

1. Bald Eagle Lake

Bald Eagle Lake is located within the cities of Lino Lakes, Hugo and White Bear Lake. It has a surface area of approximately 1,046 acres and an ordinary high water level of 911.00 (NGVD 29) or 911.19 (NAVD 88). The lake discharges to Clearwater Creek through five CMP arch pipes (910.29, 910.20, 909.98, 909.61, 909.61 NGVD 29). Bald Eagle Lake levels are also controlled by a weir located downstream of the culverts which has a crest elevation of 910.68 (NGVD 29).

In the 1981 FIS, a stage-frequency plot was developed using 56 years of historic annual high water elevations from 1923-1978, based on data received from the Ramsey County Engineer. 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 1923-2021 (see **Figure 1a**). This data is recorded by Ramsey County in MSL 1912 datum. The County recommends subtracting 0.87 feet from MSL 1912 to convert elevation data to NGVD 29, and subtracting 0.72 feet to convert elevation data to NAVD 88.¹ After converting the Lake Finder lake level data to NGVD 29 datum, the maximum annual lake levels were determined and compared to those found in the 1981 FIS for the common period of record of 1923-1978. The Lake Finder annual maxima were found to be between 0.85 and 1.0 feet lower than those listed in the 1981 FIS, suggesting that the 1981 FIS lake levels may have been carried out in MSL 1912 datum. Though the conversion method from MSL 1912 datum to NGVD 29 of subtracting 0.87 feet has been adopted for this study, the conversion method from NGVD 29 datum to NAVD 88 of adding 0.18 feet obtained from VERTCON² is adopted to be consistent with the other lakes in this study.

The maximum annual series, consisting of 99 data points, was plotted on probability paper, and a polynomial line was fit to the data to determine the elevations for the various recurrence intervals (see **Figure 1b**). 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.

Both the maximum annual series used in the 1981 FIS analysis and the combined data are plotted on **Figure 1b**. The difference in results shown in **Table 1a** are the result of both a different maximum annual series (length of data set) and the fact that in the 1981 study, a different graphical procedure was applied to create the frequency curve.

An additional component of this study consists of creating a non-exceedance frequency graph based on all daily measurements available (see **Figure 1c**). For Bald Eagle Lake, the period of record consists of the data found on the MnDNR Lake Finder website, which consists of 3,521 days of measurements, from 1923 to 2021 as shown on **Figure 1a**. The results are presented in **Table 1b**.

¹ Telephone conversation with Al Rupnow, lake biologist with Ramsey County, December 7, 2010.

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

Table 1a: Estimated Flood Elevations for Bald Eagle Lake

Return Period	Lake Level Data Source		
	1981 FIS (n = 56)	DNR (used in this study) (n = 99)	
	(NGVD 29)	(NGVD 29)	(NAVD 88)*
2	--	911.1	911.2
5	--	911.4	911.6
10	912.10	911.5	911.6
50	912.45	911.8	912.0
100	912.60	912.2	912.4
500	912.82	--	--

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

Table 1b: Daily Non-Exceedance Frequency of Lake Levels for Bald Eagle Lake

Non-Exceedance Frequency	Lake Level	
	(NGVD 1929)	(NAVD 1988)
2.5%	906.4	906.5
10%	908.6	908.8
25%	909.7	909.9
50%	910.4	910.6
75%	910.8	911.0
90%	911.1	911.3
99.5%	911.6	911.8

