

[All video music obtained from iMovie]

Community Concern

>>[Ande Ehlen]: Lake Superior, Lake Michigan, Lake Huron, Lake Ontario and Lake Erie.... The Great Lakes... All connected through flowing channels to the Atlantic Ocean through the St. Lawrence River.

>>[Joe Regan]: This area is home to more than 40 million people in the United States and Canada and provides a vital habitat to thousands of species of plants, fish, waterfowl, birds, and mammals.

>>[Ande Ehlen]: Despite the large size of the Great Lakes, spanning more than 10,000 miles of coastline, this water system is highly sensitive to the effects of a wide range of pollutants. These lakes, the largest supply of fresh water on Earth, are now threatened by serious environmental issues.

>>[Joe Regan]: Runoff from soils and farm chemicals from agricultural lands, waste from cities, discharges from industrial areas and disposal sites all contribute nutrients for algal blooms. With all the damage done to the lakes, do we still stand a chance of restoring this natural wonder back to its original form?

>>[Ande Ehlen and Joe Regan]: Yes, but with dedicated efforts.

Introduction

>>[Ande Ehlen]: Hi, I'm Ande Ehlen, a recent graduate with a degree in Biology from Christopher Newport University.

>>[Joe Regan]: Hi, I'm Joe Regan, a second year grad student at Christopher Newport University studying Environmental Science, and we are the Great Lakes Water Resources Team with the NASA DEVELOP Program.

>>[Ande Ehlen]: We've partnered with the Great Lakes and St. Lawrence Cities Initiative in order to highlight the capabilities of NASA Earth observations in evaluating intense precipitation events, storm-water runoff, and algal blooms.

Study Areas

>>[Ande Ehlen]: This project focused on four study areas within the Great Lakes and St. Lawrence Waterway.

These locations in Lake Michigan, Erie, Superior, and the St. Lawrence River were selected based on their growing concern for algal blooms in the lake water near large urban areas.

Methodology 1

>>[Joe Regan]: To analyze the concentration of algae in these study areas, we first identified three intense precipitation events from various years.

These precipitation events were identified using ground weather station data and the TRMM satellite, which measures rainfall over an area every three hours.

Methodology 2

>>[Ande Ehlen]: To monitor water quality levels following these extreme precipitation events, sediment within the water column was observed by calculating Total Suspended Sediment (TSS) from the MODIS sensor on the AQUA and TERRA satellites.

This sediment in the water is from stormwater runoff on the land, thus carrying potential pollutants and nutrients from

agricultural and urban areas. Suspended sediment is in high concentrations in the water directly after the rainfall event and the immediate days following.

Methodology 3

>>[Joe Regan]: The last step of the project shows the intensity of the algal blooms in each study area.

Heavy rainfall creates conditions favoring the rapid growth of populations of algae because the algae feed on nitrates and phosphates in the storm-water runoff.

Algal blooms can be identified through remote sensing instruments by analyzing the chlorophyll concentration that the algae create.

When conditions are ideal, algal blooms form in the weeks following intense rainfall events with high sediment concentrations.

This video shows a time-lapse of chlorophyll concentrations following the July 9th, 2005 rainfall event. The images seen in this video of the lower St. Lawrence were also created using imagery from the MODIS sensor.

Conclusion

>>[Ande Ehlen]: In summary, we were effectively able to use NASA EOS to study the water quality of the Great Lakes.

The TRMM satellite demonstrated NASA's capabilities in evaluating intense precipitation events, while methodology utilizing the MODIS sensor allowed us to observe sediment levels in the water column and heightened chlorophyll concentrations following the storms.

Acknowledgements

>>[Joe Regan]: We'd like to thank the following individuals for their assistance with this project...