Park Use, Daylighting and Water Quality Perspectives of Van Cortlandt Park Patrons: A Report for the Friends of Van Cortlandt Park and the Bronx Council for Environmental Quality.

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Introduction

During the summer of 2018, the Friends of Van Cortlandt Park (FVCP) in collaboration with the Bronx Council for Environmental Quality (BCEQ) initiated socio-environmental research aimed at accumulating and understanding the opinions and knowledge of local park users regarding the intersection between park use and park ecosystem health.

The Friends of Van Cortlandt Park have monitored the chemistry and biodiversity of Van Cortlandt Lake (VCL) and Tibbetts Brook (TB) for over three years. These efforts have led to a better understanding of the freshwater ecology of the lake and brook as well as provided the scientific support for the daylighting of Tibbetts Brook. Daylighting of the Brook will reduce the volume of water treated by Wards Island Water Pollution Control Plant and decrease the amount of sewage that flows into the Harlem River on wet days. However, the awareness of the average park user has yet to be assessed on Tibbett's Brook, daylighting and current efforts to manage the Tibbett's Brook ecosystem by FVCP. One way to collect data on local perspectives is the use of closed ended question surveys.

Three main objectives were accomplished using surveys. 1) Understand the potential impact of FVCP through gathering data on awareness of the organization and projects being performed by FVCP. 2) Gather data on public perspective of the process of daylighting Tibbett Brook. 3) Understand public perspective on the state of water quality and conditions of Van Cortlandt Lake and Tibbetts Brook.

Methods

Data collection:

A multiple-choice survey was used to collect data. Questions were chosen based on stakeholder agendas gained from discussions with the directors and water committee chair of both FVCP and BCEQ. A preliminary survey was constructed and refined with two test days given participant feedback. The preliminary survey prompted us to construct a Spanish version of the survey as well. The final VCP survey included 19 questions and was anticipated to take about ten to fifteen minutes to be completed. Question topics varied and included: Organizational awareness, Park use and Transit, Daylighting of Tibbetts Brook and the Water Quality of Van Cortlandt Lake and Tibbetts Brook. In addition, personal questions were asked to attain information of demographics that included Occupation, Years of Residence in New York City and Age. Participants could skip any questions that they did not wish to answer. We randomly distributed the survey at locations chosen at random in VCP within 500 meters from the shore of the lake. Multiple survey trips were planned spanning two months.

The following parameters were used to understand demographics of survey participants: All participants were asked to give the following background information.

Name (optional): _____ Email (optional): _____ Zip code: _____ How long have you been a New York City resident? _____ Age (optional): _____ Occupation: _____

<div align="center">**Results**</div>

Data was collected over four weeks, twice a week for five hours every day. Surveys were performed on both weekend and weekdays. For VCP a total of 5 survey days spanning the months of June and July 2018 were used for the analysis. In total 102 surveys were issued over the study period. Surveys took approximately 15 min/person to fill out. Only surveys that were fully filled out were used for question analysis. Therefore, the number of surveys used in the question analysis is a sample size of **(n=86)** unless specifically noted. Typically, less than 70% of participants fully filled out the demographic information. Results for question analysis are shown in the form of pie charts where percentages are given based on the proportion of responses to a given answer. Demographic data is shown in histograms and Bar charts.
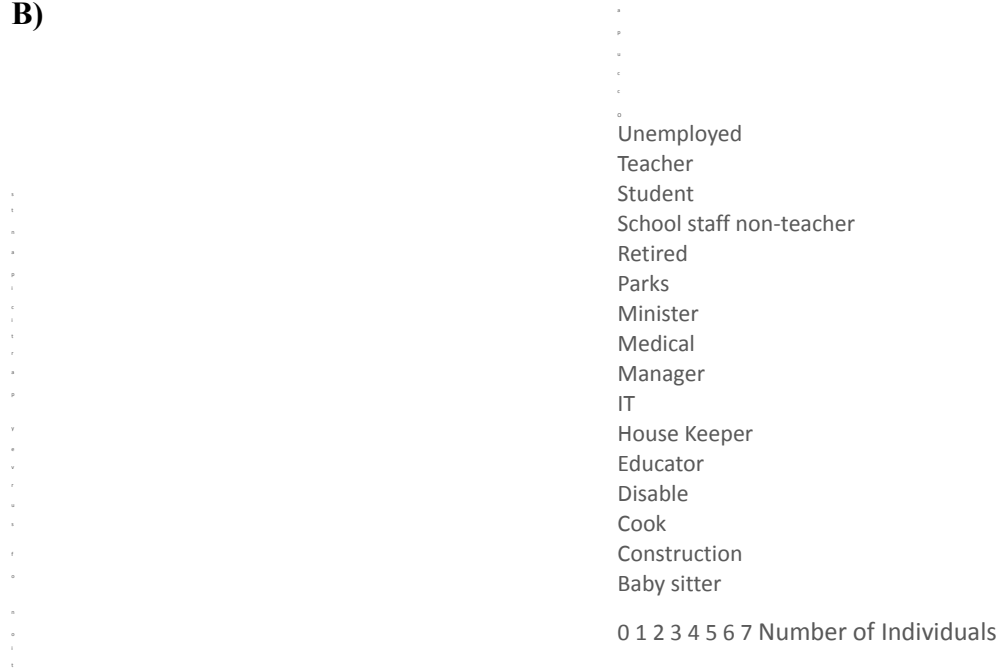
<div align="center">**Demographic Data of surveyed Park Patrons**</div>