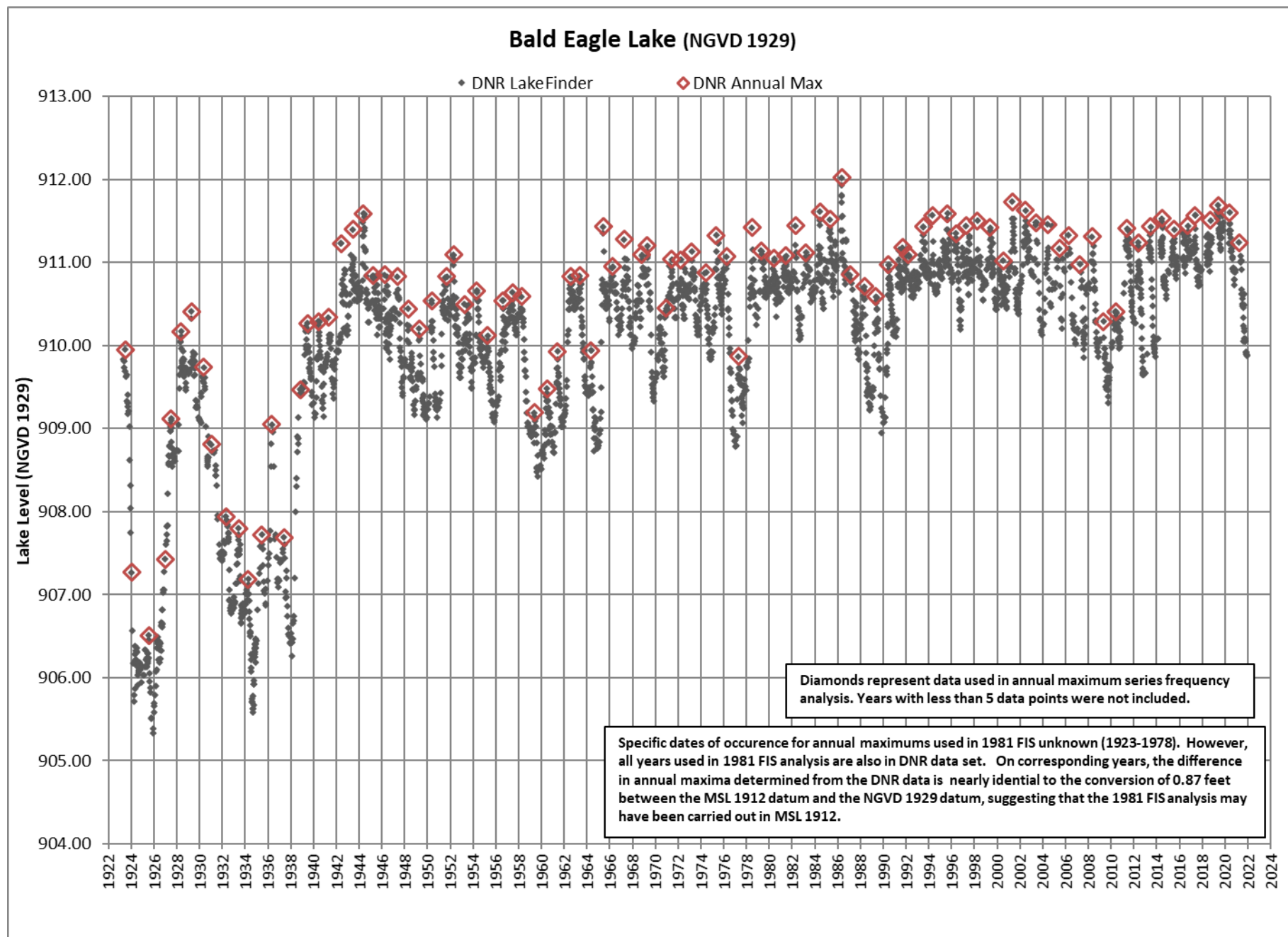
