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Introduction:

The Hudson River begins in upstate New York before eventually emptying in the Atlantic Ocean in between New York and New Jersey. Throughout New York, runoff from agriculture, combined sewage overflows, and street runoff has led to contamination in many parts of the Hudson River (Riverkeeper, 2015). An increased vigilance and investment in cleaning up our waterways has led to increased water conditions, with many areas of the Hudson River even deemed swimmable by Environmental Protection Agency standards (Riverkeeper, 2015).

Evidence of this can be seen in New York City by the resurgence of fish, whales, eagles, ospreys, beavers, and more wildlife returning to the area. In the summer of 2015, a record number of ospreys were confirmed nesting in Jamaica Bay, Queens with 21 active nests, compared to 18 in 2014 and none at all in 1990 (Kern-Jedrychowska, 2015). In 2007, the first beaver in New York City in 200 years was spotted in the Bronx River, and a second beaver was seen there three years later (Paddock, 2010). In April 2015, the first pair of nesting eagles in 100 years was seen on Staten Island (Bailey, 2015). Perhaps most striking is the return of whales to the waters of New York, last year, 106 humpback whales were seen in the city – up from just five in 2011 (BBC, 2014).

The return of whales is attributed to years of conservation efforts helping to clean up our waterways which have led to an increase of fish that whales like to eat (BBC, 2014). The combination of improved water quality, the banning of the pesticide DDT in the 1970s, and the installation of nesting platforms in Jamaica Bay in the 1990s could all be contributing to an osprey comeback (Kern-Jedrychowska, 2015).

My intention when I started this project was to incorporate often underserved populations in Staten Island, Queens, and the Bronx by highlighting and documenting the return of animal species to the area. The return of these animals shows that conservation efforts are working and making our environment healthier. A study found that more whales in the ocean could be a strong indicator of more fish and healthier waters (Roman, 2014), so an increase in whale sightings in New York City could be a strong indicator of cleaner waters.

Polluted waterways in New York City, especially the presence of fecal bacteria from combined sewer overflows, is an especially large problem that can be addressed with green infrastructure such as bioswales, rainwater barrels, and green streets (Bronx River Alliance, n.d.). By mapping wildlife in these areas, residents would see the benefit of conservation efforts and hopefully become more involved in conservation and could see an increase in funding from government agencies or nonprofit organizations for green infrastructure projects like the examples mentioned above.

Through my experience living in New York City for the past five years and from talking to people who live throughout the five boroughs, I know that residents in Staten Island, the Bronx, and the outer edges of Queens where wildlife have been returning often feel overlooked when it comes to funding of infrastructure projects, park upgrades, and transportation improvements. By mapping increased wildlife activity in these areas, the residents will hopefully feel more connected to their community and gain much needed attention from city officials and wildlife enthusiasts which could lead to more resources for other restoration projects. By documenting where wildlife is congregating, what wildlife is confirmed, and how often they're seen, hopefully this information can be used to aid conservation efforts in New York City and beyond and make these communities healthier overall.

However, after reaching out to some New York City based-nonprofit groups as well as some individuals on Staten Island, I realized my focus was too large and it would be too difficult given the amount of time to meet with enough people for the purposes of my original project in these areas. I also had a difficult time getting responses from people during the early stages of my project, but I eventually got in contact with Darren Klein from the New York City Audubon group and had a phone conversation with Paul Sieswerda, the Executive Director of Gotham Whale.

Gotham Whale is a nonprofit research group based in Staten Island which partners with the for-profit group the American Princess that runs whale and dolphin watching trips out of the Rockaways in Queens. This contact was made through Kerry Gallagher who currently works at

the Staten Island Zoo and is in my Advanced Inquiry Program cohort. Gotham Whale collects marine mammal sightings from the American Princess whale watching trips, from boaters in the area, and citizen scientists to track sightings and conduct research. However, Gotham Whale currently doesn't have the staff or capacity to document all of these sightings. Sieswerda said some kind of system where people can plug in where a species was sighted, the species type, the date, as well as a picture would be helpful for the whale watching business, researchers, and boaters which is what I set out to do with this project.

Gotham Whale has an incomplete database of whale sightings from their trips on the American Princess, but for the purposes of my project I have researched and mapped whale and dolphin sightings in New York and New Jersey to test out a process for inputting the data and to show where species have been seen in the area.

After laying out the scope of the project with Sieswerda I met with Darren Klein who currently works at the New York City Audubon Society. Independently of NYC Audubon, Klein came up with a system where people can input the locations of dead and injured birds and have these displayed on a map. He hopes to utilize his system for other groups who would like to create their own maps. Klein came up with a mapping system and input form for my map and I am excited to connect him with Sieswerda so they can continue to benefit from each other's discoveries and engineering.

I also got in contact with Will Lenihan who works at the Staten Island Museum. He informed me the museum has records of wildlife sightings going back decades. I would have liked to also include historic data points of marine mammals in the area, but time did not allow for more inputting.

Participatory mapping method:

Despite a slow start to my project once I got in contact with some community members I really hit the jackpot. Darren Klein was amazingly helpful in customizing a mapping system that would fit the needs of my project and clearly present the information that would be most helpful to

Gotham Whale. He set up a map and input fields for species, date, time, notes, picture, and the source for each wildlife sighting. Wildlife sightings can also be shown by month so users can see the migration of the animals.

After my mapping system got under way I researched marine mammal sightings in New York City, Long Island, and New Jersey. I included sightings that were published by reputable news outlets and included at least one conclusive picture and/or video. To create my map all I had to do was select the location on the map and type in the appropriate information for it to show up. Since my sightings are coming from local news outlets, they are as close to the area sighted as possible.