A)
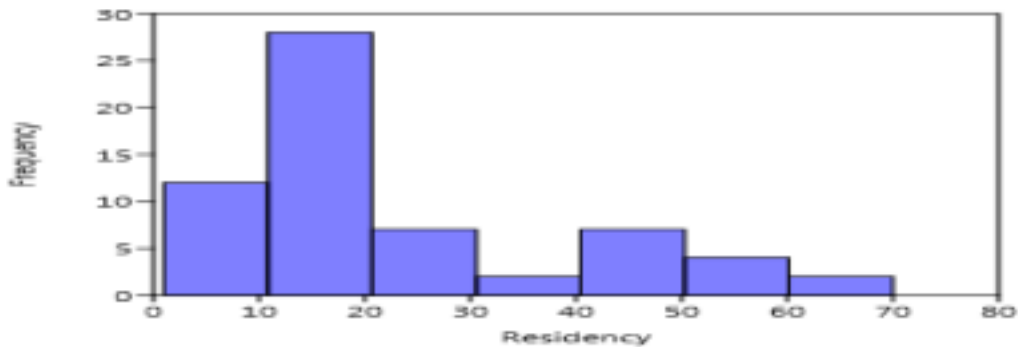
Figure A. Frequency Distribution of Residency within NYC for surveyed patrons. The x-axis is residency category in years with the y-axis showing the number of survey participants within that residency category. The Average residency time for survey participants Was 23.7 years.

B)

Unemployed
Teacher
Student
School staff non-teacher
Retired
Parks
Minister
Medical
Manager
IT
House Keeper
Educator
Disable
Cook
Construction
Baby sitter

0 1 2 3 4 5 6 7 Number of Individuals

Figure B. Bar chart displaying the occupation and number of individual participants claiming that occupation. Only 62% of survey participants answered this question. Top four occupations were Unemployed, Student and people within the non-formal Education and Information Technology sector.

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C)
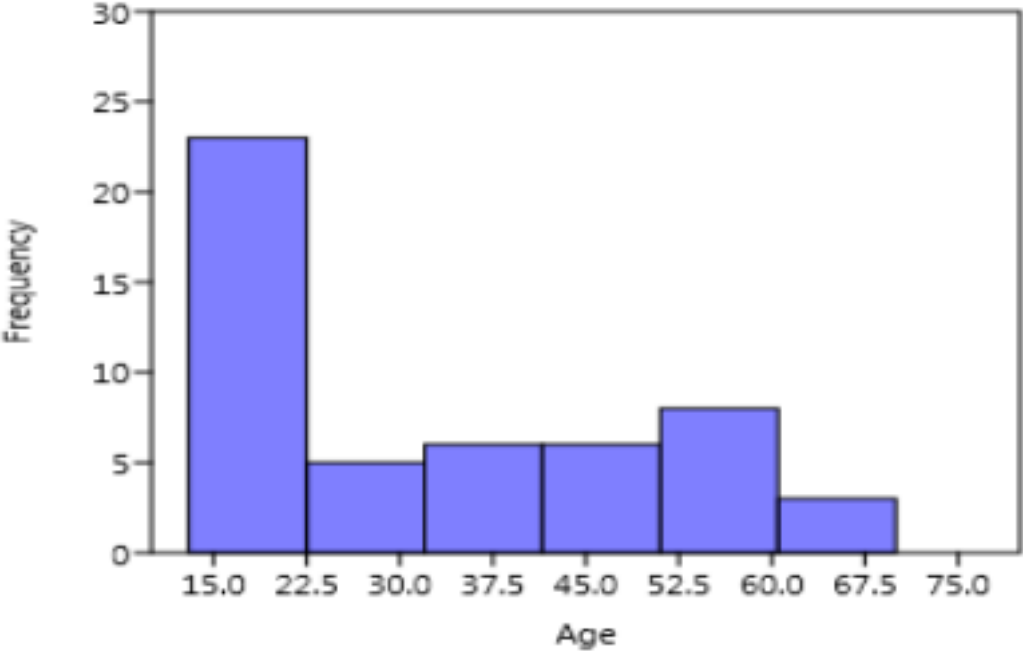
Figure C. Frequency distribution of survey participant age. X-axis are age categories starting with ages 13-29 and the y-axis is the number of participants within that age category. The average age of a survey participant was 32 years of age. Only 58% of participants answered the age question.

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D)
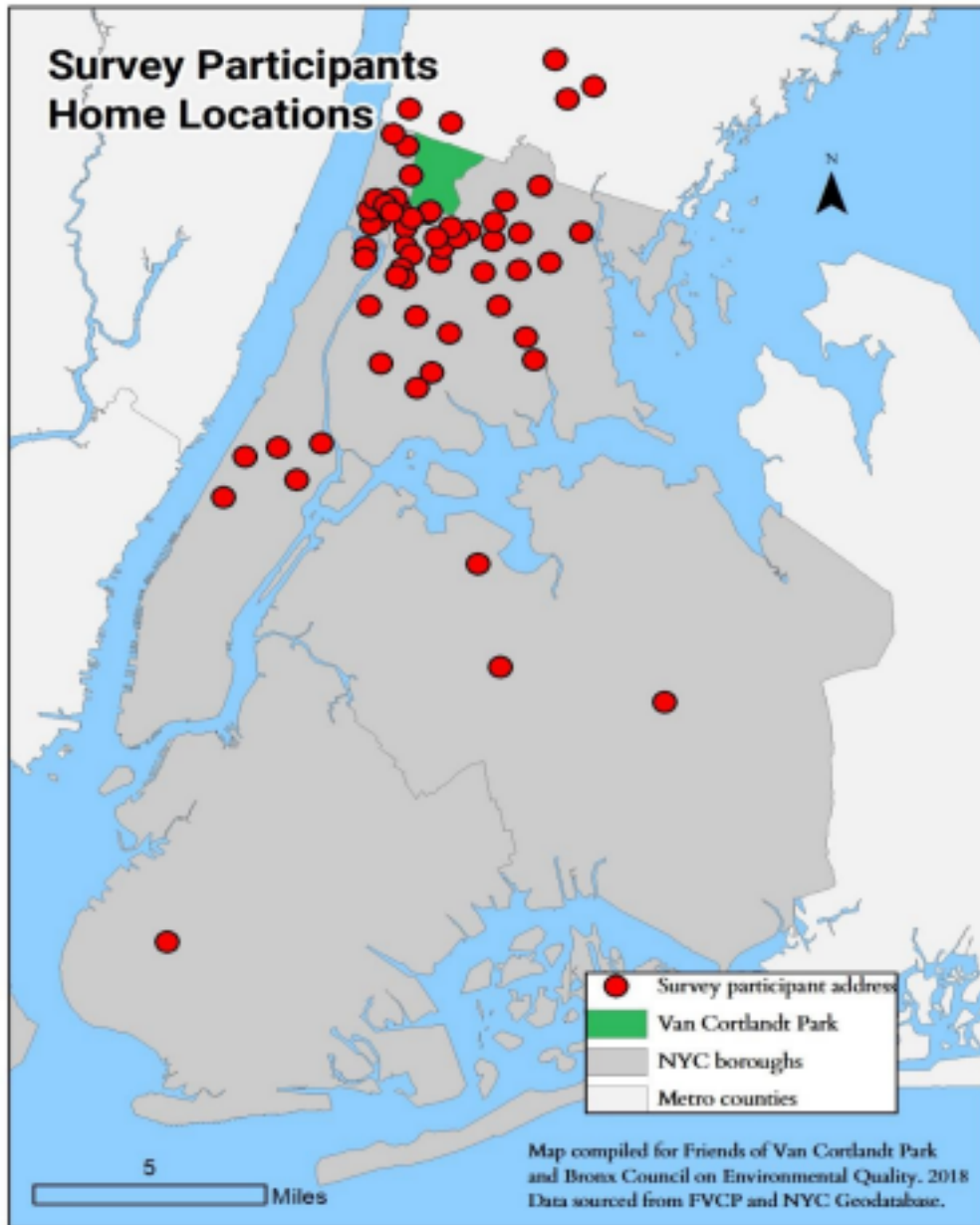
Figure D. Map of Zipcodes of Survey Participants.

