

Summaries of Hampton Roads Datathon Project Presentations

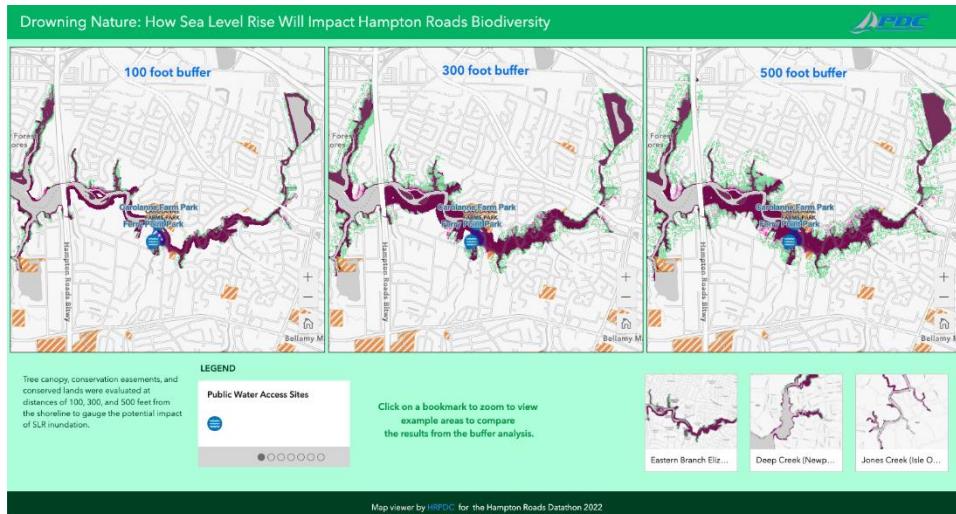
First Place Winner

Team: Hampton Roads Planning District Commission

Project title: Drowning Nature: How Sea Level Rise Will Impact Hampton Roads Biodiversity

Summary:

Sea level rise will cause significant impacts to important conservation, recreational, and natural resources and by extension, the biodiversity of species that live in these areas. These resources are typically protected or managed through easements, public investment in infrastructure and other assets, and regulations. However, these approaches do not currently account for sea level rise, which will inundate low-lying coastal areas and increase flooding or alter the shoreline in others. Assessing the impacts of sea level rise on these resources is the first step toward developing appropriate adaptation strategies. Team HRPDC analyzed the potential impact by overlaying the regional sea level rise scenarios with the existing tree canopy, conservation easements, and other conserved lands in GIS and calculating the number of acres that will potentially be inundated with water. Various distances from the shoreline were used (100, 300, and 500 feet) to provide a range for these estimates. The impact to public water access sites across the region was also calculated.

