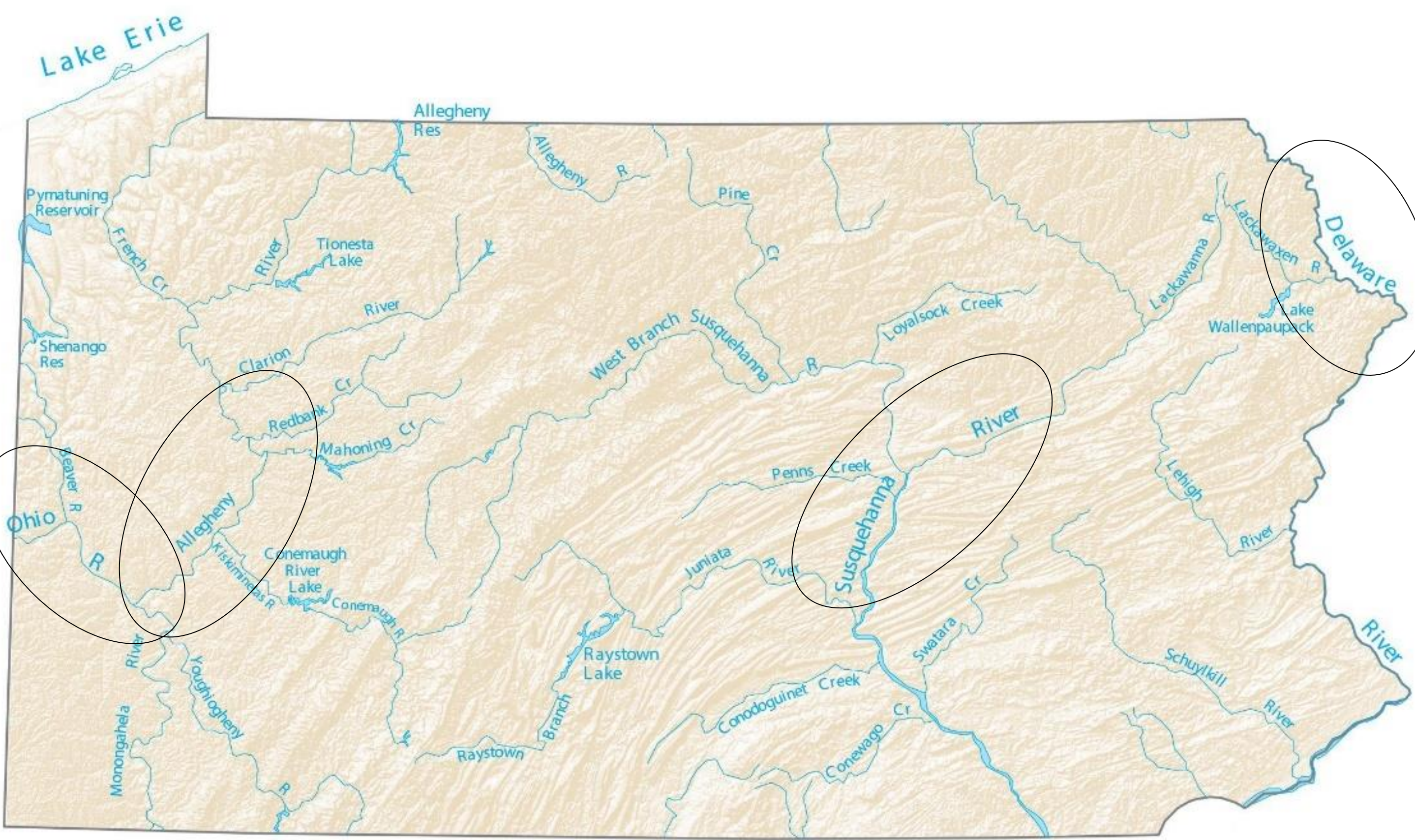




Assessing Spatial and Temporal Variations in Surface Water Availability Among Four Major Rivers in PA

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Map of Pennsylvania Lakes, Streams and Rivers (geology.com)

Introduction

The increase in frequency of extreme weather events has made it imperative to continue monitoring the behavior of our state's waterways. Flooding has become an increasing threat to our communities, making the proper monitoring and implementation of flooding mitigation practices essential to minimize the destructive impact flooding events can have. The quality of water is also inherently linked to the quantity of water in a given location, making water quantity monitoring an important aspect of making safe drinking water management decisions.

Methods

Four of the major river systems within Pennsylvania were analyzed to determine the impact that oceanic proximity has on water quantity. To do this, data regarding the average annual discharge rate, the length, and the relative oceanic proximity of each river was collected to establish relationships between these three variables. Average annual discharge was calculated for measurements taken between 2010 and 2020. Drainage basin area measurements include only areas within Pennsylvania. All data used was collected from the United States Geologic Survey.