1. Have you heard of the Friends of Van Cortlandt Park? ❏ Yes ❏ No
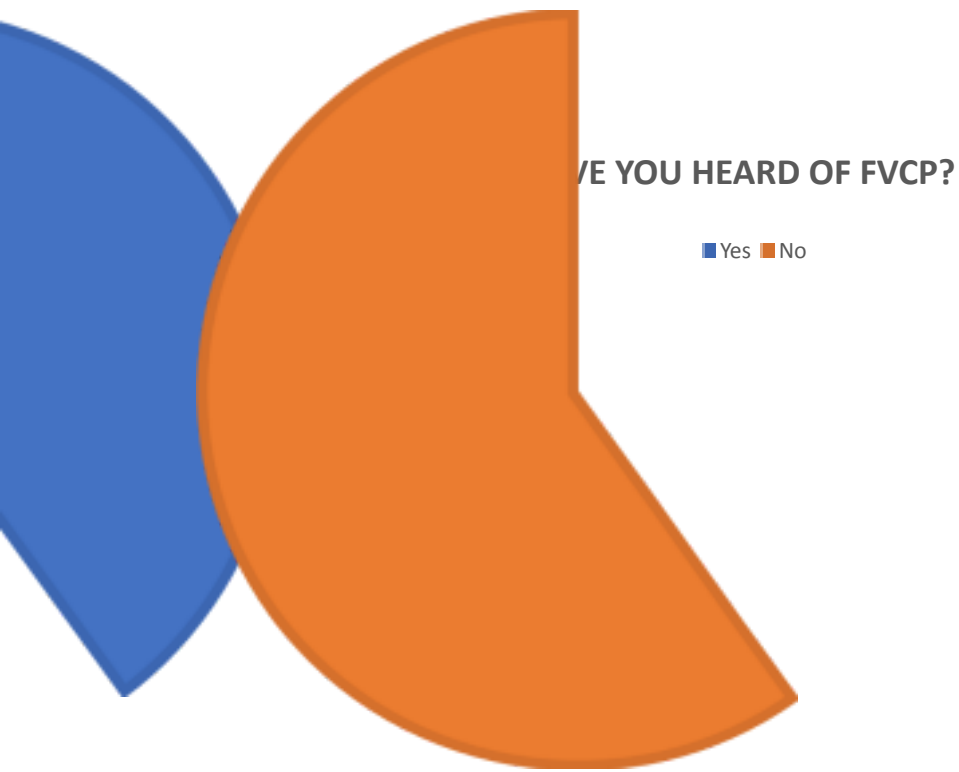
VE YOU HEARD OF FVCP?

■ Yes ■ No

Figure 1. Over half of park patrons (60%) surveyed were unaware of the presence of the non profit organization Friends of Van Cortlandt Park, FVCP.

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2. How often do you visit Van Cortlandt Park? ❏ First time ❏ Daily ❏ Weekly ❏

Monthly ❏ Annually ❏ Less than once a year

HOW OFTEN DO YOU VISIT VCP?

☐ Daily ☐ Weekly ☐ Monthly ☐ Annually ☐ Less than once a year

Figure   2. The rank order of visit frequency is Weekly, Monthly, First

Time, Daily=Annually and Less than one time a year. Fifty-four percent of surveyed park

patrons visit the park either weekly or monthly.

3. For what type of activity do you MAINLY use the park? (choose one) ❏ Hiking ❏

Fishing ❏ Sports/Cross-country ❏ Animal observation ❏ Special events ❏ Family

events ❏ Leisure

FOR WHAT TYPE OF ACTIVITIES DO YOU
MAINLY USE THE PARK?