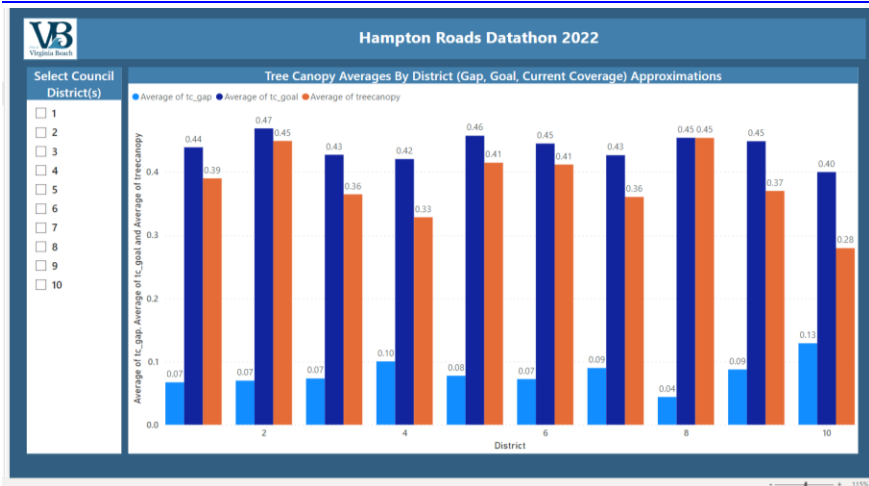
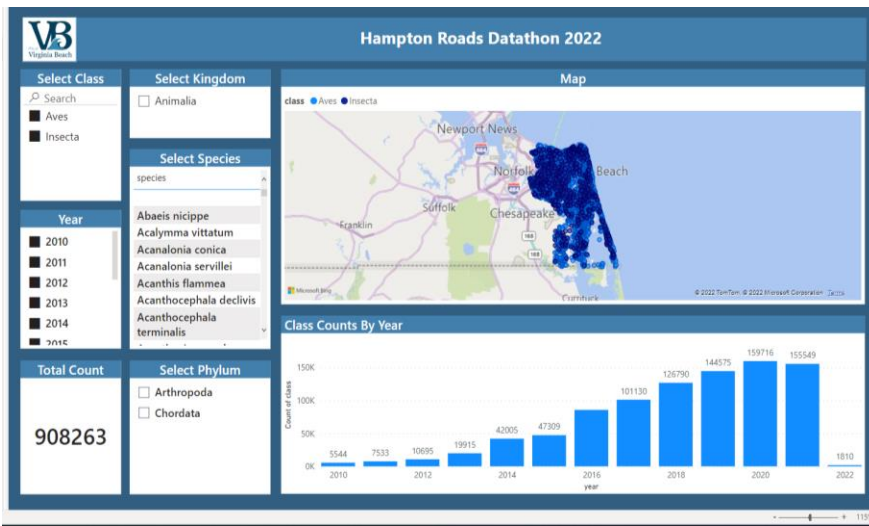


Second Place Winner

Team: The City of Virginia Beach: Collaborators for Canopies and Pollinators

Summary: The goal of this project is to understand and assess the factors affecting the biodiversity in our city and to identify areas and actions for improvement. Using available data, we score key performance indicators that affect biodiversity. In doing so, we hope that this information can help our citizens and leadership prioritize conservation efforts within the community. The City of Virginia Beach recently adopted a 10-district voting system. Our purpose is to measure a Biodiversity Score for each district to help us better focus conservation efforts and future actions for improvement. By using data from different resources, we are able to take a systematic approach in measuring the factors that affect the state of biodiversity in the City. These metrics are the first step in developing a comprehensive strategy to improving our Biodiversity scores over time.

POWER BI DASHBOARD: <https://app.powerbigov.us/groups/be7b0109-69a9-4123-84de-38e4399020ff/reports/0ced10f7-972c-45a5-aa3a-9da3342ec682/ReportSectionef15b5501b9058126f12>



Third Place Winner

Team: Old Dominion University Wetlands

Project title: Wetlands and Protected Areas in Hampton Roads

Summary: Wetlands are known as the "world's kidneys" as they purify and reduce water flow into the sea. They also help in controlling floods and reducing water pollution. They are among the most productive ecosystems on the Earth, and even so, they are among our most endangered ecosystems. This project is established to determine the coverage of wetlands in the surrounding area of Hampton Roads, Virginia. We have used ArcGIS pro to study conservation areas and wetlands to target potential wetlands' seriousness or severity, then we use PowerBI for the visualization of the data analysis (Fig 1-5). The primary protocols to develop this project are designed around available GIS data. The principal data layers used in the targeting models are – Wetlands, Conservation Lands, Priority Conservation Areas, and Boundaries of Hampton Roads (Table 1). The project here analyzes the current protection of wetlands in Hampton Roads and is a pilot to develop and analyze the seriousness of the depletion of wetlands. This study will help to understand the dynamics in the wetlands ecosystems and may help establish key steps to achieve innovative management and conservation techniques for coastal ecosystems that are being impacted by climate change. The story map with the project can be found here: <https://arcg.is/OfLmyy>

Highlights and Recommendations:

