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An ecosystem includes all of living things: plants, animals, and organisms. An ecosystem is considered a physical environment, while a community is not. A community is defined as biotic, or living, component of an ecosystem. In fact, the ecosystem provides more of an abiotic component comparing it to a community. An ecosystem can come in many different sizes; it can be marine, aquatic, or terrestrial. Other factors that are taken in an ecosystem are both matter and energy. Energy flows through the system, they usually come from light to heat. While matter is mostly recycled. An ecosystem tends to have biodiversity in an ecosystem, which provides stability with resistance and resilience in each ecosystem (Reaka-Kudla et al, 1997). The resistance and resilience are important when we consider the effect of disturbance caused by human activity.

A living organism living in an ecosystem can be divided into three categories: producers, consumers, and decomposers. These categories play a big role in the Chesapeake Bay ecosystem. The Chesapeake Bay is known to be a very large complex ecosystem with varies kinds of wildlife habitats, including forest, wetlands river, and the Bay estuary life. Water is essential to all organisms, and the ecosystems in which they all live. The balance of nutrients within the system is abnormal (Li et al, 2018). A process that requires nutrients that takes place in major bodies of water is photosynthesis. This process effects health and food quality of different types of plants and animals that live in the aquatic system (Da et al, 2018).

The Chesapeake Bay provides many different types of resources and food to the United States economy. It provides important economic resources, including crabs, oysters, and rockfish, as well as recreational and educational experiences in and around the water. Many of these resources are slowly decreasing. We are not only losing resources; but, also natural land (forest, agriculture, and wetland areas) has decreased from 1990- 2000 (Jantz et al, 2005).

The Chesapeake Bay is one of the largest bodies of water in the United States. It's a complex and productive ecosystem that provides habitats, food, and protection to thousands of different species of animals and plants (Zhang et al, 2018). It also plays a big role in providing

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resources and food to communities around it; but, throughout the years, the Chesapeake Bay is slowly losing energy because of over harvesting and pollution being thrown into the Bay. Because of the outcomes being put into the Bay, this is affecting the ecosystem, animals, and the habitat. Therefore, the Chesapeake Bay is producing unhealthy food and a providing an unsustainable habitat to different species around it (Zhang et al, 2018).

Many different factors contribute to the increase of dissolved oxygen. These factors range from harmless to detrimental. One of the most serious issues caused by eutrophication and the resulting alga bloom is hypoxia, which is typically defined as dissolved oxygen concentration (Da et al, 2018). The formation of dead zones has been exacerbated by the increase in primary production and consequent worldwide coastal eutrophication fueled by riverine runoff of fertilizers and burning of fossil fuel. These productions are the result in an accumulation of particulate organic matter, which causes dissolved oxygen in the bottom water (Diaz et al, 2008). The increase of levels of dissolved oxygen in some areas of the water can cause hypoxia, or dead zone, in the water (Chai et al, 2018). The dead zones are bad for the animals that inhabits the areas, but also the people that rely on the fishing business (Friedrichs et al, 2018). Fishes tend to have a harder time surviving with low levels of oxygen (Da et al, 2018).

Having a low level of oxygen can cause the aquatic life to stress (State of Bay 2018). For example, the rockfish survival population depends upon both the health of the Bay and regulation of the fishery. Physiological stress can increase rockfish mortality including low dissolved oxygen levels, habitat problems, and poor nutrition due to the limitation availability of their preferred prey menhaden (State of the Bay 2018). In the State of the Bay report for the Chesapeake Bay, there was not any anoxic area (State of the Bay 2018). Which mean that there wasn't any area with less than 0.2 milligrams per liter of oxygen (State of the Bay 2016). Also, fish use energy on perfusing, usually on ventilation and often on locomotion (Donald, 1987).

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These costs can cause risk of predation, will vary with oxygen availability and type of behavioral responses shown (Donald, 1987).

Studies have been made of the Bay, researchers have found several issues with the amount of dissolved oxygen (Da et al, 2018). A study was conducted, which demonstrated a level of increased dissolved oxygen was found because of excess nutrients (Environmental Protection Agency, 2003). The excess nutrients enable algae to grow. When algae grow during the day, it takes in carbon dioxide and produces oxygen during photosynthesis.

Furthermore, the impact in climate change may have an effect in the Chesapeake Bay dissolved-oxygen concentration and the potential success of nutrient reduction in attaining mandated estuarine water quality improvement (Friedrichs et al, 2018). As the effects of climate change are starting to get worse, the process of photosynthesis accelerates to unhealthy levels. Therefore, it causes the water quality to become denser and less healthy for animals and plant to maintain a healthy environment.

An improvement has been made comparing to State of the Bay 2014 report, but overall water quality has not increased by much (State of the Bay 2018). There is still hope, however, current reports show an increase of the Bay health over the past couple of years (State of the Bay 2018). Based on the State of the Bay 2018 report, there was an increase in underwater grasses, and an increase in resource lands (State of the Bay 2018). As well as a stability in the rockfish population (State of the Bay 2018). These resources contribute to stainability and improvement of the Chesapeake Bay.

Oysters are essential to the health of the Bay because they help filter the water from dead algae, fish, and other nutrients from the Bay. Oysters used to be everywhere in the Bay, making the water clear and the Bay healthy (State of the Bay 2018). After a large amount of overfishing, the oyster population was depleted. It was then impossible for the smaller population of oysters to maintain the same levels of clarity, and thus makes the water rather opaque (State of the Bay 2016). An increase in algae also does not help water quality (State of

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the Bay 2016). Algae floats at the top of the water and causes the water quality (State of the Bay 2016).

Algae effects fishes and plants, by not allowing to absorb any sunlight. During the cellular respiration algae takes in oxygen, which caused algae to float and block sunlight. Algae is one of the main factors that the water quality in the Chesapeake Bay is so poor. Algae causes other plants in the Bay, like the seagrass bed, and Bay to not produce enough dissolved oxygen (Friedrichs et al, 2018). Without improving the water quality, the Bay will continue to deteriorate and become worse than it is now.

Nutrients that help algae grow also get into the Bay from runoff. This runoff is from the areas surrounding the Bay (Friedrichs et al. 2018). This includes the farms, industrial, areas, suburban areas, river, and they all come together to be drain into the Chesapeake Bay before they reach the ocean (Friedrichs et al, 2018). This indicates that fertilizers, insecticides, and any other chemical that are used are being through thrown into streams. Which the streams connect to river, which finally makes it into the Bay (Friedrichs et al, 2018). The chemical and other product that are being thrown into the Bay are affecting the health and habitat. The state of the Bay is crucial to many different organisms. Some animals depend on it as their habitat, while others work on the Bay. If the health of the Bay is not improved, then these organisms will suffer and most likely died. Which will have a big effect in the environment (Friedrichs et al, 2018).

We want to investigate how the pollutants and other chemicals that are being thrown in, are causing less oxygen to be distributed throughout major bodies of water, causing more aquatic animals to be less healthy. Our result will show the correlation of algae and dissolved oxygen effecting aquatic life and determine weather or not it effects the health of other animals around the Bay.

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