☐ Hiking ☐ Fishing ☐ Sports/Cross Country ☐ Animal Observation ☐ Special Events ☐ Family Events ☐ Leisure
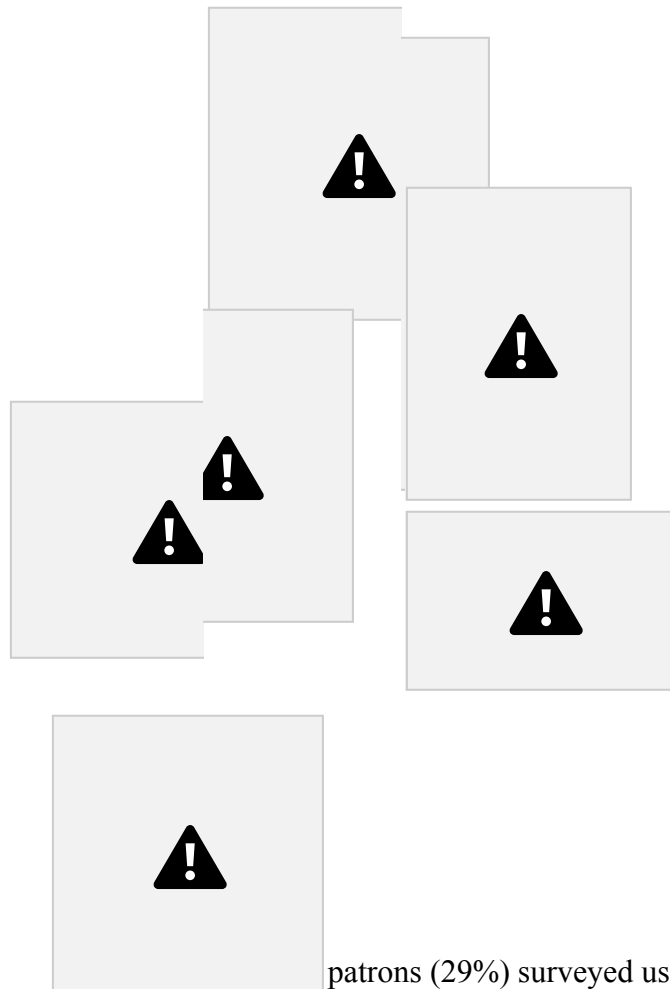
Figure 3. Most park patrons (29%) surveyed use the park mainly

for sport activities and cross country running.

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4. What is your MAIN form of transportation to the park? (choose one) ❏ Walking

❏ Bicycle ❏ Personal car ❏ Bus ❏ Train ❏ Rideshare/Cab ❏ Other

MAIN FORM OF TRANSPORTATION TO VCP

☐ Walking ☐ Bicycle ☐ Personal Car ☐ Bus ☐ Train ☐ Rideshare/Cab ☐ Other

⚠

⚠

Figure 4. The rank order of transporting to the park are: Walking, Bus, Train, Car, Bike and

Rideshare as well Other. Public transportation equates to ~43% of patron transportation mode to

VCP.

5. Have you heard of Tibbetts Brook? ❏ Yes ❏ No

HAVE YOU HEARD OF TIBBETTS BROOK?

☐ Yes ☐ No

Figure 5. TB is one of few freshwater streams left in NYC and is a large focus of FVCP

restoration and research, however 65% of surveyed patrons have not heard of TB.

6. What are water quality threats experienced by Tibbetts Brook? (choose however many

apply) ❏ Urban polluted runoff ❏ Atmospheric deposition of mercury and acid rain ❏

Nutrient eutrophication ❏ Inadequate polluted water treatment facilities ❏ Muddy

waters ❏ Invasive species ❏ Garbage

WHAT ARE THE THREATS TO TIBBETTS BROOK?

☐ Dirty Runoff ☐ Acid rain ☐ Eutrophication ☐ Muddy Water ☐ Bad Treatment ☐ Invasive Species ☐ Garbage
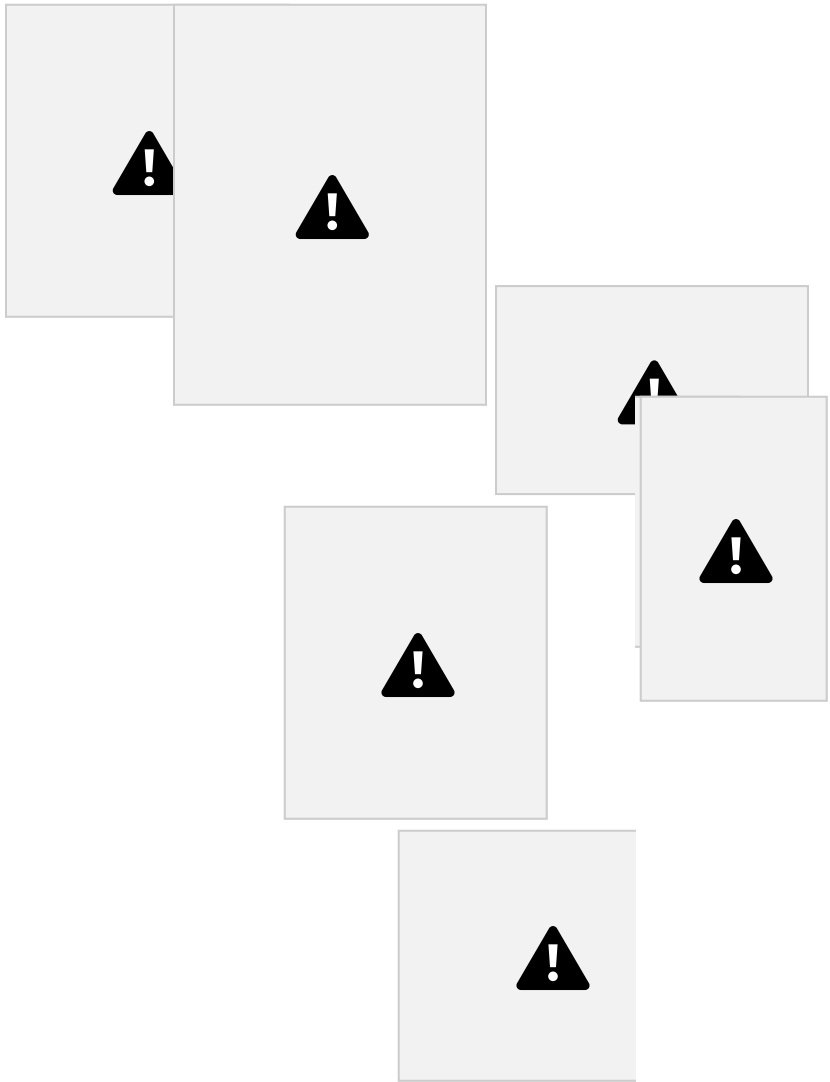
Figure 6. For this question patrons responded with multiple answers. All answers were tallied as individual responses in order to enumerate individual threats to TB, therefore the sample space for this question are the answers. Eutrophication, which was defined on the survey above the question, is a major stressor in urban aquatic environments and is considered a top threat to VCL and TB, however eutrophication ranked least 6% in potential threats for surveyed park patrons.

