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Project 1: A Real-life Example

The real-life project that I would like to see modeled relates to the Chesapeake Bay, and the problem that the oysters are facing. As many know, the Chesapeake Bay watershed spans over 11,000 miles and is a home to various types of habitats to many organisms, and serves as a great source of revenue for Virginia's government. However, one of the greatest sources of income, the oyster, are dwindling in number. While the oyster may seem insignificant, it is actually a filter-feeder organism, which allows for each oyster to have the ability to filter fifty gallons of the Bay water per day. Not only this, but the oyster reefs provide habitats for other organisms, as well. With the oyster population declining, other organisms lose habitats, watermen become unemployed, and the condition of the Bay declines as there are less oysters to filter it. For example, the current oyster population is only two percent of its former population in the eighteenth century. In this project, I would like to explore the cause for the decline in oysters in order to create a hypothetical mathematical equation.

There are many variables that contribute to the decreasing number of oysters in the Bay. One of the most impacting variables would be the presence of the watermen that work on the Bay. Each waterman has a goal to obtain as many oysters as possible, however, the rate that they take the oysters from the reefs is faster than the rate at which the oyster is able to breed. In addition, while there are restricted areas on the bay that serve to prohibit watermen from

harvesting, these areas are owned by private companies that allow certain watermen to harvest on the area, despite it being set aside as a breeding and recovering ground. For the purpose of this project, this variable would be measured so that one unit would equal one hundred watermen that take part in the oyster industry.

Second, pollution also effects the population of the oysters. As a result of the poultry industry creating run-off, more nitrogen and phosphorous has been introduced into the Bay. In response to this, there has been an increase in the prevalence of algal blooms, which creates areas of oxygen devoid 'dead-zones', which is another factor responsible for killing the oyster population. This could be used as a variable that represents the amount of nitrogen and phosphorus that increase as measured by the percentage of the Chesapeake Bay that has become covered in the algal blooms. In an equation, I would analyze this as using the variable "O", to represent the number of oyster lost per year in thousands due to the increasing percentage of dead zone coverage of the Chesapeake Bay. In addition, another variable that impacts the oyster population is the prevalence of disease, such as Dermo, which impacts the oysters through slowing the growth rate and causing death. By the time that an oyster reaches the age of three, 80 percent of a single oyster class is estimated to die from this disease. Even further, it is known that oysters breed and build their reefs through rooting to each other's shells, so even just returning the empty shells could push the population to increase and establish more reef areas. However, while there is a movement to restore these reefs, not many people return the shells, which stunts the growth of the population.

Given the variables and the current decline in oyster population, this real-life example can be computed by using an exponential equation. For example, I know that each variable, such as the increasing percentage of nitrogen and phosphorous, as well as the increasing number of

watermen and the algal blooms all show a constant percentage rate increase. This would show a concave up graph, with an initially large number of oysters decreasing in smaller amounts over time. Over all, this model is meant to show the severity of the situation of the state of the Chesapeake Bay oysters, and how the increasing percentage of pollutants and watermen negatively impact the oyster population.