An Analysis of Spatial and Temporal Variability of Water Quality Impairment in New York

Delilah Smith[1], Meng Fan Wang[2] , Nicolas Maxfield[3], Dr. Valerie Were[4], Dr. Indrani Pal[4]

[1]NOAA EPP Summer Bridge Program Scholar and Bronx Community College, Bronx, NY
[2]2019 High School Initiative in Remote Sensing of the Earth Systems Science & Engineering (HIRES) Scholar
[3]CUNY CREST Institute, [4]NOAA Center for Earth System Sciences and Remote Sensing Technologies, The City College of New York

Introduction

- New York is known to have one of the best water systems nationwide.
- Despite this, water bodies in New York continue to be listed as impaired for various pollutants, which requires development of total maximum daily load (TMDLs), which are regulated by the U.S. Environmental Protection Agency (EPA).
- TMDLs must be developed when there is an excess of pollutants found in a water stream that does not comply with water laws. This is concerning because this compromises the quality of water. It is important to investigate TMDLs because these violations impair our water and may potentially pose as a risk to our health and environment.

Cannonsville Reservoir, Upstate Delaware County (NRDC 2015)

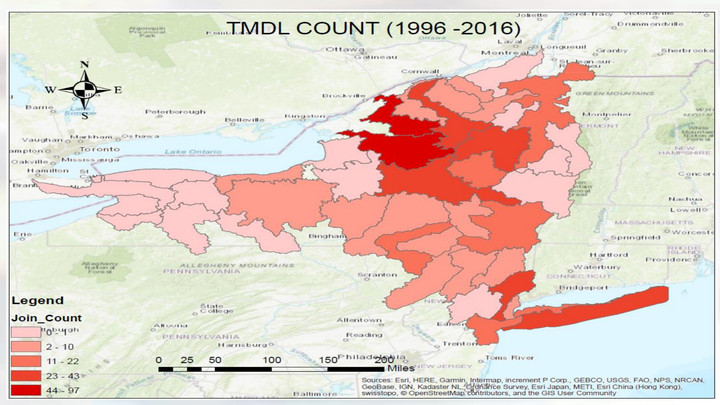
Objective

To understand water quality in relationship to water quantity while analyzing water flow, temperature, and TMDL events

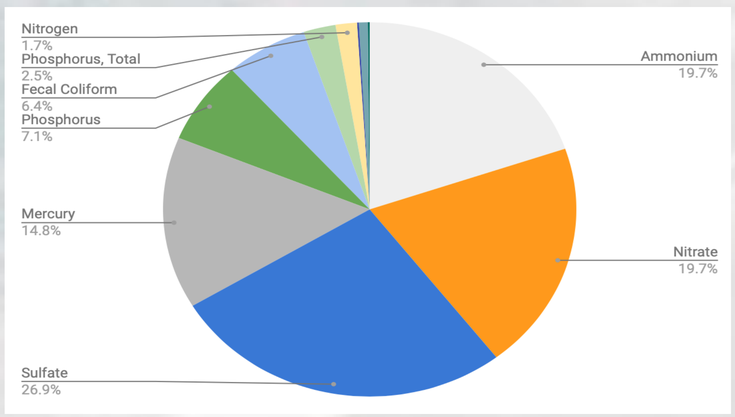
Methods

1. Created visuals using ArcMap displaying TMDLS from 1996 - 2016.
2. Mapped out stream gauges in New York using data from United States Geological Survey
3. Isolated the Delaware River because it has water temperature, discharge and TMDL information
4. Analyzed the relationship and identified trends among the parameters

Results

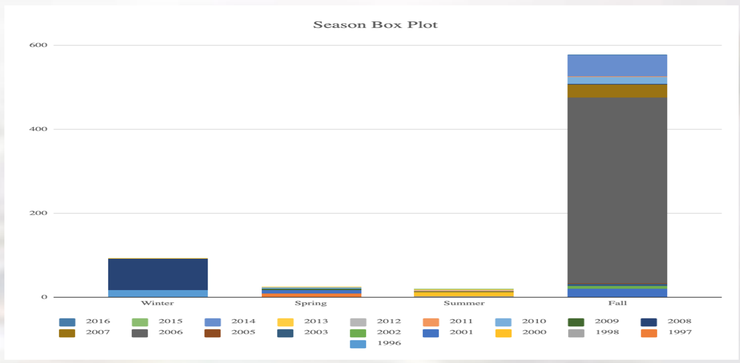


Overall, TMDL events are sporadic with a significantly higher number developed in the Adirondack Mountains, New York City area, and Long Island.



The most common pollutants are Sulfate (26.9%) and Ammonium (19.7%.)

Results Continued



- Most impairments occur in the Fall (~80%)
- 2006 contains the highest amount of TMDL events

Conclusions

- Regions in the Adirondack Mountains, NYC, and Long Island have more instances of TMDL events compared to other regions. This signals the need for better watershed management in these areas.
- In addition, the high number of events of Sulfate and Ammonium impairment in the water indicates a need for future investigation into how these pollutants enter the water bodies
- Analysis of water data from the Delaware River suggest a correlation between water flow, water temperature, and TMDL events. Further research on this topic may consist of exploring other factors that may lead to water impairments.

References

- U. (2011). GAGES-II: Geospatial Attributes of Gages for Evaluating Streamflow. Retrieved August 5, 2019, from https://water.usgs.gov/GIS/metadata/usgswrd/XML/gagesII_Sept2011.xml
- U. (n.d.). New York Cumulative Number of TMDLs. Retrieved August 5, 2019, from https://iaspub.epa.gov/waters10/attains_state.control?p_state=NY
- U. (n.d.). TNM Download Retrieved August 6, 2019, from https://viewer.nationalmap.gov/basic/#startUp
- U. (n.d.). USGS Data Retrieval. Retrieved August 6, 2019, from https://waterdata.usgs.gov/nwis/uv

- The table shows the type of TMDL event in the Delaware River region and the corresponding flow and temperature rank.
- TMDLs events that occurred in the Delaware River region are correlated to high minimum flow and temperature rank.

*High rank corresponds to high temperature and flow

Year	Season	Location Name	Event Type	Minimum Flow Rank	Maximum Flow Rank	Minimum Temperature Rank	Maximum Temperature Rank
1997	Spring	Cannonsville Reservoir	Phosphorus	4	12	1	11
2001	Fall	Cannonsville Reservoir	Phosphorus	17	10	21	10
2006	Fall	Rock Lake	Ammonium	2	5	1	10
2006	Fall	Rock Lake	Nitrate	2	5	1	10
2006	Fall	Rock Lake	Sulfate	2	5	1	10
2006	Fall	Rock Lake	Ammonium	2	5	1	10
2006	Fall	Rock Lake	Sulfate	2	5	1	10
2006	Fall	Rock Lake	Nitrate	2	5	1	10
2006	Fall	Rock Lake	Ammonium	2	5	1	10
2006	Fall	Rock Lake	Sulfate	2	5	1	10
2008	Winter	Cannonsville Reservoir	Mercury	1	7	9	19
2010	Spring	Summit Lake	Phosphorus	6	8	2	13

ACKNOWLEDGEMENT: This study is supported and monitored by The National Oceanic and Atmospheric Administration – Cooperative Science Center for Earth System Sciences and Remote Sensing Technologies under the Cooperative Agreement Grant #: NA16SEC4810008. The authors would like to thank The City College of New York and NOAA Office of Education, Educational Partnership Program with Minority Serving Institutions (EPP/MSI) for support for Delilah Smith. The statements contained within the poster are not the opinions of the funding agency or the U.S. government, but reflect the author's opinions.