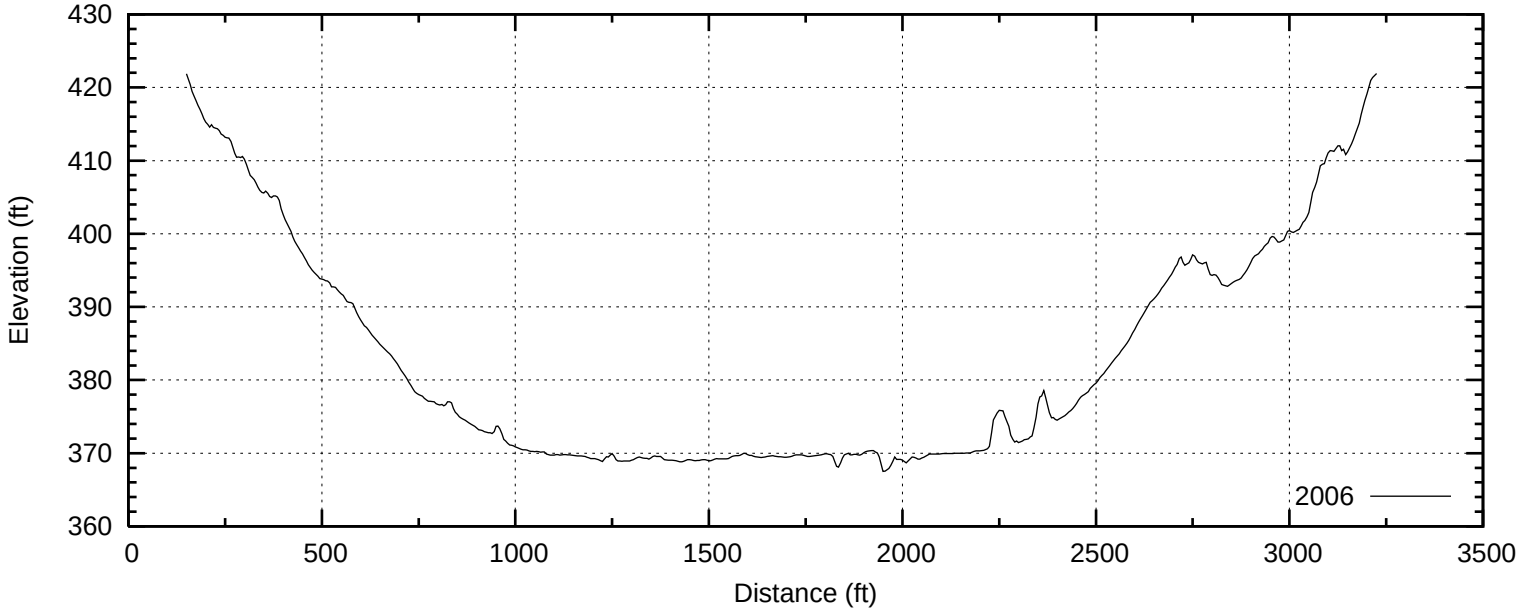


Legend

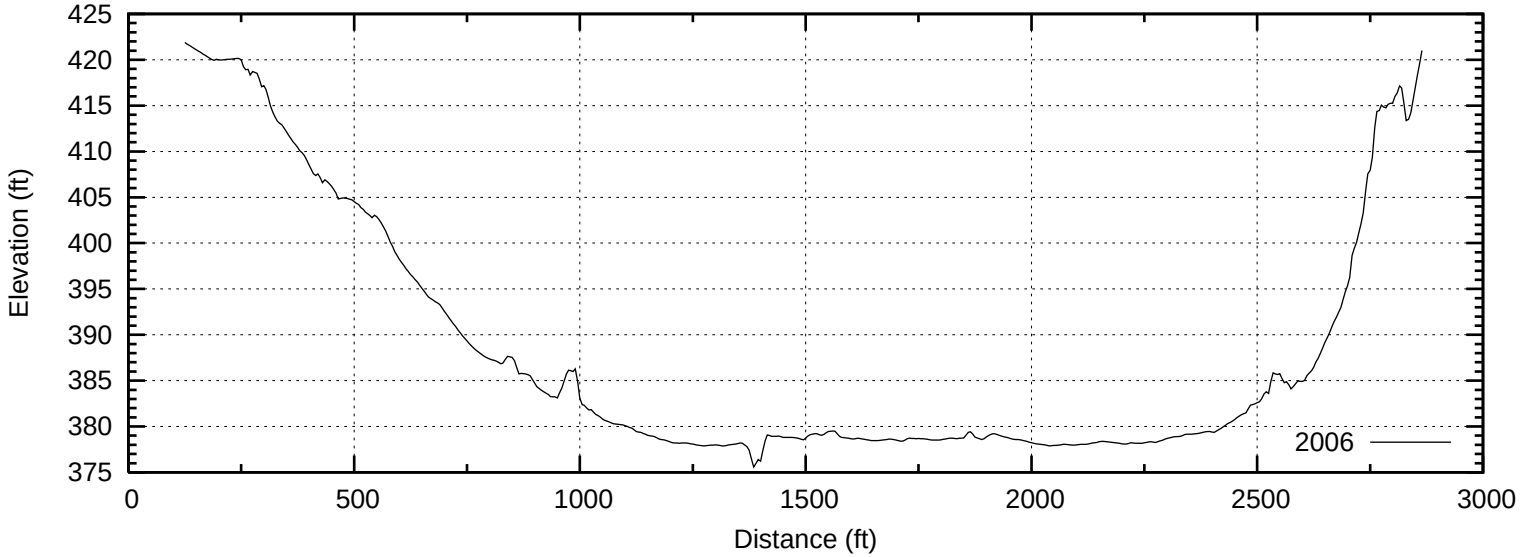
- Sediment Range Lines
- Islands
- Lake Boundary
  Elev. 422.0 ft above msl