1. Less than 35% of the total area of wetlands in Hampton Roads are part of protected land.
2. Only 6% of the total protected/managed area contains wetlands.
3. Virginia Beach has the highest number of Protected Areas with Wetlands.
4. Norfolk, Portsmouth, Williamsburg, and New Kent have the smaller number of Protected Areas with Wetlands.
5. Areas in the counties which are priority conservation and threatened areas need more focus on increased protected areas and restoration efforts. Special focus on low-income areas.
6. Interdisciplinary teams and efforts need to be done for effective management and restoration of these vital ecosystems. Policymakers, scientists, non-profits, and community members, each section needs to be involved to achieve the greatest conservation returns.
7. Continuous monitoring of each area is needed. A possible interesting future item is a time series analysis of the wetland change over a long period of time

Honorable Mention

Team: Virginia Modeling and Simulation Center

Project Name: Biodiversity of Significant Trees in Norfolk, VA by Census Tract

Summary: Trees serve an important role in providing protection from the natural elements, such as providing cooler spots to rest during the hot portions of the day and helping to stay out of direct sunlight to reduce the risk of sunburn. Exposure to high temperatures and high humidity can lead to heat cramps, heat exhaustion, and heatstroke. A contributing risk factor to the occurrence of heat exhaustion is a high heat index of 91 degrees Fahrenheit or higher. Trees provide assistance in these instances by providing shade and lowering the perceived air temperature.

For the Hampton Roads Datathon, we explore the benefits provided by trees identified as significant within the city of Norfolk within the Hampton Roads area. Additionally, we also look at the locations of newly planted trees as part of the City of Norfolk's tree planting program that plants trees on city owned property. Data and categorization of significant trees in Norfolk, VA are collected by volunteers with the Norfolk Master Gardeners. Visualizations and analyses are conducted at the census tract level within the city to provide insights into the geographical distribution of trees across the city. Our solution is divided into three sections: (i) visualization of significant and planting tree program trees by census tract in Norfolk, VA, (ii) a simulation exploring the effects of heat exposure and the role of Norfolk's significant trees on pedestrians, and (iii) analytics highlighting the breakdown of trees within each census tract and highlighting the findings from the simulation runs.

Project website:

<https://vmasc-datathon-2022.github.io/>

Project source code and data:

<https://dev.azure.com/cjlynch/Hampton%20Roads%20Datathon%202022%20-%20Team%20VMASC>

Team: Booz Allen Hamilton

Project name: Birds of Hampton Roads

Summary: "Birds of Hampton Roads" is an exploratory data visualization tool to search and filter birds in the Hampton Roads area by their nativity and conservation status. It compiles over 30 years of data from Project Feederwatch, a civilian science effort to survey bird abundance and distribution in North America. The application is built on kepler.gl, a React web framework, to allow users to see the change in bird distribution over time. The application showcased over 280,000 data points across 156 unique species of birds in the area. The solution presented a custom conservation score, representing the change in bird population over time within the region with a weighting applied to recency. The application used nativity status data from the Virginia Society of Ornithology, and sourced images and conservation status from Wikimedia Commons and Wikipedia, respectively. The data scripts used for the source data and web application are available at <https://github.com/engineerchange/biodiversity-hack>.

Team: City of Norfolk General Services

Project Topic: The Elizabeth River & the Mighty Mummichog Fish

Summary: This project explained how the tiny native fish, mummichogs, can be a predictor of river health and eventually human health. In our project, we focused on the Creosote toxin level of the Elizabeth River that polluted the river from centuries of industrial and Naval traffic along this area.

Elizabeth River has played important roles in U.S. history and has been the location of various military and industrial activities since the 17th century. These activities have been the source of tremendous chemical contamination. Several scientific research shows that Atlantic killifish, or mummichog, (*Fundulus heteroclitus*) has a remarkable degree of resistance to chemical pollution. This fish responds to pollution in a very different way. Also, this fish is non-migratory, which is why it is native to this area. The development of cancer and tumors in mummichog are unique indicators of the overall Elizabeth River health. This level of pollution has a potential correlation to an increase of cancer in humans, specifically residents of Norfolk and Portsmouth, due to the reoccurring high flood levels.

Our solution was an "every little bit helps" approach, encouraging fellow city employees to use the provided four hours of volunteer leave each calendar year and partake in volunteerism with the Elizabeth River Project. Most employees are unaware or don't use these paid hours. After becoming aware, City leadership can motivate employees to participate in the cleaning project. Lastly, the City can collaborate with local universities to monitor the fish cancer and make the data publicly available for further research and analysis.