The link to this map is available here and will be after the conclusion of this project: https://darren-field-set.cartodb.com/viz/e16217fa-81dc-11e5-a654-0ecd1babdde5/public_map

Screen grab:

Figure 1

In the website format, users can select a data point and see information about the species, location, and when the species was seen.

Discussion/Results:

I was very excited about my original idea for this paper but given time constraints and the sheer size of New York City it quickly became clear my scope was too large. I hope someone, possibly myself, someday takes on a participatory mapping project involving more members of the community so underserved neighborhoods can feel more connected to their natural environment.

One thing I noticed during my community listening was that all of the organizations and people I contacted did not know of any individuals or groups of individuals who I could work with on this mapping project. Everyone I spoke with was either part of a nonprofit organization or from a city agency and they referred me to different groups or government agencies. I thought someone would direct me to a group or couple of individuals who were avid birders or were often seen wildlife spotting for example, but I did not find this to be the case in any of these communities. It is possible I was not clear enough about the types of people I hoped to engage with on this project, these types of people or groups are not prevalent enough for others in the community to know about them, or they did not want to participate in a group project. I do not think it is because these types of people do not exist, I think perhaps some greater clarity of my project in the beginning and given additional time I could have found the active environmentalists I was looking for.

Despite my disappointment at not being able to involve my community more in this project, I think making the connection with Darren Klein will hopefully allow something like my original idea to happen in the future. The mapping system he has made is easy to use, can be used on a mobile phone, and produces a simple, helpful map. In terms of connecting researchers and wildlife enthusiasts going forward, I think my project has been a success. I hope Gotham Whale continues to use the map I've created and the system Klein has put in place to add marine

wildlife sightings for the customers of the American Princess ship and for the broader community.

By learning where marine mammals have consistently been seen, boaters can be careful entering these areas in order to avoid injuring whales, whale watching expeditions and researchers can get a better sense of when they are most likely to see a whale and what time of year they could have the best chances of a whale sighting.

I think my project has highlighted that ease of use is crucial in a group or individual's ability to maintain and create a useful map. Reporting on or documenting one whale sighting is easy but where do you go from there? As I learned, compiling sightings even in a relatively small area is very time consuming and I had to severely limit how much I could include. Once a system is put in place, however, the time constraints become less severe and the entire process is easier for everyone.

Going forward, I hope Darren Klein's system is used by more wildlife lovers across New York City. Showing the migratory patterns and increases in wildlife activity over the years can go a long way in making people more protective and connected to their environment.

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Appendix:

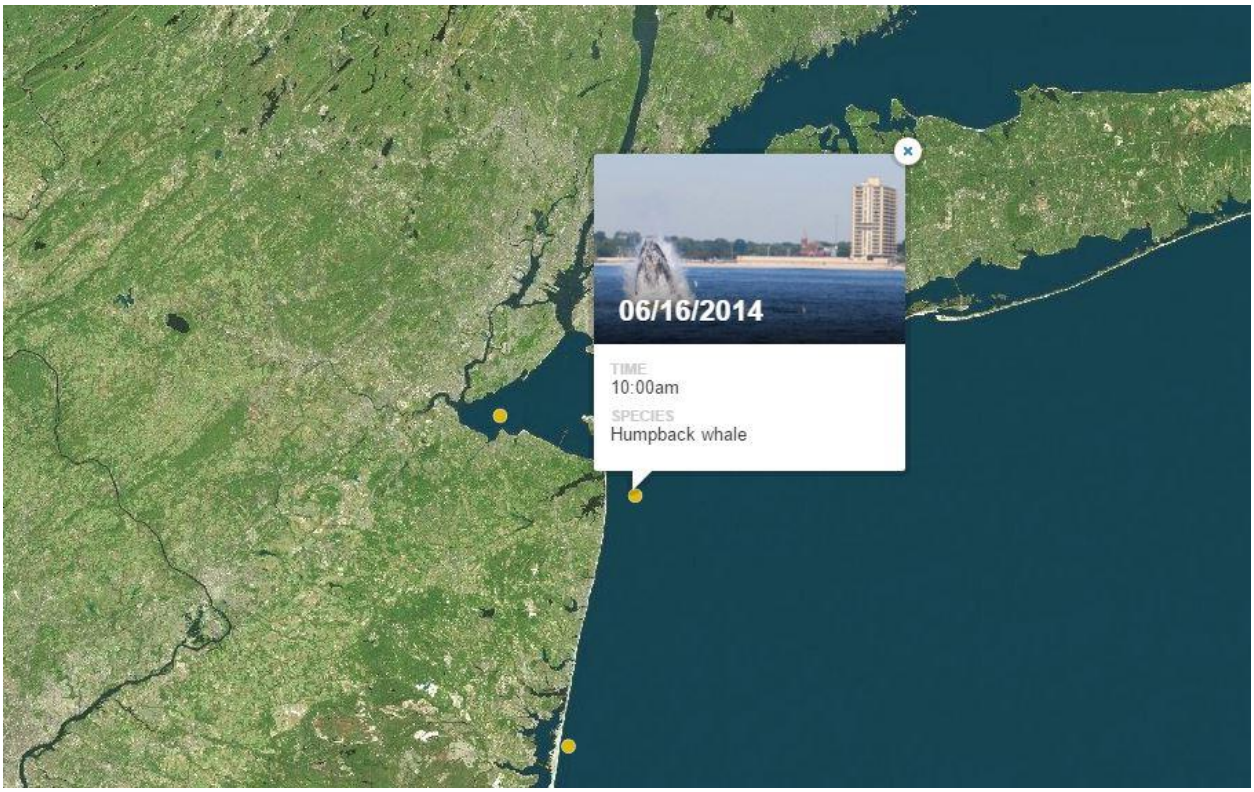

Figure 2: Example of expanded view when the user clicks on a data point.