

7. Johanna Lake

Johanna Lake is located within the City of Arden Hills in Ramsey County. It has a surface area of approximately 212 acres and an ordinary high water level of 878.00 (MSL 1912), 877.41 (NGVD 29), or 877.58 (NAVD 88). The lake level is controlled by a 28-foot long weir at elevation 877.65 (NGVD 29), or 877.82 (NAVD 88), leading to a 5-foot by 10-foot box culvert.

The DNR Lake Finder website provides lake level data for a period of record from 1924-2021 (see **Figure 7a**). This data is recorded by Ramsey County in MSL 1912 datum. The County recommends subtracting 0.59 feet from MSL 1912 to convert elevation data to NGVD 29, and subtracting 0.42 feet to convert elevation data to NAVD 88.¹ This is consistent with adding 0.17 feet to lake levels in NGVD 29 datum to obtain levels in NAVD 88, as indicated from VERTCON.²

The maximum annual series, consisting of 98 years, was plotted on probability paper. A polynomial line was fit to the data to determine the elevations for the various recurrence intervals (see **Figure 7b**). The estimated flood elevations are shown in **Table 7a**. The 100-year flood elevation was estimated using the polynomial equation. Insufficient lake level data and information on potential overflow elevations are available to provide a reliable estimate of the 500-year flood elevation. The water surface elevation for the 100-year recurrence interval reported in the 2010 Ramsey County FIS is 879.0 (NAVD 88) (see FIS for details on methodology), as compared to 880.9 estimated in this study. The 98-year period of record used in this study includes seven occurrences exceeding elevation 879.0, indicating that 879.0 is too low to be a reliable 100-year estimate.

An additional component of this study consists of creating a non-exceedance frequency graph based on all daily measurements available (see **Figure 7c**). For Johanna Lake, the period of record consists of the data found on the MnDNR Lake Finder website, which consists of 3,141 days of measurements, from 1924 to 2021, as shown on **Figure 7a**. The results are presented in **Table 7b**.

¹ Email from Al Rupnow, Environmental Resource Specialist, Ramsey County Public Works, May 19, 2011.

² <http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html>

Table 7a: Estimated Flood Elevations for Johanna Lake

Return Period	Lake Level Data Source		
	1981 FIS	DNR (used in this study) (n = 98)	
	(NGVD 29)	(NGVD 29)	(NAVD 88)*
2	--	877.5	877.7
5	--	878.3	878.5
10	--	878.8	879.0
50	--	880.0	880.1
100	--	880.8	880.9
500	--	--	--

*0.17 feet is added to NGVD 29 datum to convert to NAVD 88 datum

Table 7b: Daily Non-Exceedance Frequency of Lake Levels for Johanna Lake

Non-Exceedance Frequency	Lake Level	
	(NGVD 1929)	(NAVD 1988)
2.5%	873.5	873.7
10%	874.9	875.0
25%	875.9	876.1
50%	876.6	876.8
75%	877.3	877.5
90%	877.9	878.0
99.5%	879.5	879.7

