Chesapeake Bay Oyster Population
CS171 Project Proposal

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Background and Motivation

I chose this project because I live on the Chesapeake Bay and am aware of the effects of the dramatic decline in oysters in recent years on the health of the bay as well as Maryland's economy. I am interested in using data visualization to explore patterns in weather, oyster harvesting, water quality, pollution, and economic data in order to better understand the causes and results of the oyster population decline, as well as the success of efforts to restore the oyster population. My hope is to come up with a visualization that provides meaningful insight into this issue that I can share with the Chesapeake Bay Foundation.

Project Objectives

The primary questions I am trying to answer with my visualization are:
-How has the oyster population changed over time in the Chesapeake Bay?
-What are the primary causes of the decline in oyster population?
-What are the effects of the decline in oyster population on the water quality (oysters filter the water), and the local economies?
-How can efforts to reintroduce oysters be most successful? What other elements need to be considered?

I would like to learn how visualization can be used to address a complex issue like this and help highlight conclusions that may not have otherwise been obvious. The benefits of this if successful could be far reaching. My goal is to make an impact by enabling others to fully understand the causes and effects of the issue of oyster population decline in the bay, and provide insight that is useful in restoration efforts.

Data

The Chesapeake Bay Foundation (www.cbf.org) provides some data. There is also data readily available from a number of sources on the oyster population by year and the effects of oysters on water quality (I haven't decided which source to use yet but based on a Google search the sources are plentiful). I will also leverage local weather data from the Weather Underground API as well as economic data from Maryland's government site (msa.maryland.gov), and potentially from other state governments that are affected by Chesapeake Bay oyster trade. Chesapeake Bay pollution data is available on the Maryland government site as well (https://data.maryland.gov/Energy-and-Environment/Chesapeake-Bay-Pollution-Loads-Nitrogen/rsrj-4w3t). The Maryland Department of Natural Resources has data on salinity, water temperature, and other factors that might affect the oyster population(http://mddnr.chesapeakebay.net/). This data is regional and not availble for all areas of the bay.

Data Processing

I will need to do substantial data cleanup since I am bringing together data from so many sources, and some of the data will require HTML scraping. I plan to use Python for scraping data from the web and converting it to CSV or JSON. I will derive a number of quantitative measures in order to enable me to effectively show potential causes and effects of the declining oyster population. These include averages for temperatures, pollution, and water quality measures over time, as well as scoring the economic effect.

Visualization

I plan to display the combination of data sets in a set of linked visualizations. The design will be centered around a chart of the Chesapeake Bay oyster population by year data. I plan to enable users to focus in on each year of this chart individually by using a slider bar, which will trigger the linked visualizations to show up and change based on the selected year.

The main focus will be showing how the decrease in oysters has contributed to an increase in water pollution (to provide support for oyster reef restoration), so I plan to have a single bar showing the pollution level to place emphasis on this link. I will also use linked visualizations to show the effects of oysters on Maryland's economy, and the changes in various aspects of water quality and temperature by year (which have the potential to impact the oyster populations).

Must-Have Features

-Oyster population by year visualization with interactive year slider.
-Linked chart with pollution level.
-Information on how oysters clean water and their pollution-removal rate
-Display of water quality data