Pennsylvania is commonly divided into five major and two minor river basins (fayettecd.org)

Results & Discussion

The Susquehanna River was the second longest river of the four studied and had the largest drainage basin and the highest average annual discharge. This river was the second closest in proximity to the Atlantic Ocean behind only the Delaware River. While the Delaware River was the closest to the ocean, it had the lowest average discharge, as seen in Figure 2, and was draining less area than two of the other three rivers (Figure 3). No relationship was observed between discharge and oceanic proximity. The Ohio River, the furthest from the ocean but the river with the second largest drainage basin, showed average discharge rates just shy of those in the Susquehanna River but three times the discharge at the Delaware River, as shown in Figure 1. The Ohio was the longest river studied at ~980 miles long, almost twice the length of the Susquehanna (~445 miles), and over three times the length of the Delaware and Allegheny (~300 and 325 miles, respectively).

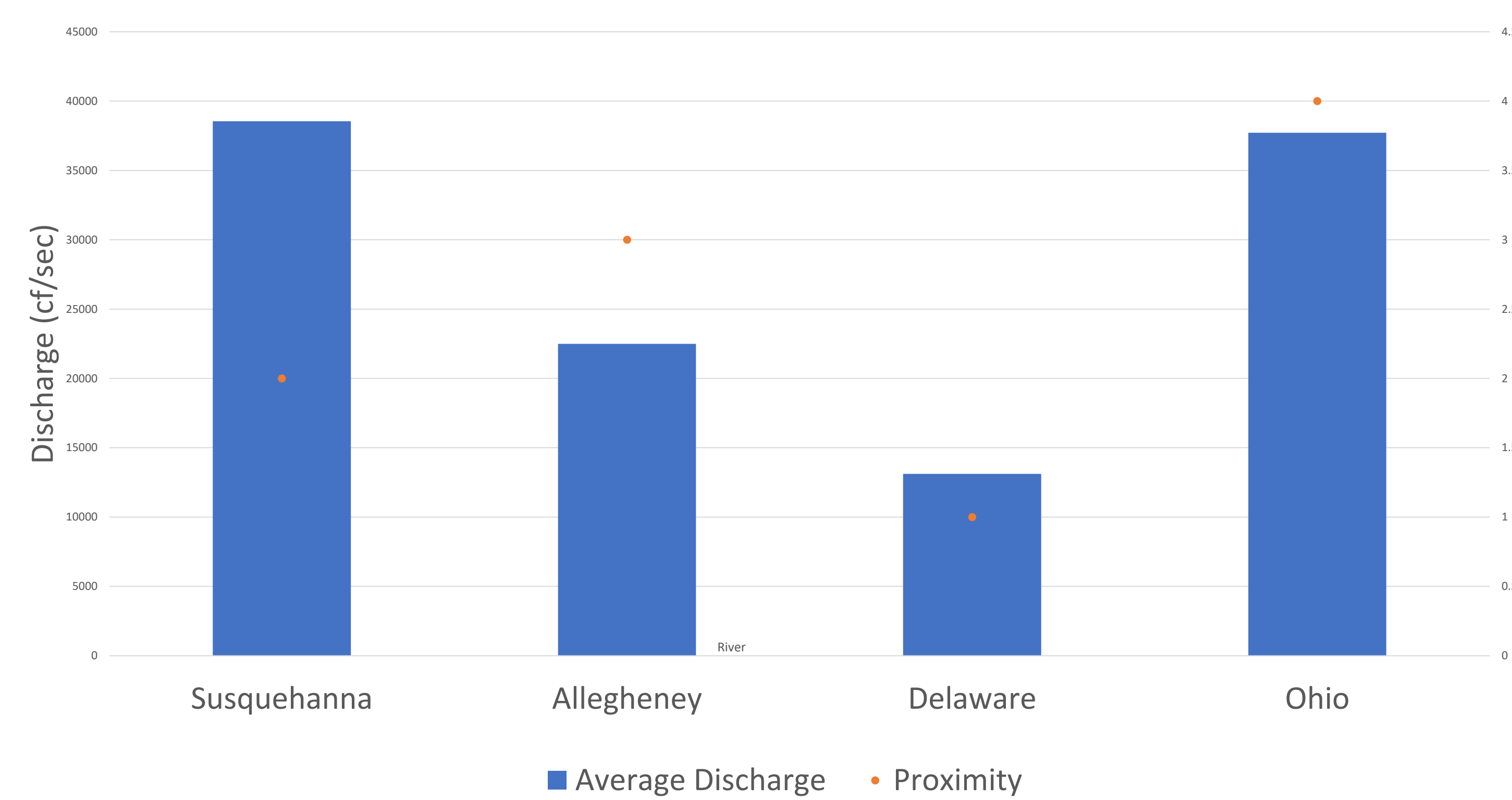


Figure 1: Graph showing the average annual discharge rates (from 2010-2020) of the four streams study in comparison with their relative oceanic proximity. To measure relative oceanic proximity, each river was assigned a value of 1-4 (1 being the closest river to the ocean, 4 being the furthest from the ocean).