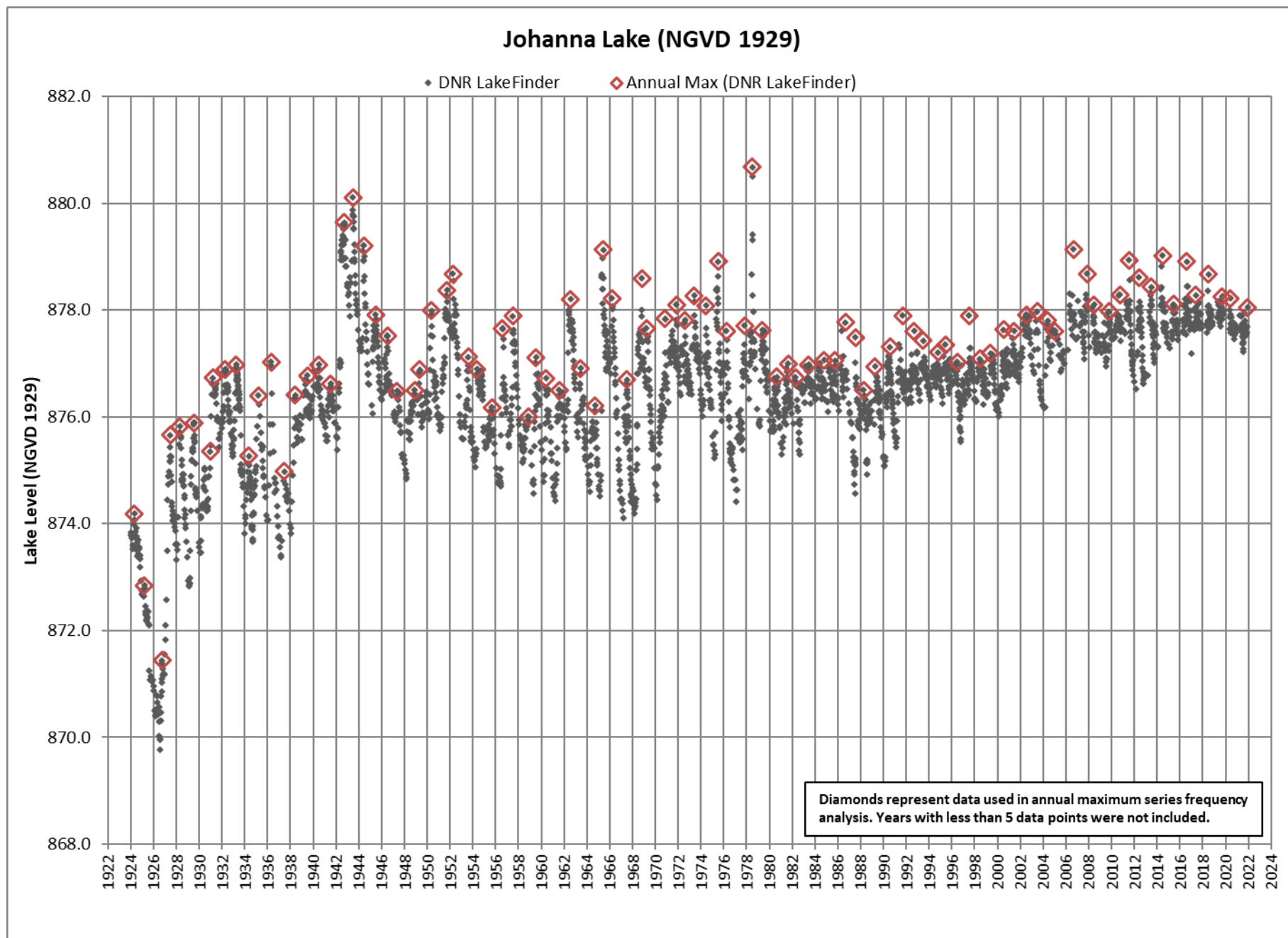
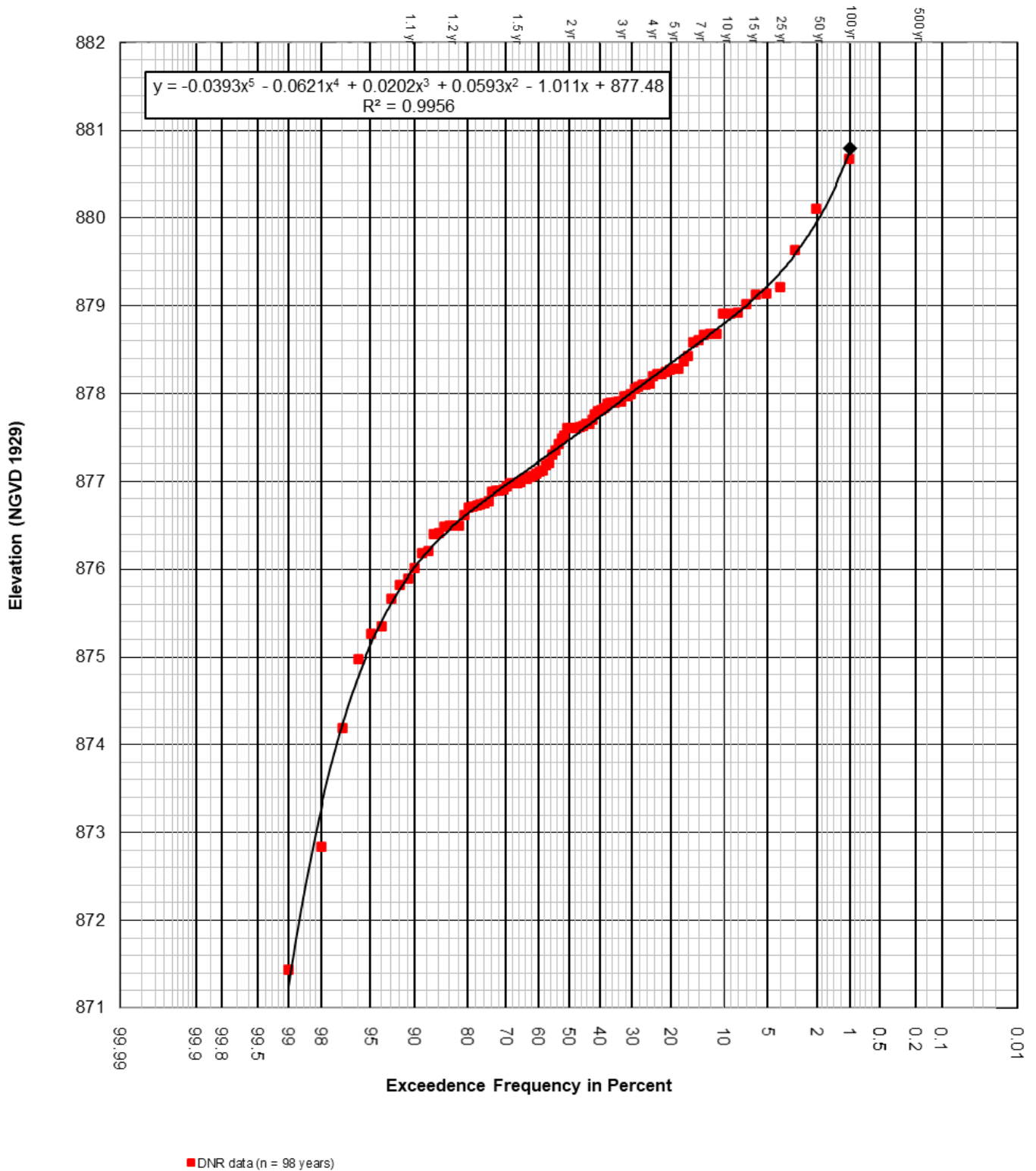