7. Where do you think the water goes when it leaves the southern end of the lake and enters the sewer? (choose one) ❏ **Harlem River** ❏ **Wards Island Water Pollution Control Plant** ❏ **Atlantic Ocean** ❏ **Pumped back into Van Cortlandt Lake.**

WHERE DOES THE WATER GO AFTER ENTERING THE SEWER?

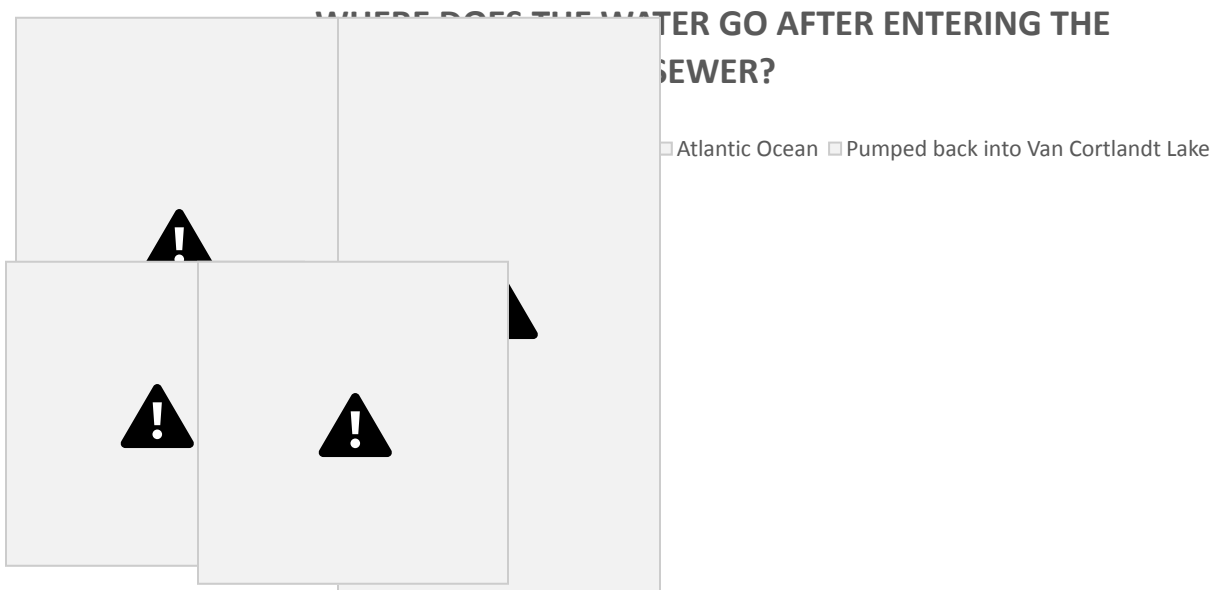☐ Atlantic Ocean ☐ Pumped back into Van Cortlandt Lake

Figure 7. TB and VCL terminates at the southern end of Van Cortlandt Park, where it enters the combined sewer system of New York City. On a dry day, the water within this pipe travels to Wards island pollution control Plant, however rain can trigger a combined sewer overflow (CSO) leading to the water within this pipe to enter directly into the Harlem River. Most surveyed patrons 39% saw the Harlem River as the end point of the water after entering the sewer whereas only 16% answered correctly.

8. What percentage of rain events trigger sewage overflow events? (choose one) ❏ **10%**

❏ **40%** ❏ **50%** ❏ **80%**

WHAT PERCENT OF RAIN EVENTS TRIGGER SEWAGE OVERFLOW?

en Percent ☐ Forty Percent ☐ Fifty Percent ☐ Eighty Percent

Figure 8. Combined Sewage overflow events occur when the volume of rain water entering the sewage system exceeds capacity forcing the overflow of sewage into local rivers. Surveyed park patrons thought that 40% of rain events contributed to sewage overflow.

9. How many gallons of water from Tibbetts Brook enter the sewage system on a dry day

(no rainfall)? ❏ **None** ❏ **10-20 gallons** ❏ **3,000-5,000 gallons** ❏ **4-5 million gallons**

HOW MANY GALLONS OF WATER FROM TIBBETTS BROOK ENTER SEWAGE SYSTEM ON DRY DAY?