Lake Jacksonville

Range Line SR01

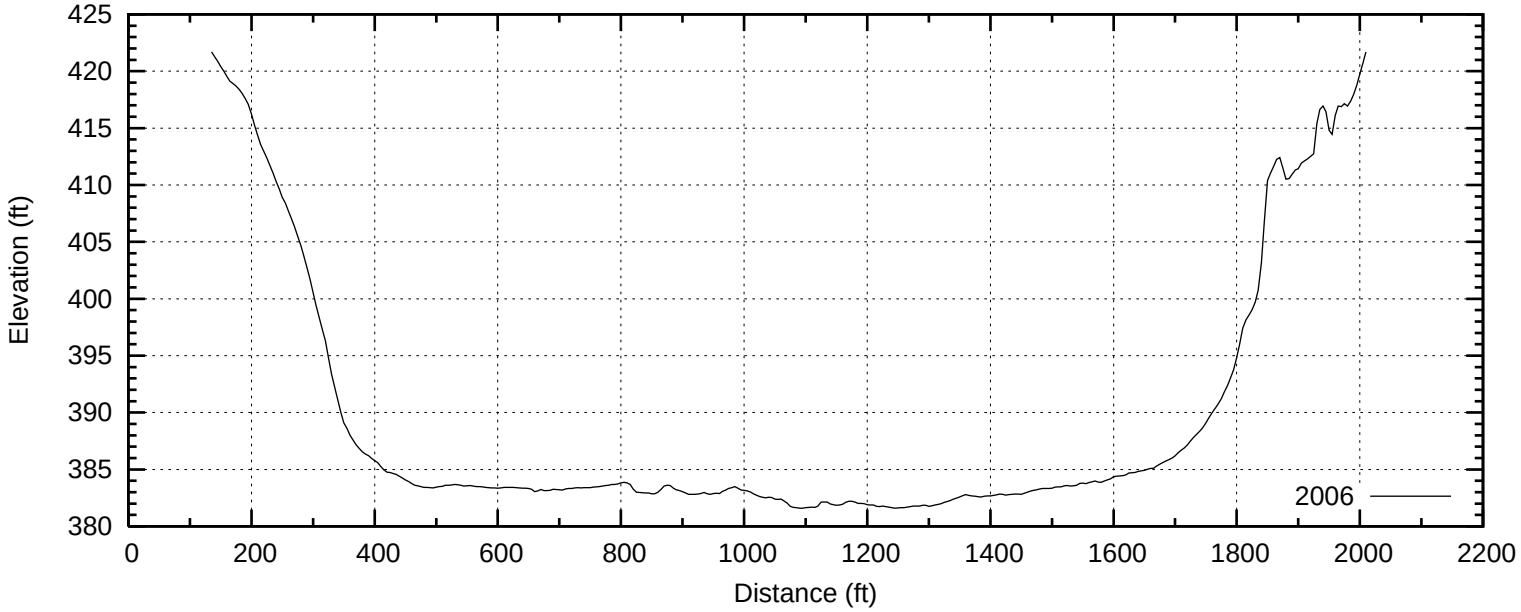


Range Line SR02

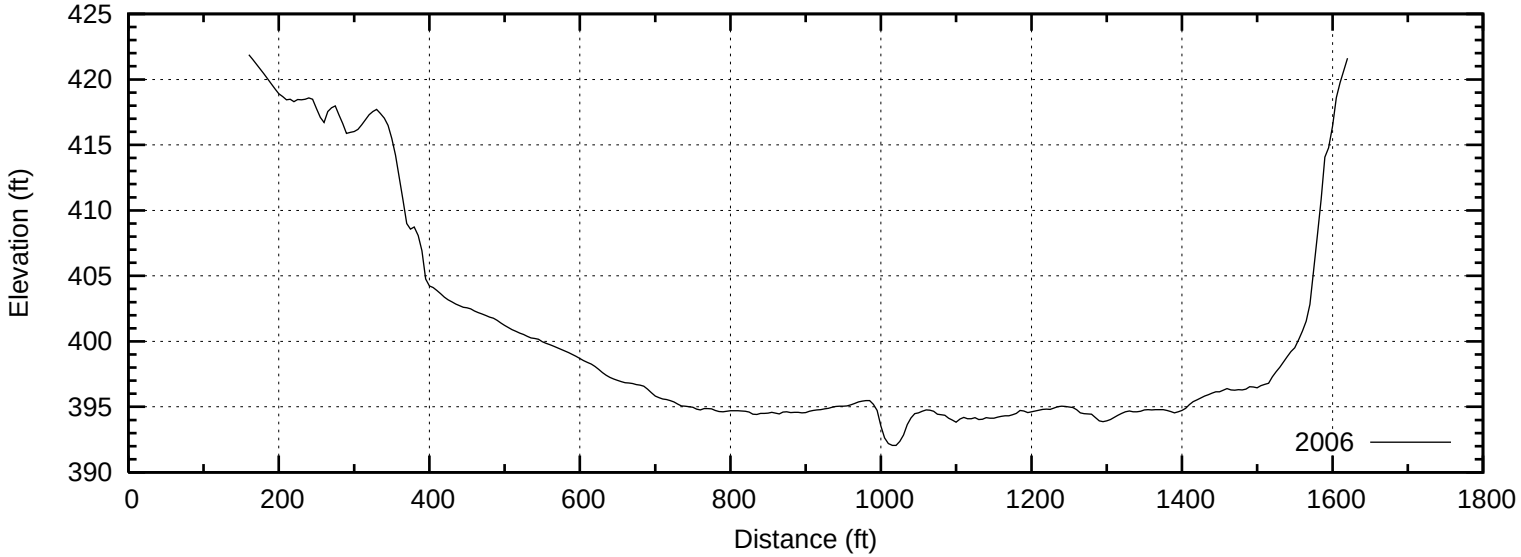


Lake Jacksonville

Range Line SR03