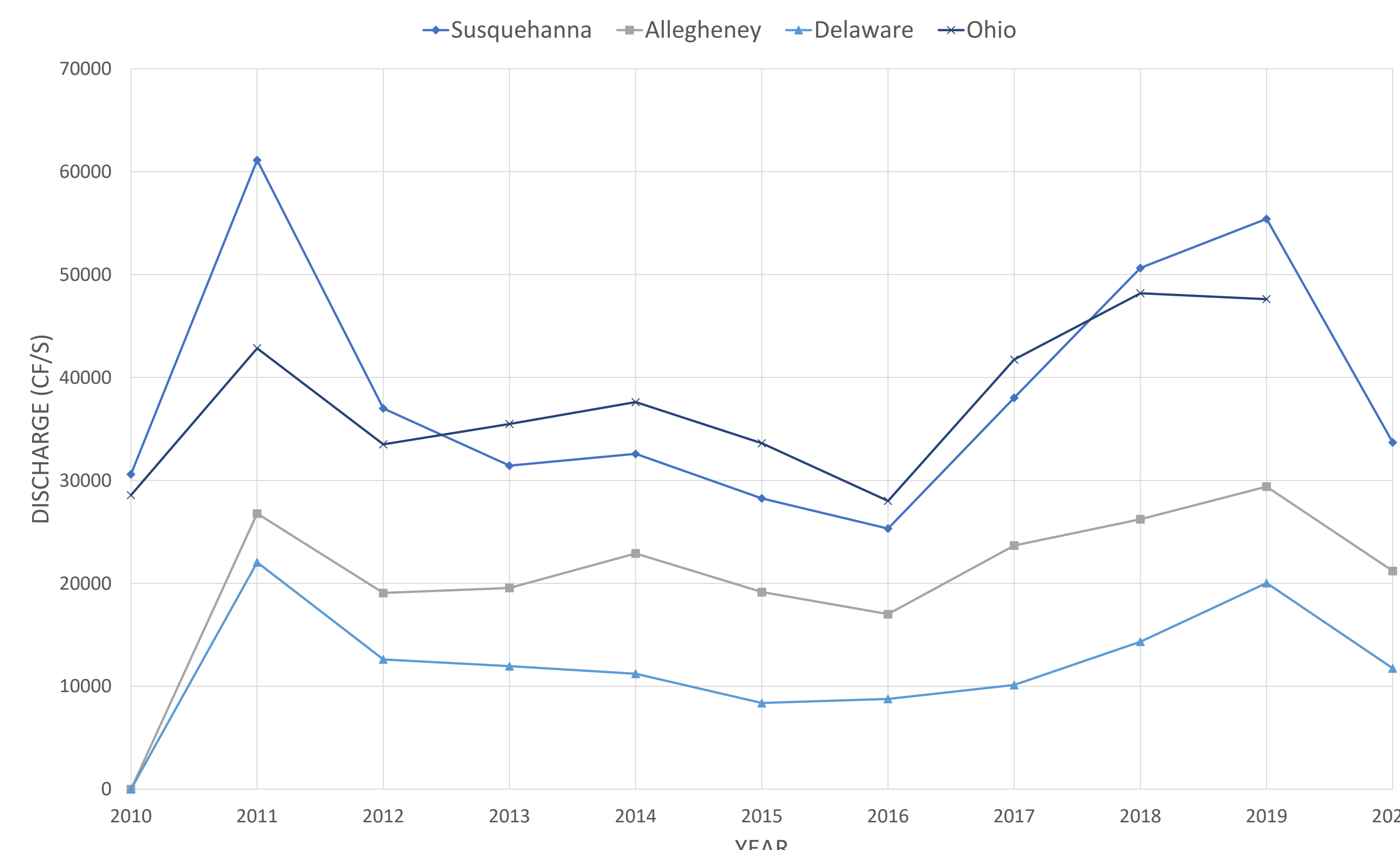


Figure 2: Graph depicting the annual discharge rates of the four rivers studied. Annual discharge rates from 2010-2020 were compiled to create this graph.