☐ None ☐ Ten-Twenty Gallons ☐ Four- Five Thousand Gallons ☐ Four- Five Million Gallons
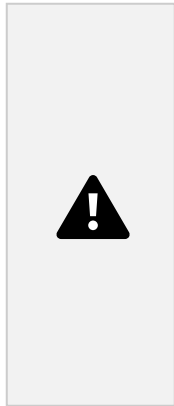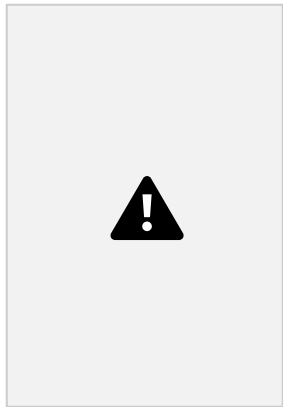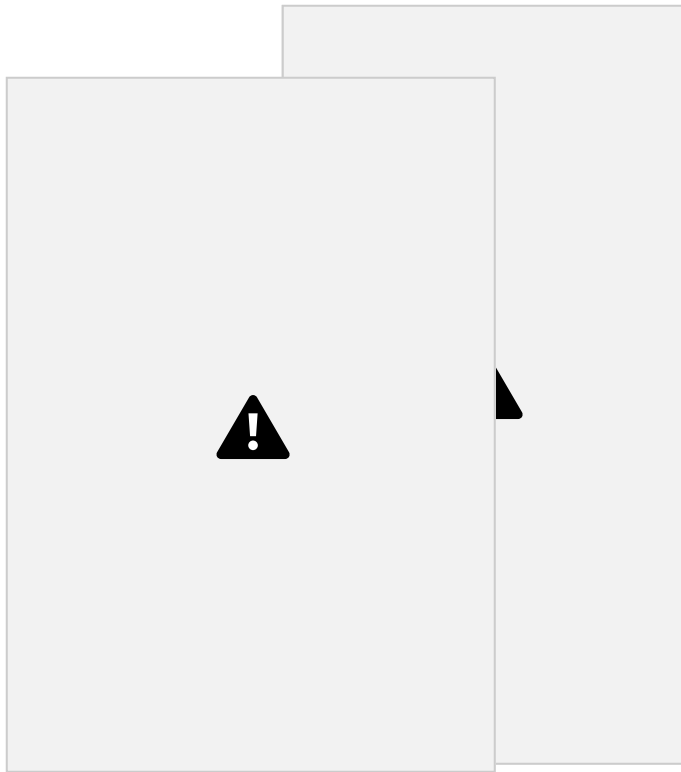
Figure 9. TB and VCL Flow into the sewer system where water is treated by Wards Island Water Pollution Control Plant on a dry day. The top two answers for this question exhibit large discrepancy, (40%) of surveyed patrons thought that Ten-Twenty Gallons of water flow to the treatment facility on a dry day, where the top answer suggested 4-5 thousand gallons. The correct answer is 4-5 million Gallons.

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10. Do you think the water in Van Cortlandt Park needs to be treated at a water treatment facility? ❏ Yes ❏ No

DO YOU THINK WATER IN VCL NEEDS TO BE TREATED BY A WATER TREATMENT FACILITY?

☐ Yes ☐ No

Figure 10. VCL and TB waters are treated by Wards Island Water Pollution Control Plant as a function of flowing the brook into the sewer system. Most surveyed Park patrons 64% suggest that the water of VCL and TB needs to be treated by a water treatment plant. FVCP's water quality monitoring program has shown that the water does not need to be treated.

11. Are you aware of any actions that are being taken to improve water quality in the lake, such as the removal of invasive and non-native species and water quality testing? ❏ Yes ❏ No

ARE YOU AWARE OF ANY ACTION TO IMPROVE WATER QUALITY SUCH AS INVASIVE PLANT REMOVAL AND WATER QUALITY MONITORING?

☐ Yes ☐ No

Figure 11. The Friends of Van Cortlandt Park have been working on multiple projects surrounding the quality of the lake's chemistry and biodiversity. Most surveyed park patrons are unaware of activities to improve the Tibbetts Brook ecosystem.

12. Are you aware of the daylighting project of the Saw Mill River? ❏ Yes ❏ No

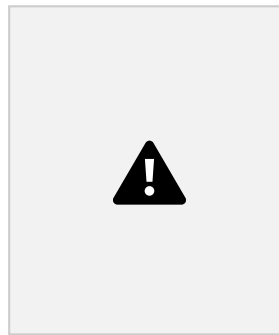### ARE YOU AWARE OF THE DAYLIGHTING OF THE SAWMILL RIVER?

☐ Yes ☐ No

Figure 12. Just as efforts to daylight Tibbetts Brook are underway, the Saw Mill River located in Westchester county was successfully daylit in Yonkers where the water now flows into the Hudson River. Most surveyed park patrons were unaware of the Daylighting of the Saw Mill River.

13. If Tibbetts Brook is daylit, to where will the water flow? (choose one) ❏ Bronx River

❏ Hudson River ❏ Harlem River ❏ East River

IF TIBBETTS IS DAYLIT, WHERE WILL THE WATER FLOW?

☐ Bronx River ☐ Hudson River ☐ Harlem River ☐ East River

Figure 13. The proposed route for the Daylighting of Tibbett's Brook will run the water into the

Harlem River, where it once naturally flowed. Over half of surveyed park patrons 53% thought

the Bronx River was the proposed terminus of flow with 25% answering the Harlem River.

14. What are major barriers to completing this project? (choose however many apply)

❏ **Obtaining the land** ❏ **Water quality** ❏ **Funding** ❏ **Public support**

WHAT ARE THE MAJOR BARRIERS TO COMPLETING THIS PROJECT?

☐ Land obtaining ☐ Water quality ☐ Funding ☐ Public Support

Figure 14. Given daylighting is multifaceted, involving the work of scientists, public officials and community leaders, many barriers must be overcome before putting the project into play. Most park patrons think that funding is a major barrier to project completion. Land acquisition which has shown to be a current top priority for the project was less of a concern by the surveyed public.

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15. Do you think that daylighting Tibbetts Brook could help New York residents better connect with nature and the environment? ❏ Yes ❏ No The next section concerns Van Cortlandt Park's animal protection and diversity, or the variety and abundance of living species in an ecosystem.