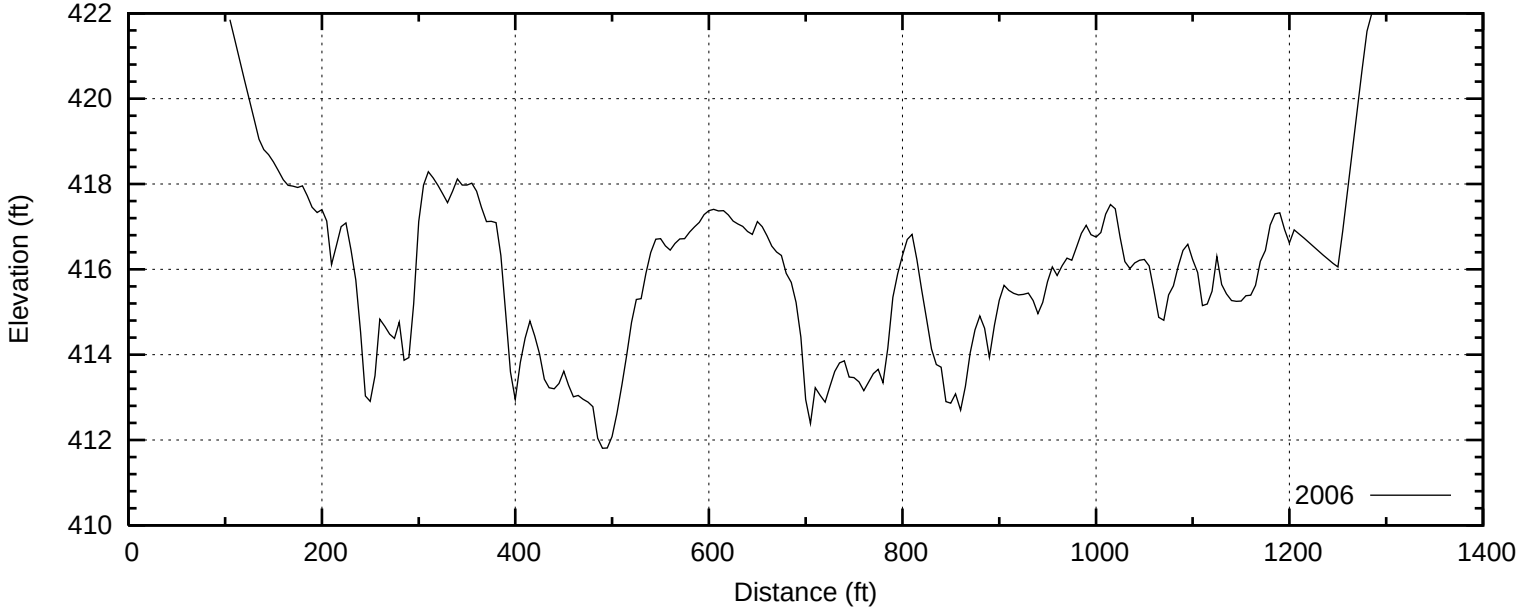


Range Line SR04

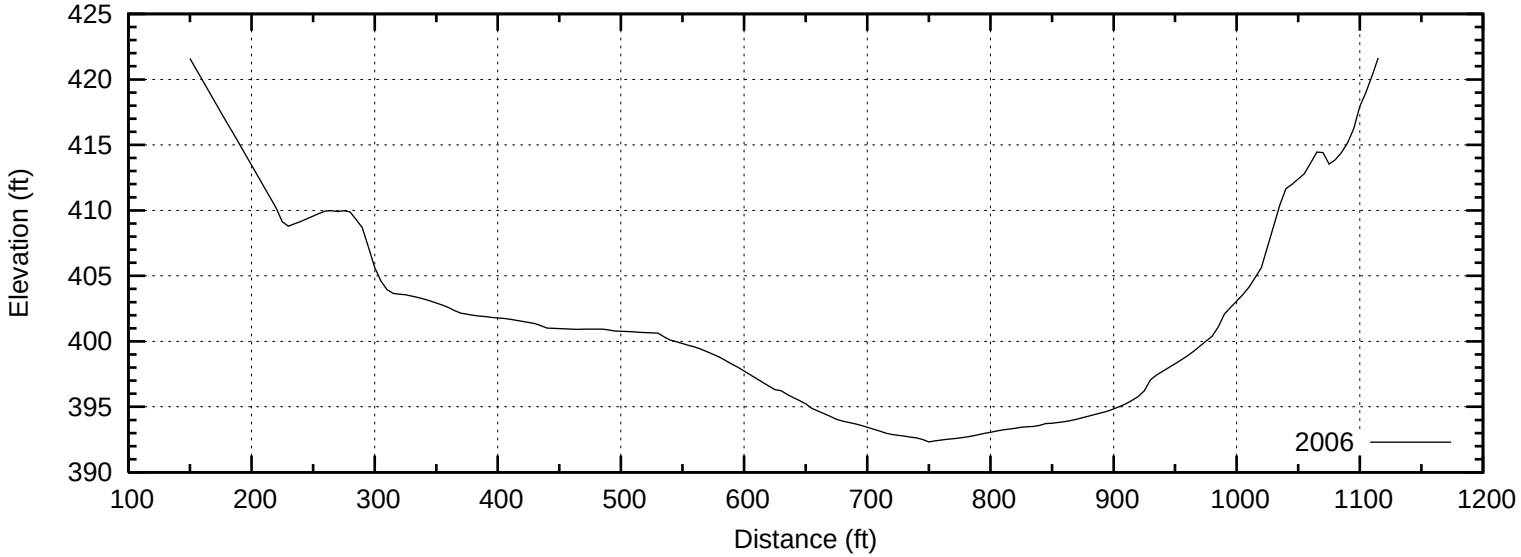


Lake Jacksonville

Range Line SR05

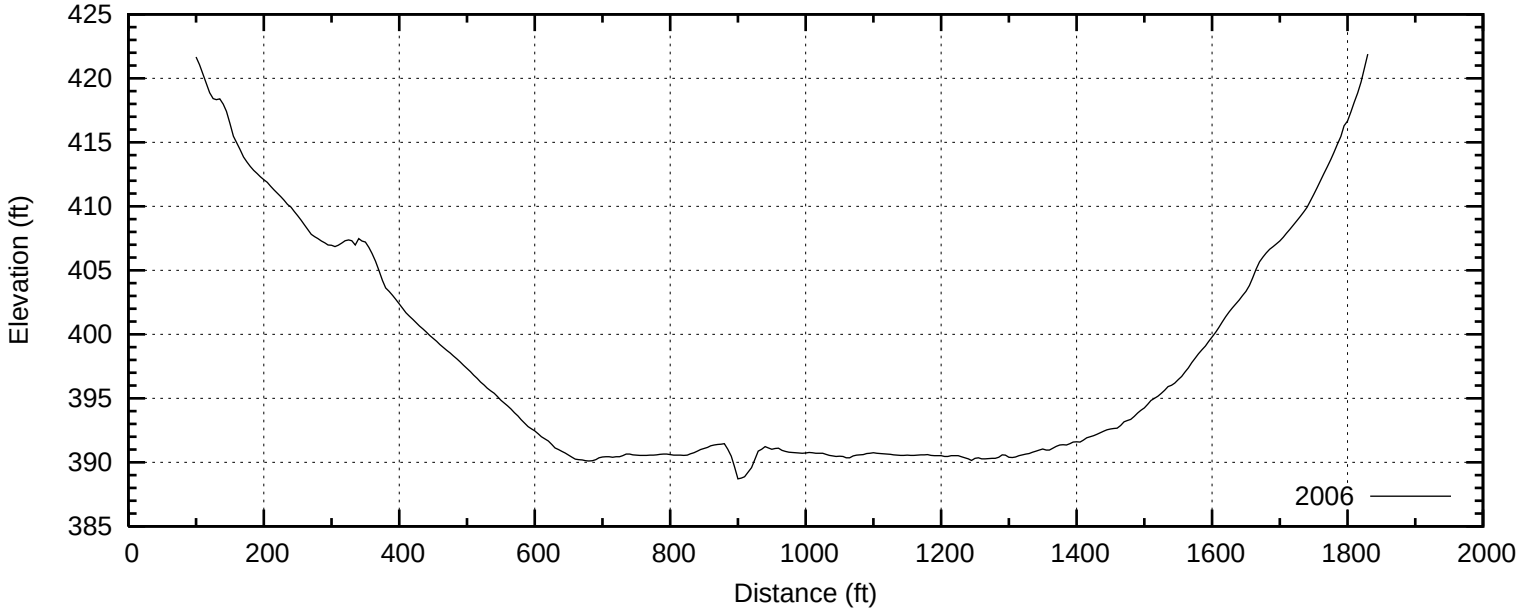


Range Line SR06

