

NASA's Eyes in the Skies Keep Watch Over Critical Coral Ecosystems
NASA Stennis Space Center
Earthzine/DEVELOP Virtual Poster Session, Fall 2011
Video Transcript

Stennis Space Center Gulf of Mexico Ecological Forecasting Team

Introduction

Jason Jones: [Flying into Earth from Outer Space] NASA's Earth Science Division is dedicated to better understanding and protecting our home planet. Here within the Applied Sciences DEVELOP National Program, our goal is to extend the benefits of NASA Earth observation to our local communities. Here in the Gulf of Mexico Region Stennis Space Center DEVELOP students have studied the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. As you can see here from the study area map, the national marine sanctuary at the Flower Garden Banks consists of three primary locations. These are Stetson Bank, West Flower Garden Bank, and East Flower Garden Bank. [Detailed Map of Banks] East Flower Garden Bank is approximately five by nine kilometers. West Flower Garden Bank is approximately eight by eleven kilometers, and Stetson Bank is approximately one half by one kilometer. This work is critical for better understanding and protecting important coral reef ecosystems and conserving biodiversity and protecting our natural resources as you will hear more in a moment. [Underwater Footage of Small Octopus Moving around on a Coral Bank] This work is critical for better understanding and protecting important coral reef ecosystems and conserving biodiversity and protecting our natural resources as you will hear more in a moment.

Team Introductions at the Audubon Aquarium of the Americas

Jason Jones: My name is Jason Jones, and I'm a recent graduate from the University of Southern Mississippi with a Bachelor's of Science degree in Geography and a minor in Computer Science.

Renane Burbank: Hi, my name is Renane Burbank, and I'm with the University of West Florida. I am working on my Master's in Environmental Studies.

Cody Dockens: Hi, I'm Cody Dockens. I'm a junior at the University of New Orleans pursuing a Bachelor's of Science in Environmental studies with a minor in Geography.

Mollie Nunez: Hi, my name is Mollie Nunez. I am a grad student at the University of Southern Mississippi pursuing a degree in Geography.

Voice-in: Threats to the Community Slides

Renane Burbank: The Gulf of Mexico Ecological Forecasting Team is working with the National Oceanic and Atmospheric Administration and the Texas Flower Garden Banks National Marine Sanctuary. Some of the mechanisms of coral reef mortality are: disease and harmful algae blooms which can spread and harm coral reefs and surrounding ecosystems. In the National Marine Sanctuaries, recreational and commercial fishing is limited because

they damage the ecosystem by destroying the reefs and by disrupting the natural biodiversity. Additionally, river run-off contributes to excessive sedimentation and eutrophication by bringing in sediments and nutrients that can harm the ecosystem. Often, several of these stressors combine to cause ecosystem degradation through impacts such as toxicity, reduced of light penetration, and depletion of dissolved oxygen.

Voice-in: Benefits of Coral Reefs Slides

Mollie Nunez: Coral reef ecosystems provide several economic community benefits. As tourism is a major industry along coastal cities, these ecosystems provide resources from recreation and tourism venues. They provide protection to coastal lands from storms and waves by absorbing over 90% of the energy from wind-generated waves and their materials produce sand that creates beaches. Coral reefs support more than 800 hard coral species and more than 4,000 species of fish which makes them major commercial fishing areas providing food for over a billion people worldwide. Coral reefs ecosystems' are the largest area of biodiversity since 32 of the 34 phylum found in the world are found in coral reefs. Reefs are a new source of "bio-prospecting" in the medical field; this is where scientists study living organisms for potential medical uses. Some examples are anti-cancer drugs and anti-viral drugs that are derived from coral sponges.

Voice-in: Data analysis Slides

Cody Dockens: While analyzing data near the flower garden banks, we are looking for chlorophyll anomalies $\frac{1}{2}$ milligram per cubic meter or larger, which would indicate substantial difference from typical conditions. Using SeaDAS software, we have generated anomalies for 2003 – 2011 by subtracting the 7-year average from each monthly average. Preliminary results show chlorophyll anomalies in September 2005 immediately following Hurricanes Katrina and Rita and also for several months in 2008. Because various substances interact differently with certain wavelengths of light, the Fluorescence Line Height product from MODIS will help determine whether chlorophyll or some other substance is actually causing these anomalies. We also plan to compare *in situ data* from Flower Garden Banks scientists with the MODIS data. Results will be completed by the end of the Fall 2011 DEVELOP term.

Jason Jones: The maps Cody just discussed visually depict interesting patterns, but the real value of the data lies in numerical analysis. Using a stationary pixel location at the center of the West Bank (shown by the red cross), we plotted the average monthly anomaly value within a 3 km square box over the entire year. This graph shows where monthly values within that box dip below or rise above the 7-year average. As you can see, there is only a moderate spike (less than $\frac{1}{2}$ mg / m³) in September. This is because the pixel location fell just south of the anomaly shown on the previous map. Now let's look at Stetson Bank, which lies to the northwest, more within the anomaly shown on the map. Here you can see that the value for September 2005 rose nearly $\frac{1}{2}$ mg / m³ above the long-term mean, which indicates a substantial anomaly.

Voice-in: Conclusion Slides

Jason Jones: Accurate and relevant information is key to wise environmental stewardship and decision making, but monitoring the ever-changing ocean often proves challenging. Our research has sought to meet that challenge. The chlorophyll anomaly data that we have produced are useful for better understanding when water conditions have been detrimental to coral health. This type of information is critical to national marine sanctuary staff who are charged with conserving and protecting our nation's marine protected areas, and this data may assist them with targeting their research efforts. The benefits of this project, however, extend far beyond the boundaries of the Gulf of Mexico. NASA MODIS imagery is collected over all the world's oceans, and the methodology described in this presentation can be globally applied to assist environmental decision makers worldwide. Ultimately, the goal of all DEVELOP research is to extend the benefits of NASA Earth Science to our local communities. Thank you for watching our presentation.

Credits

NASA:

Joseph Spruce – CSC
Cheri Miller – DEVELOP
Brandie Mitchell – DEVELOP
Dr. Kenton Ross – Science Systems and Applications, Inc.

University of South Florida:

Dr. Frank Muller-Karger – Institute for Marine Remote Sensing
Dr. Robert Chen – Institute for Marine Remote Sensing

NOAA:

Steve Gittings – National Science Coordinator, NOAA National Marine Sanctuaries
Dr. William Kiene – NOAA National Marine Sanctuaries – Southeast Region
Emma Hickerson – Research Coordinator, NOAA Flower Garden Banks

Photo Credits

Jean DeMarignac – Monterey Bay National Marine Sanctuaries

Claire Fackler – NOAA National Marine Sanctuaries

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