DO YOU THINK DAYLIGHTING TIBBETTS BROOK COULD
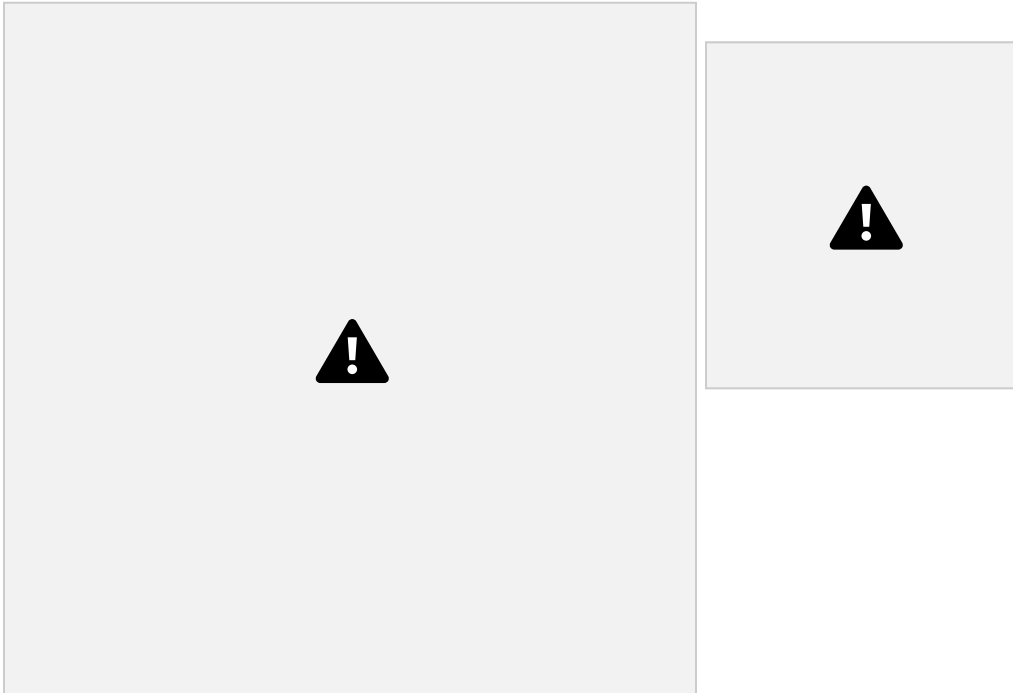HELP RESIDENTS CONNECT TO NATURE?

☐ Yes ☐ No

Figure 15. Urbanization removes citizens from interacting with nature when biodiversity and ecosystem function are not considered as part of the design process. Most surveyed park patrons believe that daylighting of TB will increase connection to nature, shown to be beneficial on many fronts.

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16. Generally algae are an important POSITIVE component of an ecosystem. ❏ **True**

❏ **False**

GENERALLY ALGAE IS AN IMPORTANT POSITIVE COMPONENT OF AN ECOSYSTEM
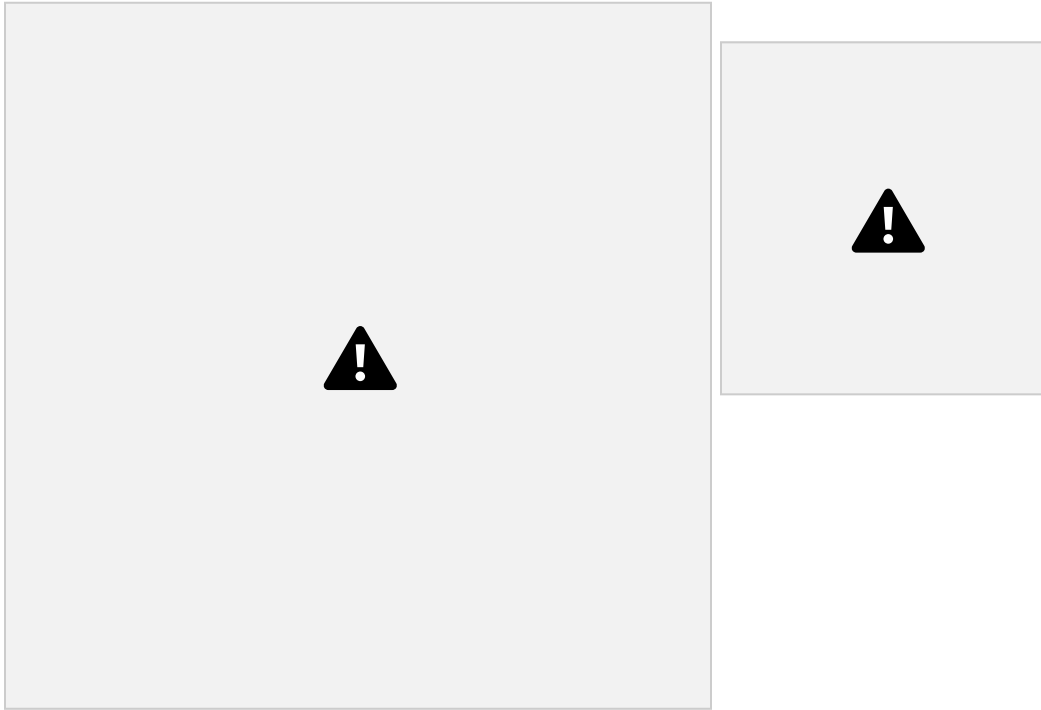
☐ Yes ☐ No

Figure 16. Due to the problem's algae cause in urban areas as a function of increased nutrient concentration, it is possible many nonscientists are unaware of the beneficial properties of algae in freshwater ecosystems. Most surveyed patrons agreed that despite being agents of rapid change, algae are important.

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17. Do you think that Van Cortlandt Lake/Tibbetts Brook is a suitable habitat for animals?

❏ **Yes** ❏ **No**

DO YOU THINK VCL AND TB IS A SUITABLE HABITAT FOR ANIMALS?

☐ Yes ☐ No

Figure 17. FVCP staff has recently completed the most comprehensive analysis of biodiversity within Tibbetts Brook and Van Cortland Lake to date, describing over 40 different types of invertebrate taxa. Most park patrons surveyed 72% thought that VCL and TB are suitable habitat for animals.