Figure 7a

Johanna Lake Levels (NGVD 1929) Maximum Annual Series Frequency Curve (Weibull Plotting Positions)



Outlet:

20-foot Long Weir @ 877.65 (NGVD 29) or 877.82 (NAVD 88)

Figure 7b

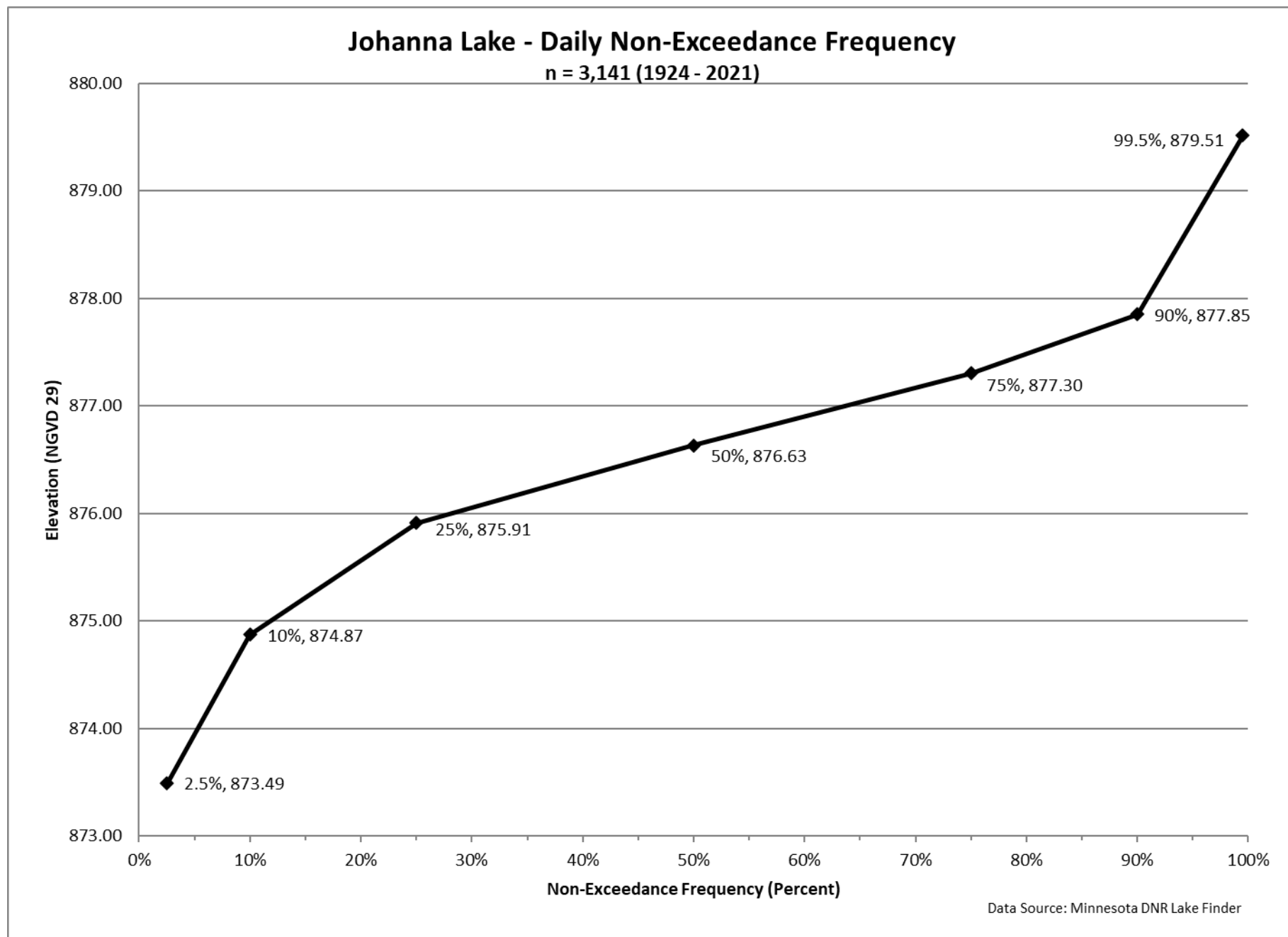


Figure 7c