Precipitation – Supporting Variable

Question:
How has precipitation in the Piscataqua Region Watershed changed over time?

Why We Track Precipitation
Precipitation has a significant impact on the health of our watershed and our estuaries. Precipitation directly affects what is "loaded" into our tributaries and, thus, our estuaries. For example, light penetration in estuaries is significantly influenced by precipitation levels because rainfall impacts the three main components that attenuate (i.e., decrease) light penetration: algae, total suspended solids, and colored dissolved organic matter. Therefore, increased precipitation decreases photosynthesis underwater due to the decreased light penetration. In addition, precipitation affects salinity and temperature, which in turn impacts the health of a host of organisms, including shellfish and migratory fish.

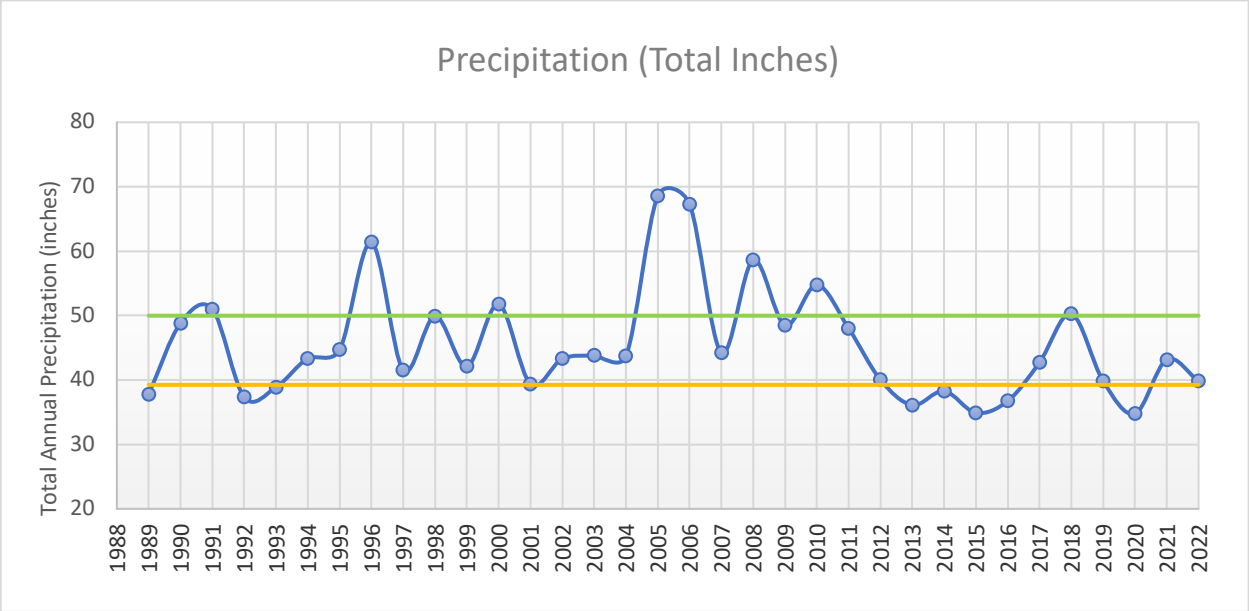

Figure P-1. Total annual Precipitation measured in inches at the Pease Airport station in Portsmouth, NH. The green line represents the 75th percentile of the data while the yellow line shows the 25th percentile. Thus, the area between the lines depicts the middle 50% of the measurements.

Explanation/Discussion
The precipitation record (Figure P-1) shows increased variability beginning in 2005, which began a 5-year period of much higher precipitation than the previous 15 years, except for 1996. Since 2012, precipitation levels have been lower and slightly less variable, except for 2018. Lower amounts of precipitation have contributed to two extreme droughts in our region, one in 2016 and one in 2020 (Source: https://droughtmonitor.unl.edu/). Drought is determined by looking not only at precipitation but also streamflow, temperature, evaporative demand, water content in the soil, and vegetation health.

Variability in annual precipitation also affects the variability of non-point source nitrogen loading. During the previous 5-year reporting period (2012 to 2016), annual precipitation was at or below the bottom 25th percentile in all 5 years, which has never happened at any other time in this data record. This consistently low annual precipitation was a primary factor in non-point source nitrogen loading being at its lowest level on record during the 2012 to 2016 period. During the 2017 to 2020 period, precipitation was at or below the bottom 25th percentile in 2 of the 4 years, but at the 75th percentile in 2018. The combination of low precipitation in 2012 to 2016 and low to moderate precipitation in 2017 to 2020 resulted in the 2017 to 2020 average non-point source nitrogen loading increasing by 15% when compared with the previous five years (2012 to 2016).

Methods

In the figure above, the data are from one source only: the Pease Airport (Portsmouth) weather station. However, precipitation has been quantified in various ways over the years and even within the 2023 State of Our Estuaries Report. For example, in previous years and in the "Eelgrass" section of this report, data from the Pease and Greenland stations were combined into an average. The most notable result of averaging the data is a much lower amount of precipitation reported for 2015 (mainly due to missing data at the Greenland station). Therefore, as of May 2023, PREP staff now believe it is more accurate to show this time series with only the Pease station data, as shown above and in the nitrogen loading sections of the Report, but not the Eelgrass section.

Acknowledgements and Credit

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