

## **8. Marshan Lake**

Marshan Lake is a 312-acre lake lying upstream of Rice Lake, along the main stem of Rice Creek, within the City of Lino Lakes. The ordinary high water level is not recorded by the Minnesota DNR. However, the ordinary high water level, as recorded by the Minnesota DNR, for Rice Lake downstream of Marshan Lake is 883.1 (NGVD 29). Marshan Lake discharges into a natural channel at elevation 876.68 (NGVD 29).

In the 1981 FIS, annual high water elevations for Marshan Lake<sup>1</sup> were determined from historic lake levels from 1951 to 1979 received from the St. Paul Water Utility. The measured data is no longer available, but the selected annual maximums are provided in the 1981 report. The DNR Lake Finder website provided lake level data for a spotty period of record from 1992-2013 (see **Figure 8a1**). Due to the low number of lake level data recorded, only four years (1997, 1998, 1999, and 2000) were included in the analysis. The annual maximum lake levels provided in the 1981 FIS, together with the DNR measurements, provide a total of 28 years of data for a lake level frequency analysis.

The maximum annual water levels listed in the 1981 FIS were merged with the maximum annual water levels determined from data collected from the DNR Lake Finder. The resulting maximum annual series, consisting of 28 data points, was plotted on probability paper. No polynomial line was found to fit well with the plotted data. As seen on **Figure 8b**, a straight line was fit through the points, and the 100-year flood elevation was estimated using the linear equation. However, the resulting elevations from the 28 years of data are consistently lower than the estimated flood elevations on Rice Lake, which does not reflect the expected relationship between the two lakes. Results of hydraulic modeling conducted under the 2010 RCWD district-wide modeling effort<sup>2</sup> show that Marshan Lake flood elevations match closely to those of downstream Rice Lake for all modeled events (2-, 10-, 50-, and 100-year). These results are supported by the fact that there is no hydraulic control in the channel between Marshan Lake and Rice Lake (the Aqua Lane bridge spans the entire channel). Also, **Figure 8a2** shows that for the observed data available, Rice Lake levels appear to control Marshan Lake levels, and that they are equalized under most conditions. Because the Rice Lake analysis has the advantage of having more years of data (42 years), the flood elevations for Marshan Lake are reported in **Table 8a** as the results of the Rice Lake level study found in Section 12 of this report.

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<sup>1</sup> Note that the 1981 Lino Lakes FIS referred to Marshan Lake as Forsham Lake

<sup>2</sup> "Rice Creek HEC-RAS Model Report," 2010, performed under District-wide Modeling.

**Table 8a: Estimated Flood Elevations for Marshan Lake**

Return Period	Lake Level Data Source		
	1981 FIS (n = 24)	Lake Level Results Adopted from Rice Lake Analysis (Section 12) (n = 42)	
	(NGVD 29)	(NGVD 29)	(NAVD 88)*
2	--	882.3	882.5
5	--	883.4	883.6
10	884.4	884.2	884.4
50	885.6	886.0	886.1
100	886.0	886.8	887.0
500	886.9	--	--

\*0.15 feet is added to NGVD 29 datum to convert to NAVD 88 datum

An additional component of this study consists of creating a non-exceedance frequency graph based on all daily measurements available (see **Figure 8c**). For Marshan Lake, the period of record consists of the data found on the MnDNR Lake Finder website, which consists of 82 days of measurements, from 1992 to 2013 (see **Figure 8a**). The results are presented in **Table 8b**.