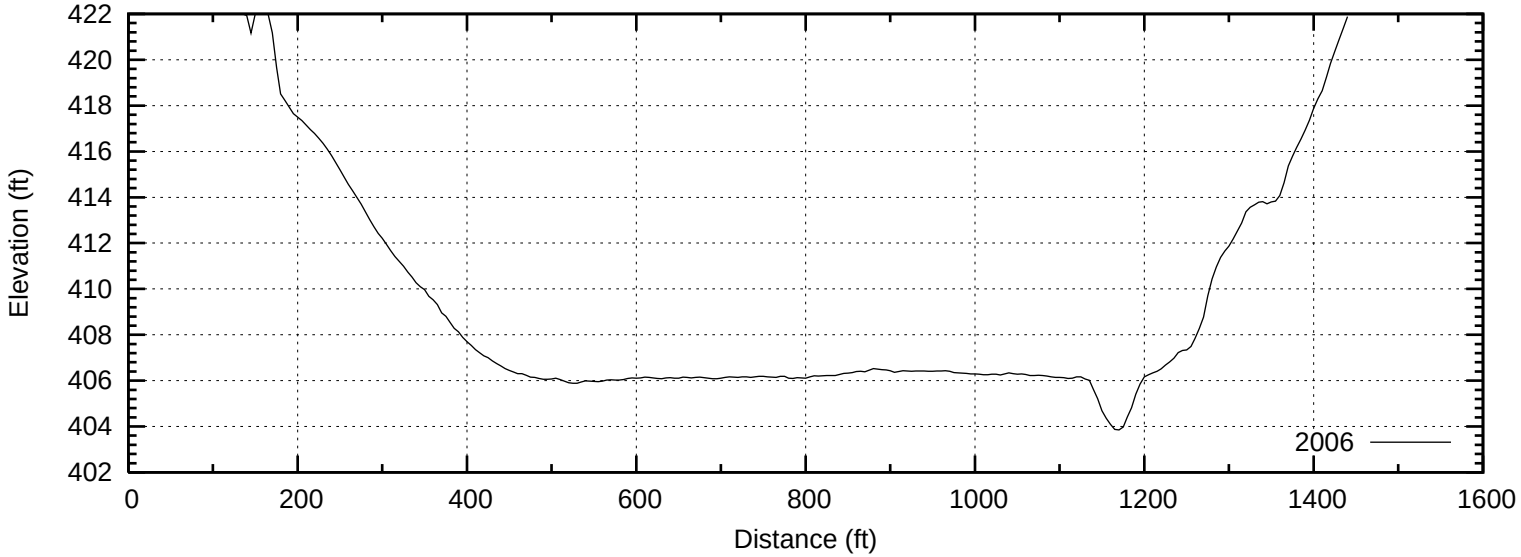


Lake Jacksonville

Range Line SR07

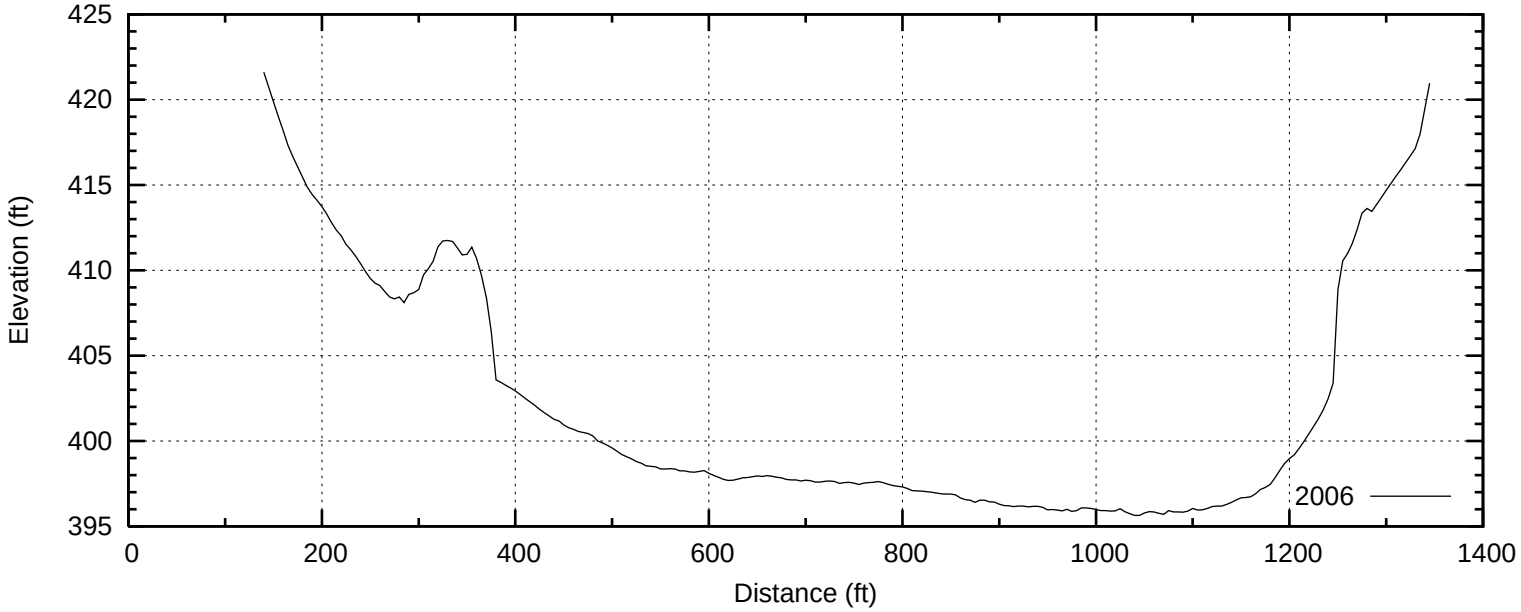


Range Line SR08



Lake Jacksonville

Range Line SR09