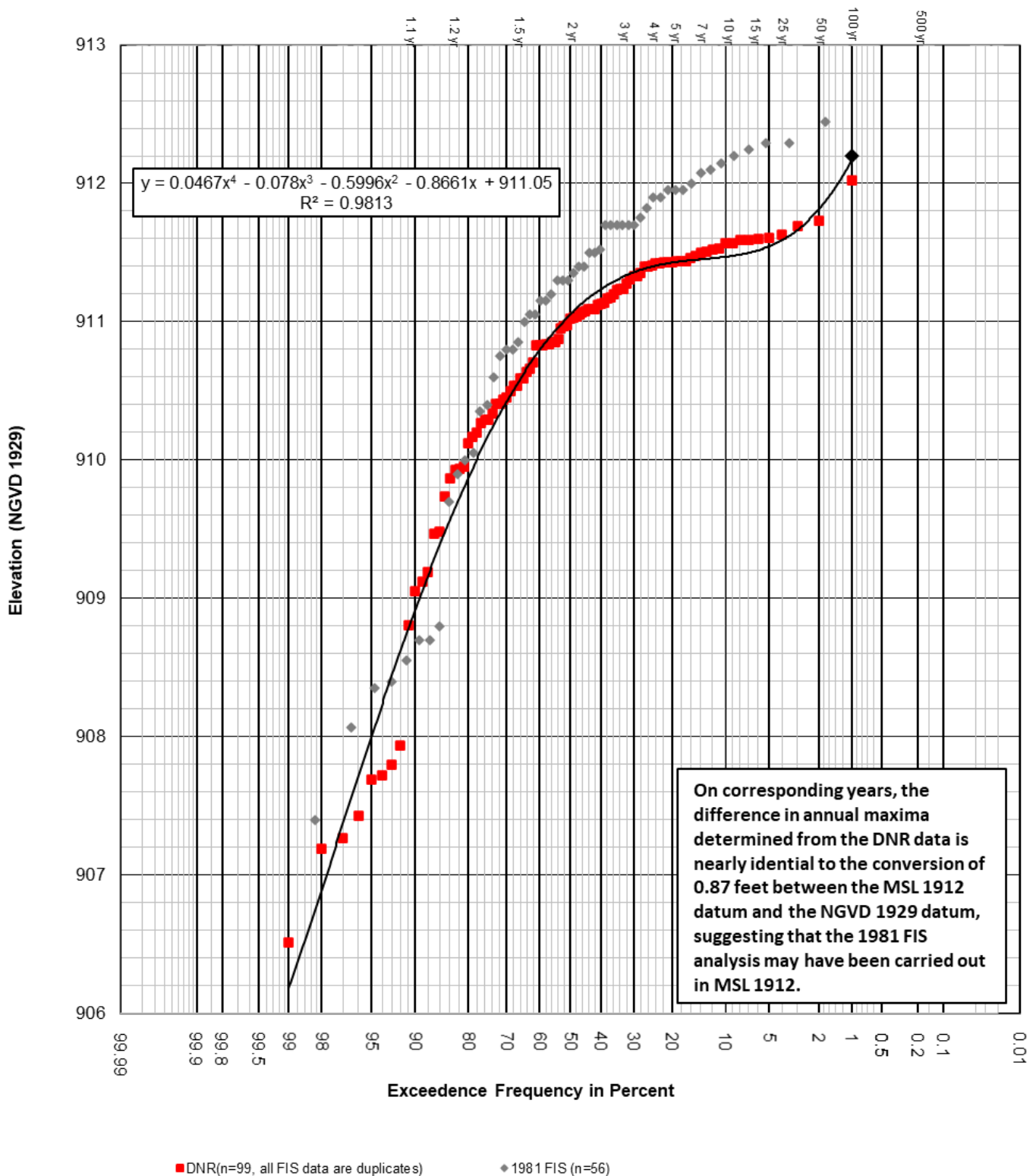