**Table 8b: Daily Non-Exceedance Frequency of Lake Levels for Marshan Lake**

Non-Exceedance Frequency	Lake Level	
	(NGVD 1929)	(NAVD 1988)
2.5%	878.8	878.9
10%	879.0	879.1
25%	879.3	879.4
50%	879.8	879.9
75%	880.6	880.7
90%	881.2	881.4
99.5%	882.5	882.7

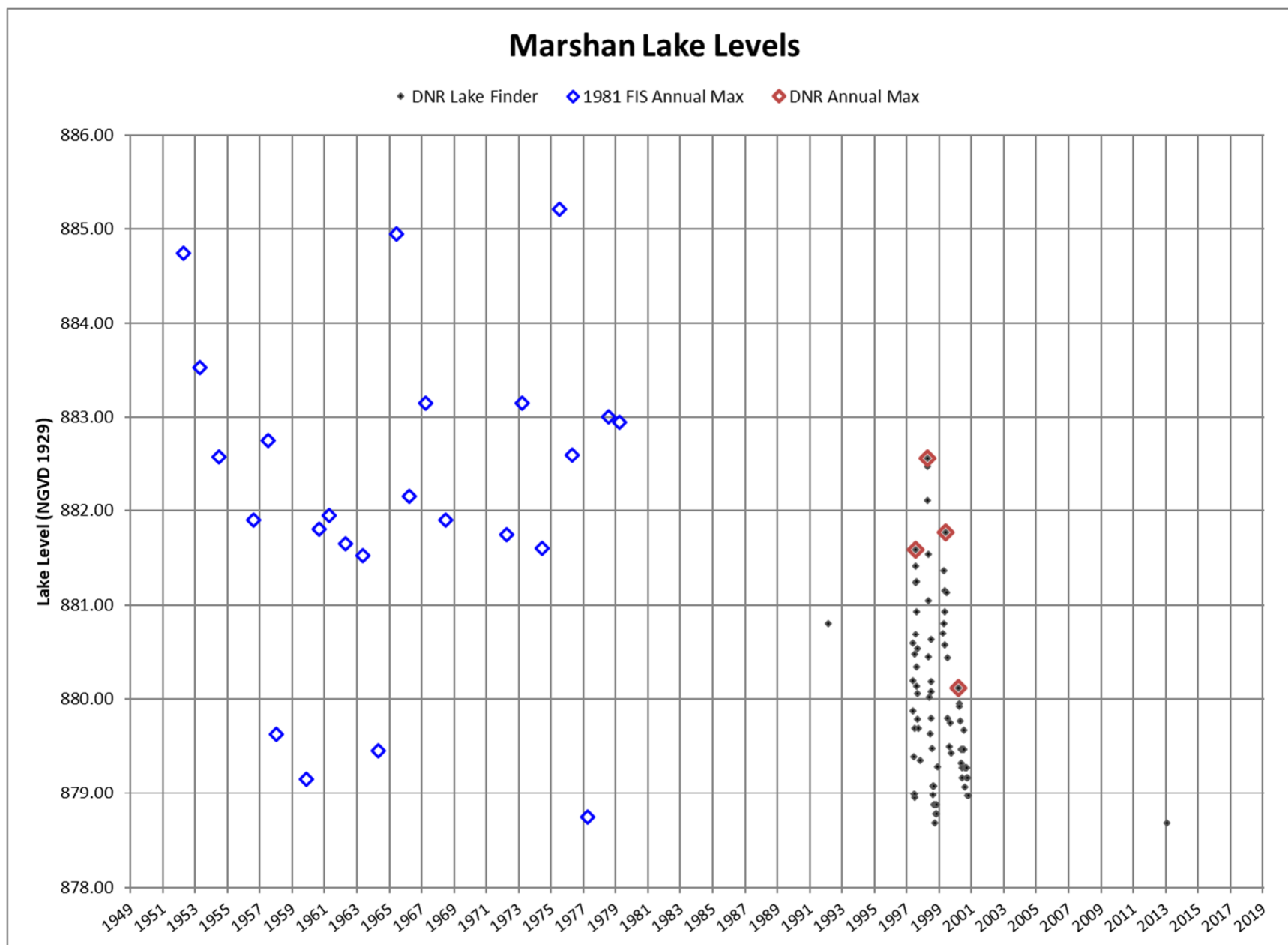
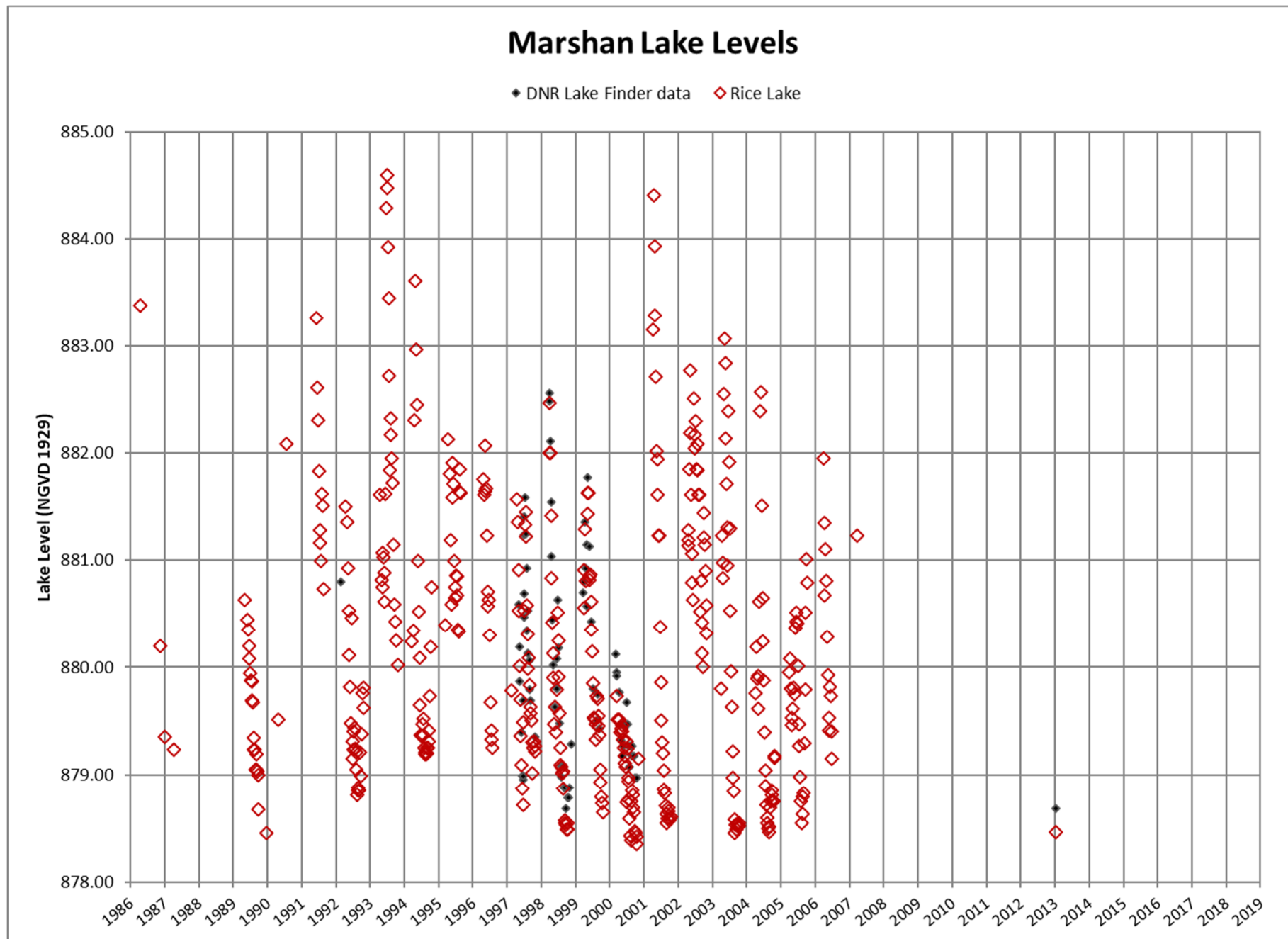
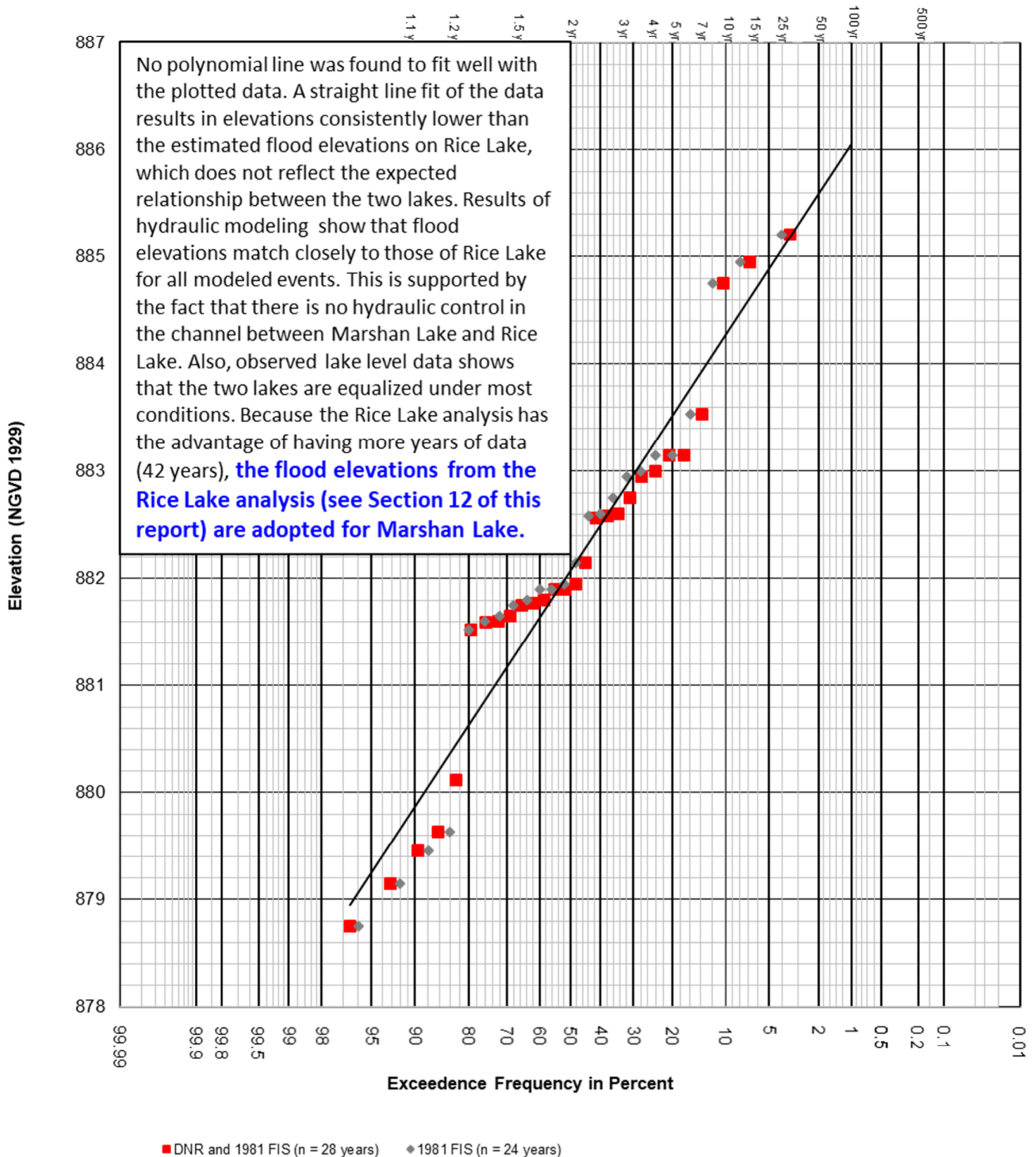