Range Line SR10

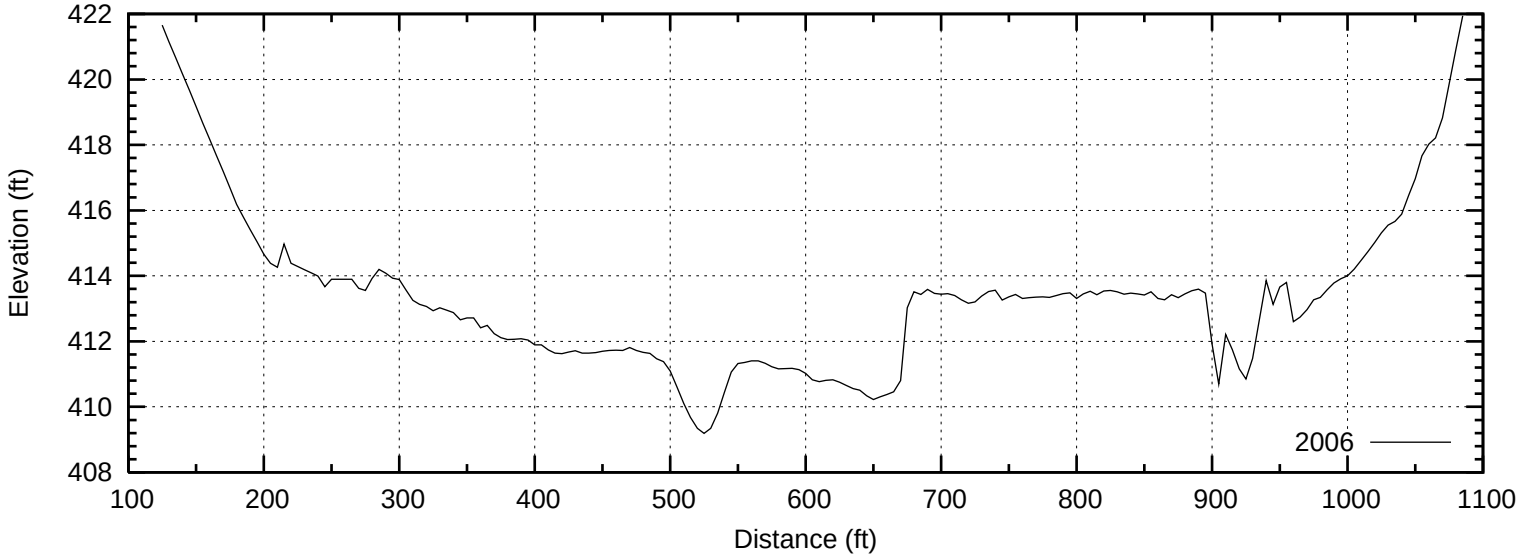
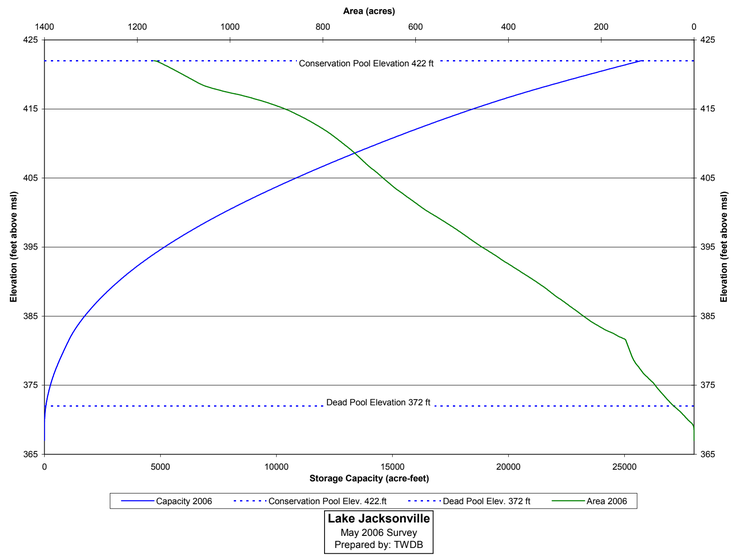


Figure 5

Lake Jacksonville

5' - Contour Map



Lake Jacksonville
May 2006 Survey
Prepared by: TWDB

Area and Capacity Curves

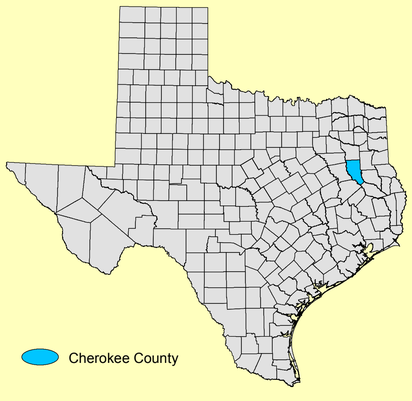
CONTOURS

- 370'
- 375'
- 380'
- 385'
- 390'
- 395'
- 400'
- 405'
- 410'
- 415'
- 420'

Islands

Lake Jacksonville Boundary
Elevation:
422 ft above msl

Projection: NAD83
State Plane
Texas 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 Jacksonville. The Texas Water Development Board makes no representation or assumes any liability.

3,858,000

3,864,000

10,704,000

10,696,000

10,688,000

N

0.5 0.25 0 0.5 1 Miles

Prepared by: TEXAS WATER DEVELOPMENT BOARD May 2006 Survey