Team: City of Norfolk General Services

Project name: The Elizabeth River & the Mighty Mummichog Fish

Summary: Team General Services presented on the topic “The Elizabeth River & the Mighty Mummichog Fish”. This project explained how the tiny native fish, mummichogs, can be a predictor of river health and eventually human health. In our project, we focused on the Creosote toxin level of the Elizabeth River that polluted the river from centuries of industrial and Naval traffic along this area.

Elizabeth River has played important roles in U.S. history and has been the location of various military and industrial activities since the 17th century. These activities have been the source of tremendous chemical contamination. Several scientific research shows that Atlantic killifish, or mummichog, (*Fundulus heteroclitus*) has a remarkable degree of resistance to chemical pollution. This fish responds to pollution in a very different way. Also, this fish is non-migratory, which is why it is native to this area. The development of cancer and tumors in mummichog are unique indicators of the overall Elizabeth River health. This level of pollution has a potential correlation to an increase of cancer in humans, specifically residents of Norfolk and Portsmouth, due to the reoccurring high flood levels.

Our solution was an “every little bit helps” approach, encouraging fellow city employees to use the provided four hours of volunteer leave each calendar year and partake in volunteerism with the Elizabeth River Project. Most employees are unaware or don’t use these paid hours. After becoming aware, City leadership can motivate employees to participate in the cleaning project. Lastly, the City can collaborate with local universities to monitor the fish cancer and make the data publicly available for further research and analysis.

Team: Virginia Wesleyan University Marlins

Project name: All About Ants in Hampton Roads: Data Analysis and Visualization

Summary: *Brachyponera chinensis* (Asian Needle Ant) is an invasive species of ant that is originally from Japan. It is a generalist feeder but prefers to prey on termites. Therefore, the ant prefers moist and dark areas, generally where termites can be found, to set-up their own nests. As a result, a study was done comparing a local species of ants (*Aphaenogaster rudis*) to Asian Needle Ant to see does Asian Needle Ant impact the seed dispersal of native species of ants. From this study, in plots where Asian Needle Ant was present, the seed dispersal of plants was drastically reduced compared to where no Asian needle ants were present. Therefore, the course of this study was to determine their location and monitor their population within Virginia.

From this, it was determined that Asian Needle Ant had a range extending all the way to Richmond, Va down to the Hampton Roads area capture method that was used was a pitfall trap using a lure and killing agent. The traps were then collected on a weekly basis and counted. Since this species has shown to affect the local population of flora and fauna, many other arthropods that were captured in the traps were counted into morpho-categories to determine the effects that Asian Needle Ant had on the local biodiversity. As a result, from the data analysis the population of Asian Needle Ant started at a high at the beginning of September but dropped off at the end of October. This demonstrated that Asian Needle Ant had a population boom within beginning of September where it then began to drop off as temperatures decreased. Also, from this study, the Asian Needle Ant affect on biodiversity within the traps was recorded and correlated a decrease in biodiversity with the presence of Asian Needle Ant in the trap.

Further analysis of the traps demonstrated that other species of ants were found within the traps. From this, we ran a random fit test to see if presence of Asian Needle Ant corresponded to a high presence of other ant species within the traps. From this, three species of ants were found commonly associated with the Asian Needle Ant. *Aphaenogaster carolinensis*, *Lasius aphidicola*, and *Nylanderia faisonensis* were the top three that were found associated with Asian Needle Ant, of which *Lasius aphidicola* and *Nylanderia faisonensis* are considered slave species of ants while *Aphaenogaster carolinensis* is like *Aphaenogaster rudis* in that both fill similar roles in seed dispersal. Therefore, in future studies it is significant to see does Asian Needle Ant utilize the slave species of ants to help them compete against native species of ants and other insects.

To further communicate this data, a website was designed that could later be improved upon to incorporate more species of ants and insects that can be found in our area to help communicate the data better to the general public.

A link to the website that was made for the project:

https://zeus.vwu.edu/~kdforker/vwu_datathon/index.html