Figure 1a

Bald Eagle Lake Levels (NGVD 1929) **Maximum Annual Series Frequency Curve** **(Weibull Plotting Positions)**



Outlet:

5 – 31" x 50" CMP Arches

Inverts: 910.29, 910.20, 909.98, 909.61, and 909.61 (NGVD 29)

Figure 1b

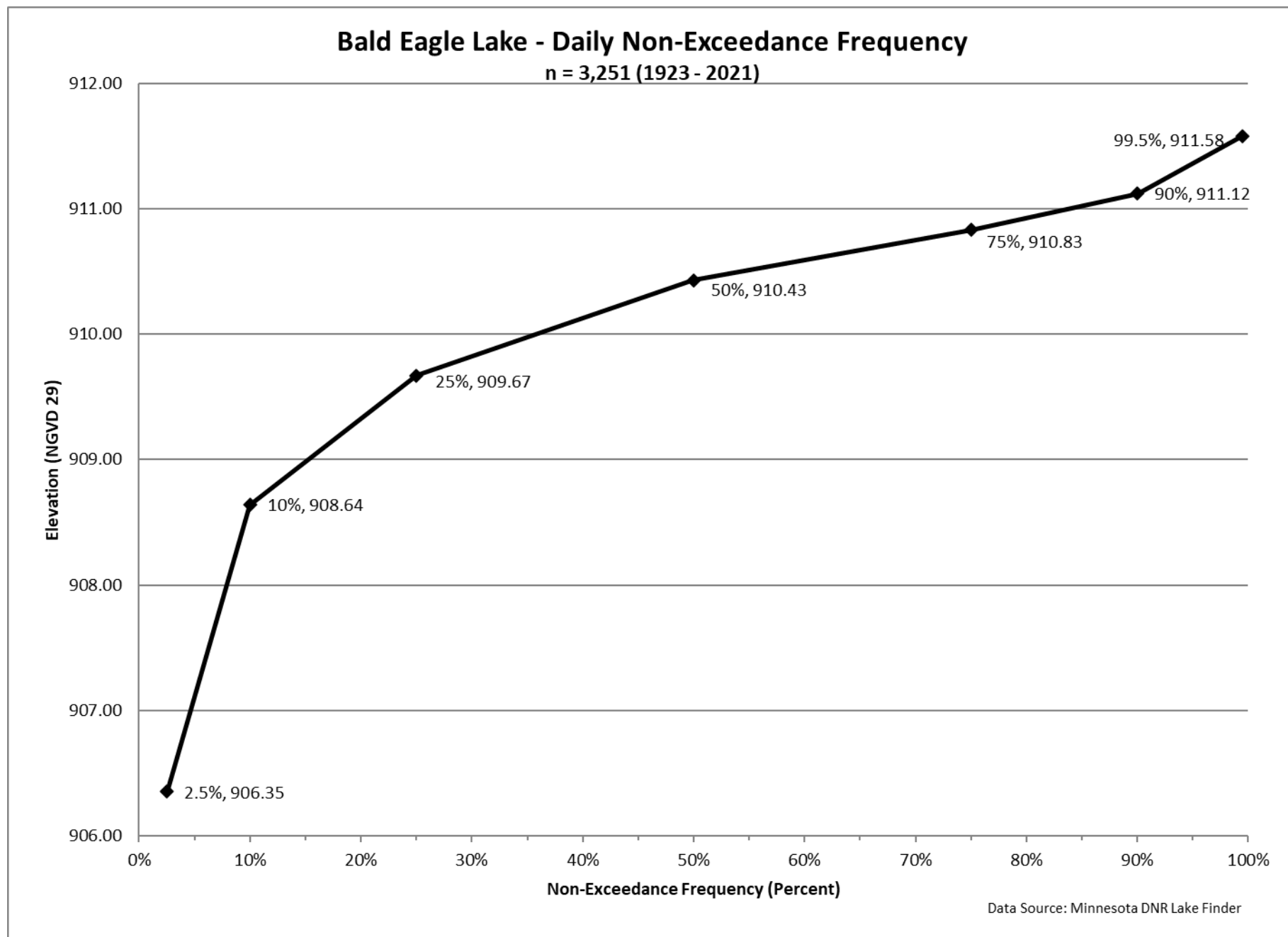


Figure 1c