Applicant Information New York City Department of Environmental Protection + Town+Gown

Organization/Company Website

https://www1.nyc.gov/site/dep/index.page
https://www1.nyc.gov/site/ddc/about/town-gown.page

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Organizational Description

DEP's mission is to equitably provide services that promote the health and wellbeing of all 8.6 million city residents, while continuing to be a good neighbor and partner with dozens of upstate communities. New Yorkers are fortunate to have an ample supply of some of the best drinking water in the world, thanks to the foresight and toil of seven generations of DEP's predecessors, and the continuing vigilance of its current staff. The NYC water supply remains one of only four large water supplies in the nation that is pure enough to remain unfiltered.

In recent decades, DEP has invested heavily in watershed protection programs, upgrades to wastewater treatment facilities, stormwater control, and modernization of data processing resulting in significantly healthier waterways. The City's source waters are cleaner today then they've been in more than a century. Still, there is much work to do, and DEP is investing in major capital upgrades to ensure that recreational opportunities can be further expanded. DEP also ensures that the City's massive water resource and water treatment infrastructure, which extends more than 100 miles from the city, is maintained in good operating condition and is resilient.

The New York City Water Supply System provides one billion gallons of safe drinking water to New York City's 8.5 million residents every day. The system also provides about 110 million gallons a day to one million people living in Westchester, Putnam, Orange, and Ulster counties. The Water Supply System is comprised of 19 reservoirs and three controlled lakes and spreads across a 2,000-square-mile watershed. The watershed is located in portions of the Hudson Valley and Catskill Mountains, with areas that are as far as 125 miles north of New York City. The System consists of three major water systems :

- The Delaware Water Supply System, located in Delaware and Sullivan Counties west of the Hudson River

- The Catskill Water Supply System, located in Schoharie, Greene, and Ulster Counties west of the Hudson River

- The Croton Water Supply System, located in Putnam, Westchester, and Dutchess counties east of the Hudson River

Town+Gown is a city-wide action research program, resident at NYC DDC, that provides research resources for practitioners and academics in the built environment to develop and facilitate research projects, including experiential learning engagements with graduate students. Town+Gown will help work with the student team and NYC DEP, as client, on this project to bridge the academic practitioner divide and ensure this project is successful for both the student team and NYC DEP.

Project Title

Visualization of water quality data as it flows into the NYC drinking water distribution system

Project Abstract

DEP uses near real-time water quality data to guide its operations (i.e., the selection and routing of water) to achieve optimum quality for consumers. Historical data is used to evaluate the effectiveness of watershed protection programs, and model predictions of future water quality are used to understand potential impacts to the water supply under different infrastructure and climate scenarios.

Project Description & Overview

Specifically, the objective of this project will be to build a 3D schematic diagram of the six Catskill and Delaware system reservoirs, which account for 90 % of the City's drinking water, and the flowpath to Kensico Reservoir and into distribution. This will be done using existing bathymetric data in ARCGIS. Fluctuations in reservoir volume will be included in the animations according to data on reservoir elevations. The physical framework of reservoirs will then be used to display water quality data and its changes over time as water flows through each of the reservoirs. The water quality data will be either a specified analyte (such as turbidity, fecal coliform bacteria, UV254, or ASU) or an index calculated from several analytes. The time period will be selected for each animation run and may be from hours to decades. Input data for analytes will be derived from past, current, or future predictions from model runs. Concentration changes will be scaled to show increases as higher intensity in color. Once the physical framework, designated sample sites, and water quality changes over time are coordinated, the input can be from past data, current data, or future predictions.

Relevance

Each time frame has a different application: historic data will allow us to review water quality changes over long periods of time to see trends or details of impacts from extreme events (floods and droughts); current data can be reviewed to show any short-term variations, such as algal blooms, that would suggest operational changes needed to maintain optimal water quality; and model projections of future water quality under different scenarios of infrastructure, watershed protection measures, or climate can inform infrastructure decisions or policy development. The data visualization tool to which future data can be added to at different spatial or temporal resolutions will assist NYC DEP's decision-making and predictive modeling efforts.

Datasets

- reservoir bathymetry in ARCGIS produced by the USGS
- reservoir elevation data from DEP Operations
- reservoir diversion elevations
- water quality data in LIMS

Learning Outcomes/Deliverables

The deliverables will be an interactive visualization illustrates water quality data as described above, with a capacity for automatic updates, and a final report that provides the methodology and analyses used and findings.

1. As part of the domain research component, the students will gain a deep understanding of the city's water system and water quality issues.

2. This geospatial data analysis/mapping of data will enable the students to use all data analytic skills learned to date and possibly require them to pick up other techniques required by the project.

3. If time permits and the students develop theories, developing a predictive model, with capacity for automatic updates, may be of future use by the agency, in addition to the map the importance of which cannot be overstated.

Competencies

All students should have excellent and geospatial data analytic skills, and an interest in water supplying a dense urban environment under conditions of climate change would be helpful.