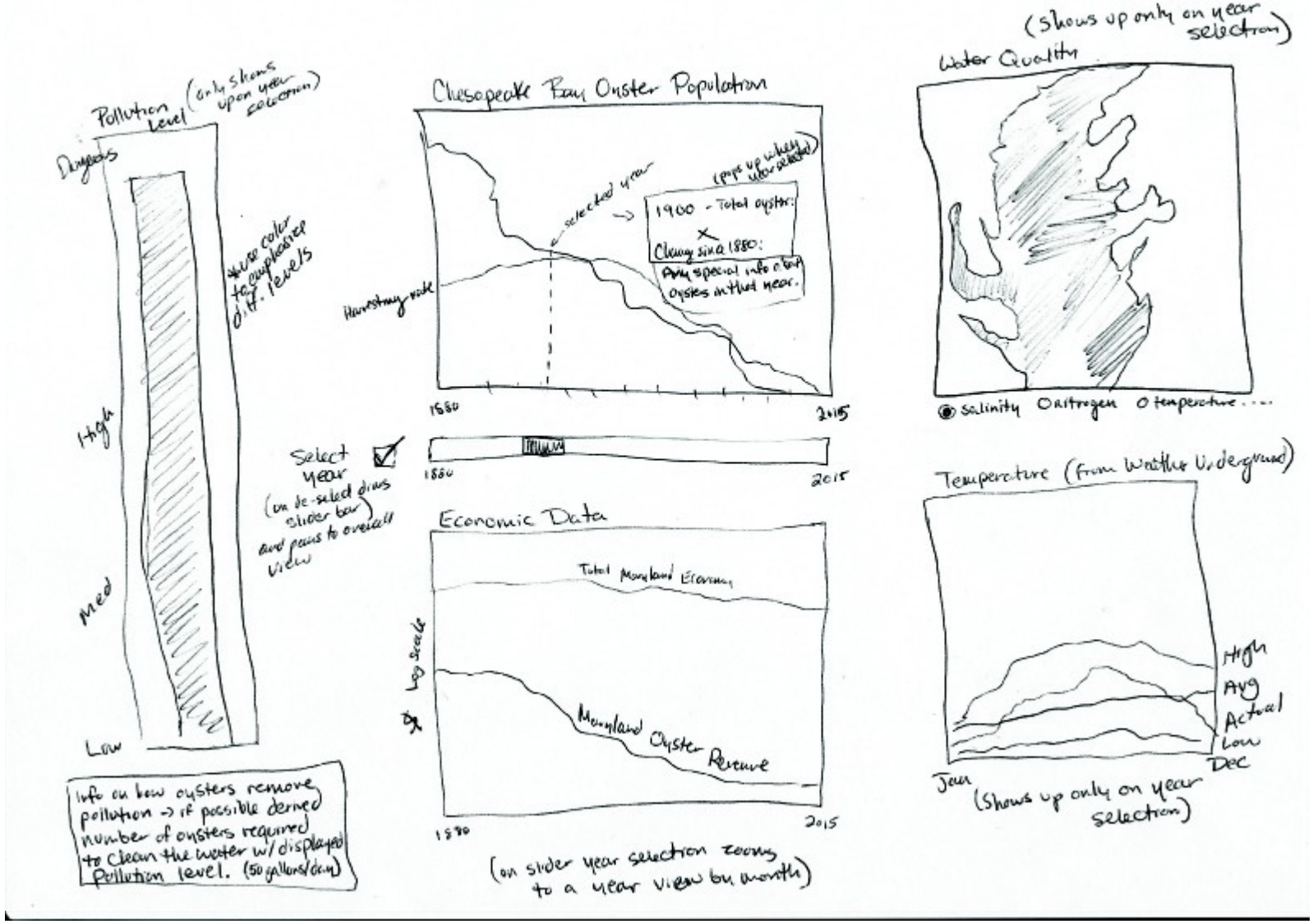
Optional Features

-Pop-up box with percent change in oyster population since a historical year, as well as information about important years with respect to oyster population decline or restoration when a user slides to that year.
-Derived chart showing
-Maryland economic information display with respect to oyster trade
-Weather/temperature data display by year
-Enhanced display of water quality data displayed by region on a map of the Chesapeake Bay

Project Schedule

-Week 1: Complete data acquisition and begin cleaning
-Week 2: Complete data cleaning and static visualizations for oyster population and pollution views
-Week 3: Complete interactivity and begin static visualizations for other views
-Week 4: Complete visualizations, web page, and screencast

See next page for sketches


Pollution Level (only shows upon year selection)
Dangerous
High
Med
Low
*use color to emphasize d.f. levels
Info on how oysters remove pollution → if possible derived number of oysters required to clean the water w/ displayed Pollution level. (50 gallons/day)
Chesapeake Bay Oyster Population
selected year
(pops up when year selected)
1900 - Total oysters:
X
Chesapeake in 1880:
Any special info about oysters in that year.
Harvesting rate
1880
2015
Select year
(on de-select gives slider bar)
and zooms to overall view
1880
2015
Economic Data
Total Maryland Economy
$ Log scale
Maryland Oyster Revenue
1880
2015
(on slider year selection zooms to a year view by month)
(shows up only on year selection)
Water Quality
Salinity
Nitrogen
Temperature ...
Temperature (from Weather Underground)
High
Avg
Actual
Low
Jan
Dec
(shows up only on year selection)