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18. Do you think that daylighting could improve animal diversity and protection? ❏ Yes ❏ No

DO YOU THINK DAYLIGHTING COULD IMPROVE NYC ANIMAL DIVERSITY AND CONSERVATION?
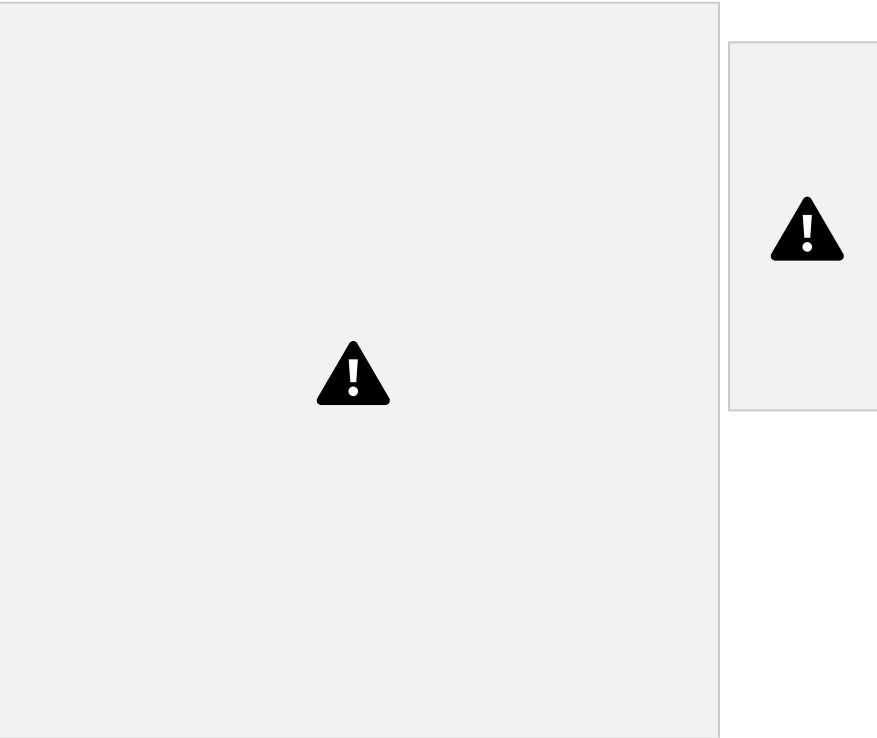
☐ Yes ☐ No

Figure 18. Daylighting of TB and VCL will reduce the number of CSO days on the Harlem River, as well as indirectly providing new habitat and niche space for NYC wildlife. Overwhelmingly, patrons when surveyed responded with an overall improvement to animal diversity and conservation with daylighting.

19. Would you say the water quality here is (choose one) ❏ Great ❏ Good ❏ Fair ❏ Poor

WHAT IS THE WATER QUALITY OF VCL AND TB?
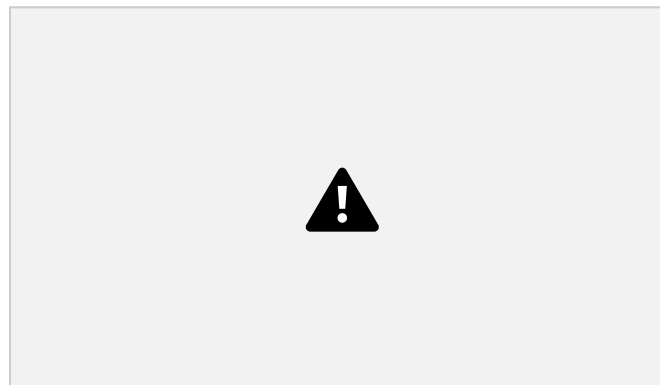
☐ Great ☐ Good ☐ Fair ☐ Poor

Figure 19. Based on research by FVCP the water quality of VCL and TB is classified as Hypereutrophic to eutrophic, meaning a fair to poor classification would best suite the state of Van Cortlandt Lake and Tibbetts Brook. Only 2% of surveyed patrons thought the water quality to be great with 68% answering within the correct range.

Discussion and Caveats

We recommend the use of surveys within the park as it both provided an opportunity to collect stakeholder information as well as act as outreach and education for the organization. Surveys should be first trialed in the field and refined based on the ease of patron understanding. Surveys should be printed in multiple languages for maximum output. It is also important to limit the responses of people to single answers as the independence of the data gets confounded and analysis becomes difficult. We also suggest that individuals distributing the surveys not be stationary at a table or tent but rather approach park patrons as we observed a large increase in success when an active sampling approach was used. For future survey work where questions test public awareness on specific phenomena, we recommend adding the additional answer to each question (I Don't Know), this will allow for a more representative understanding of public awareness as we suspect that in the absence of an (I Don't Know) people may choose answers at random. We also recommend reducing the amount of jargon, especially when concerned with scientific matters.

Major findings include that most park users 60% are unaware of FVCP, providing data for the advancement of outreach within the organization. In addition, most park users are unaware of the existence of Tibbetts Brook 65% suggesting to us that in general NYC freshwater ecosystems are underappreciated and that the work of FVCP largely goes unnoticed 64% were also unaware of

any conservation action within VCL and TB. Our data on perceived threats to Tibbets Brook

demonstrated that the basic ecological knowledge is lacking in park patrons as a majority. An

increase in educating people about eutrophication in the park is needed. With only 16% of

surveyed patrons aware that TB and VCL water enters a water pollution control plant, we

recommend pushing for an educational sign at the waterfall outflow providing the needed

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information and basic background. However, despite this most surveys patrons 64% thought that

the VCL and TB water should be treated by a water treatment facility. In terms of providing

public support for Daylighting, most surveyed patrons think that Daylighting will help NYC

residence connect with nature 82% and improve habitat for wildlife 93%. Based on questions

about the particulars of Daylighting such as the number of CSO days, volume of transported

water on dry days and the proposed route we suggest the development of a specific FVCP

educational program on the weekends that focuses on Daylighting to increase awareness and

education.

Given the overwhelming positive responses to questions regarding biodiversity/animals,

FVCP would find a large base of public support for wildlife/animal/plant-based

restoration/conservation and research projects. Lastly park patrons in the education fields are

abundant within the park making up most surveyed occupations.

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