Results & Discussion (continued)

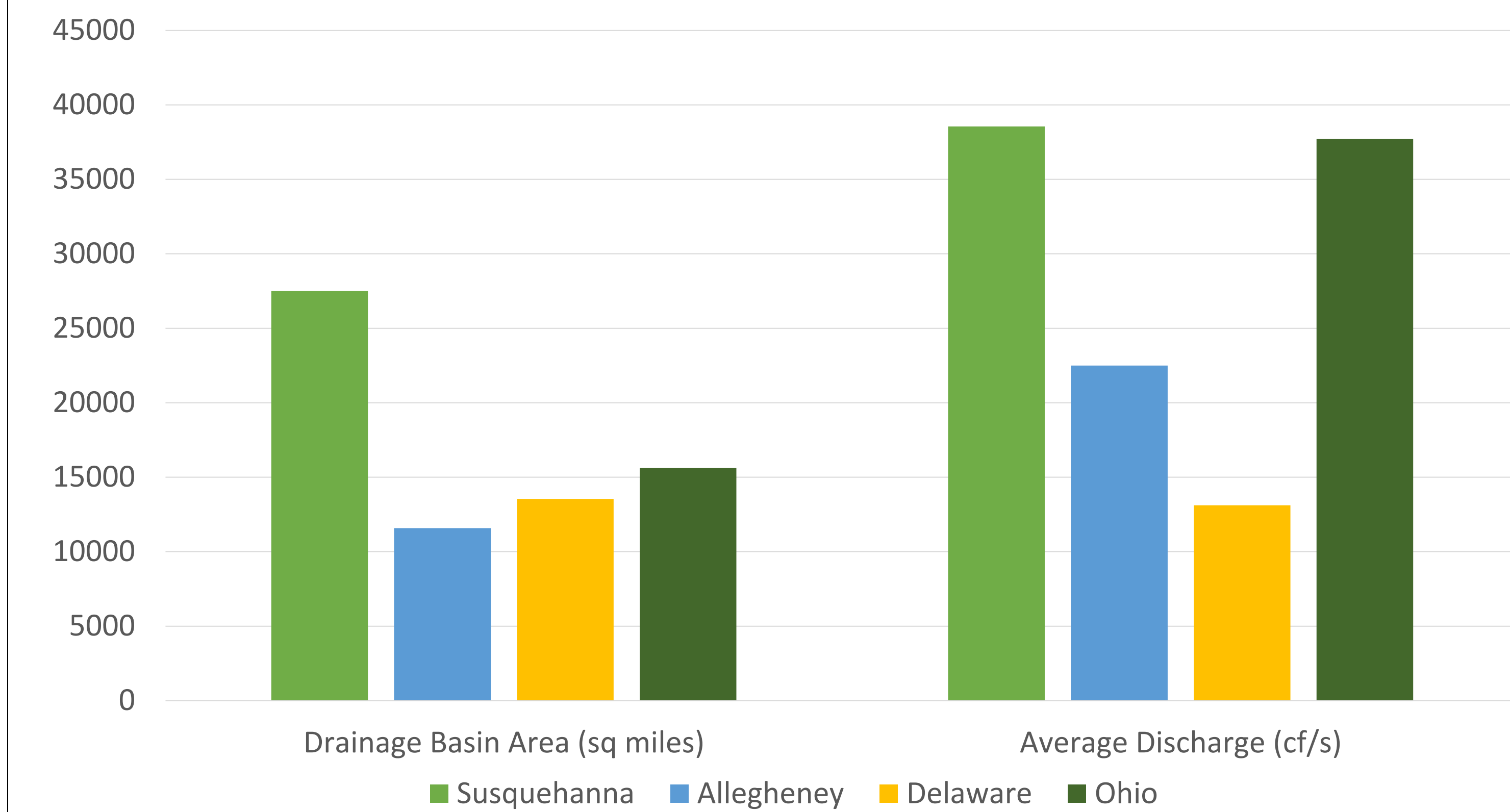


Figure 3: Bar graph comparing the drainage basin area feeding each river to the average annual discharge rate measured in that river. The unit of measurement for each attribute is defined on the horizontal axis.

Conclusion

While there were no observable trends present between the rate of discharge within a river and the rivers distance to the ocean, there was a correlation between the size of the drainage basin, the length of the river, and the average discharge. Longer streams are likely to drain a larger area of land than their smaller counterparts, which results in a larger amount of water draining to the stream. The increased amount of contributing water sources due to the river having a larger drainage basin can result in elevated discharge rates within that river. Further studies should focus specifically on how extreme weather events impact discharge levels at a variety of sites within PA, as well as the extent to which climactic warming and increased annual precipitation has contributed to changes in discharge historically.

Bibliography

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