Figure 8a1



# **Marshan Lake Levels (NGVD 1929)** **Maximum Annual Series Frequency Curve** **(Weibull Plotting Positions)**



## **Outlet:**

Natural Channel @ 876.68 (NGVD 29), 876.83 (NAVD 88)

**Figure 8b**

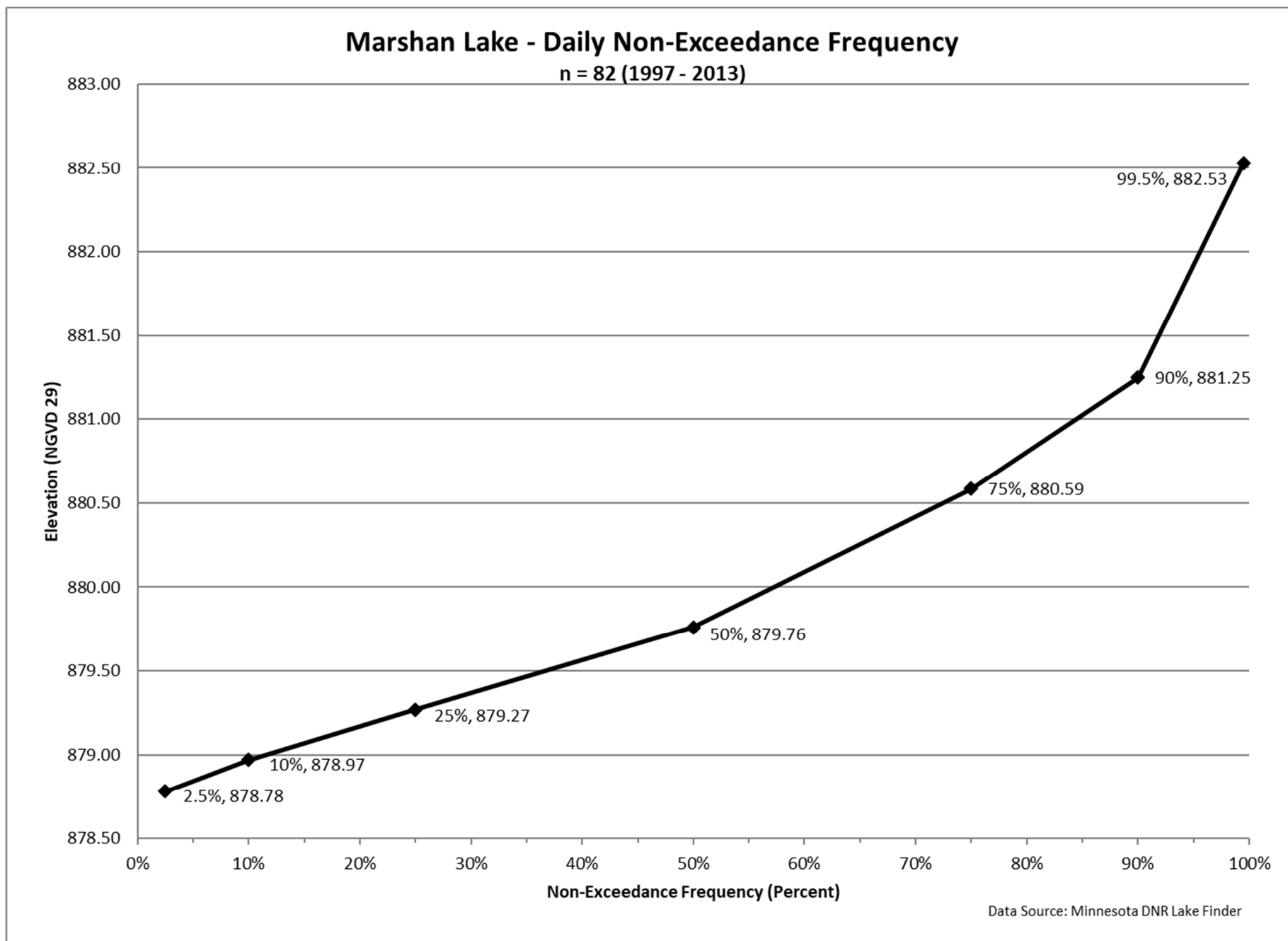


Figure 8c