



# Seasonal Variations in Features of Ocean Water

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## INTRODUCTION

Since 2016, Middlesex College has conducted a marine biology research study establishing seasonal trends in features of ocean water. Conducted at Sandy Hook beach in New Jersey, this study focuses on detecting any significant changes in water quality that may be due to environmental factors, as well as climate change. Current research studies note increasing levels of CO<sub>2</sub> being emitted into the air and water, leading to oceans becoming more acidic and inhospitable to marine organisms.

By taking samples from two bayside and two ocean side locations, water quality tests were conducted which consisted of: pH, salinity, and dissolved oxygen (D.O.) measurements. Water and air temperature variations were also measured at the time each sample was taken.

## HYPOTHESES

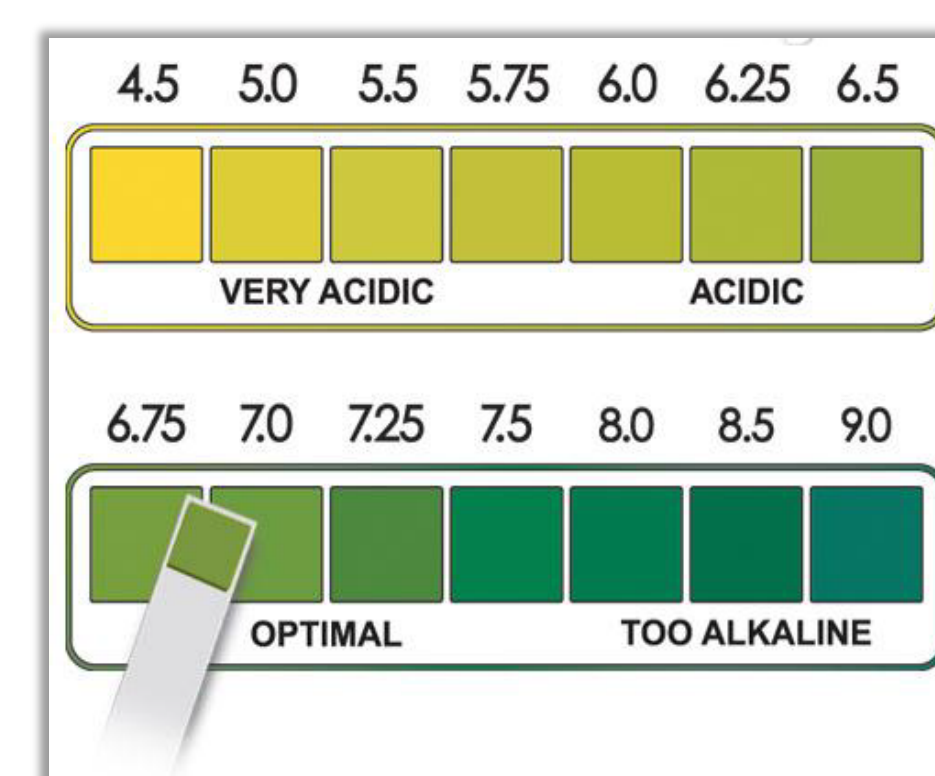
- A higher pH average will be seen in summer months compared to all other seasons
- Lower salinity levels will be present in the winter months
- Dissolved oxygen levels will increase during the winter months

## EXPERIMENT

Monthly water samples were taken from two ocean side locations (Lot C and D) and two bayside locations (Officer's Row and Lot C) in Sandy Hook beach on the New Jersey coast. Each sample was then tested to measure the pH value, salinity level, and dissolved oxygen level.

### pH Test Procedures

- Fill small cuvette with water sample
- Add 8-10 drops of Wide Range indicator
- Shake sample and compare color with predetermined pH level color code



### Dissolved Oxygen (D.O.) Test Procedures

- Rinse bottle with water being sampled and then fill bottle completely, capping bottle under water
- Add 8 drops of Manganous Sulfate followed by 8 drops of Alkaline Potassium Iodine Azide
- Cap sample and invert 2-3 times
- Add 8 drops Sulfuric Acid to create fixed sample
- Fill titration tube with 20mL of fixed sample and fill titrator with Sodium Thiosulfate
- Depress plunger until solution becomes a faint yellow
- Remove titrator and add 8 drops of Starch Indicator and swirl solution to turn it purple
- Depress plunger slowly until color changes and record reading on titrator

### Salinity Test Procedures

- Fill graduated cylinder with water sample
- Take temperature with thermometer and specific gravity with hydrometer and record measurements
- Find both temperature and specific gravity on salinity chart to determine salinity level



## CONCLUSIONS

1. Both bayside and ocean side pH samples remained nearly consistent throughout all seasons. The highest pH readings for bayside samples occurred in the winter of 2017 (averaging 9), and the lowest in winter of 2019. Ocean side samples also had their lowest readings in the winter of 2019.
2. Both bayside and ocean side samples showcased noticeably lower salinity levels during the winter months compared to other seasons.
3. Both bayside and ocean side samples showcased noticeably higher levels of dissolved oxygen during the winter months compared to other seasons.

## FUTURE RESEARCH

Ocean and bayside water pH, salinity, and dissolved oxygen levels will continue to be tested by future research students as part of this long-term study on water quality on the coast of New Jersey. The potential correlation between Sandy Hook results and ground water discharge locations, as well as combined sewage outflows (CSOs) and the effects that Covid-19 in sewage outflows may have on the water quality, may also be included.

Additionally, future research may include adding the northern-most point of Sandy Hook as a new location to see if there is a difference in water quality due to bay and ocean water mixture. Research results will be shared with NJ Sea Grant Consortium for future collaboration.

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## RESULTS

