FLORIDA STATE UNIVERSITY
PANAMA CITY

Preserving our Underwater Pastures (PUP): Researching human impact on local historic artificial reef structures

Study and Analysis of reef degradation by recreational and commercial activities in Gulf waters

With miles of Gulf of Mexico shoreline, miles of sugar-white sand beaches and tons of summertime sunshine, Bay County is prime territory for visitors from across the globe. Add to that the beautiful Gulf of Mexico and the accompanying commercial and recreational fishing industry and the need for caution, conservation and concern for these resources arises. In addition to those pressures, the area is included in the coastal areas affected by the Deepwater Horizon oil spill which devastated the tourism industry and the effect on benthic organisms on the Gulf floor is still not totally understood. Given that the threat to this major economic resource is real as well as the fact that so many rely on the health of the Gulf and its underwater environments, it seems prudent that providing the learners in Bay County the opportunity to explore these environments, to analyze their health, and to develop a method of informing others about them is a wise investment with great potential to mitigate further degradation.

Certainly "meaningful watershed educational experiences" (MWEE's) vary in scope and nature, but few have access to the myriad of resources that Florida State University Panama City can supply. FSU Panama City is home to the Advanced Science Diving Program which has matured into a thriving college experience that trains students to operate in an underwater environment while applying forensic strategies to investigate possible crimes and to solve them. In addition to criminal activities, Advanced Science Divers investigate insurance fraud, pollution sites and causes as well as survey harbors and docks for breeches in homeland security. The wealth of expertise that resides at FSU Panama City is great ranging from PhD's to retired safety diving instructors from the Naval Surface Warfare Center Panama City Division Navy Dive School. Connecting this expertise as well as the equipment used in this program as well as the SeaNole, a 41 foot dive boat used by the program, expands the learning possibilities for students enormously. FSU Panama City has a mission to use its resources to enhance the community, and allowing this scope and reach through this B-WET funding to include high school students in the community provides not only great learning experiences that will last a lifetime, but creates new advocates for caution, conservation and concern regarding our marine environments.

The Plan

FSU Panama City through its STEM Institute will recruit 16 students who are fifteen years old or older and who are in a public high school in Bay County or one of the surrounding counties. This project will begin after July 1, 2016 and will culminate July 1, 2018 utilizing the warmer summer months when students are not in school to do most of the data gathering. Four educators will be selected, two primary teachers and two reserve teacher that will be trained and certified to work with students with the hands-on data gathering, analysis and use of science diving equipment and the analysis and interpretation of

the data collected being the professional development of these teachers. Teachers are then expected to utilize their experience to develop their own classroom MWEE's during the ensuing school years with support as possible from FSU Panama City.

FSU Panama City will have teachers implement MWEE using the following professional development model proven for STEM: Teachers will be trained by experts, generally professionals currently working in various Ocean Science STEM areas. Teachers will then practice what they learned with students which become their classes during summer B-WET research implementation. Teachers then return to their own classrooms during the school year to implement their new learning and are assisted as needed by the same STEM professionals with whom they worked during the summer professional development opportunities. This gives teachers the tools to incorporate Ocean Literacy in the classroom and outside labs using MWEE in teaching the direct cause and effect to students using their local watershed and eco-system. This will allow for teachers to feel comfortable when they implement new ocean literacy and watershed based programs since they are provided continued support by Florida State University giving them the confidence to try new things in their classrooms. It also connects them to the network of professionals with whom they have worked closely and now have a personal relationship that removes any barriers between those who teach in STEM areas and those who daily apply STEM learning in their own careers. After utilizing this STEM model over the last ten years to train over three hundred teachers and to provide summer STEM learning to over 2000 students, many of whom have now joined the ranks of those STEM practicing professionals, the model is successful.

For this specific proposal, immersing teachers in the research, data collection and analysis that is required as well as having them utilize some of the latest technology available raises not only the level of educational expertise of the teacher, but also requires that the teacher work alongside students to assist them as they also learn and to continually hone their pedagogical skills as they work to collect data, to analyze it and to extrapolate solutions from the mined data. By working alongside NOAA personnel as well as FSU Panama City experts, teachers create their personal cadre of mentors who are regularly available for collaboration.

The 16 students and 4 teachers during the summer of 2016 will be tasked with the following:

- Earning *Science Diver* certification
  - » This entails learning dive equipment and how to use it
  - » How to use dive resources such as dive tables to maintain safety
  - » How to prepare dive equipment and maintain it for safety
  - » Maintain or gain physical requirements for safe diving
- Learning research techniques for underwater environments
- Learning data analysis strategies
- Preparing data for public presentation

These students and teachers will visit three historic artificial reefs, Black Bart, the old Hathaway bridge span and Stage II. Each of these locations has histories within the region. Students will learn how to employ their new dive expertise and to gather baseline data on reef heights, locations, and fish populations around the structure.

During the school year these students will meet one Saturday per month, September through May for nine additional days of learning. These days will continue work on earning dive certification that will lead to their ability to pass the certification exam to become an official Science Diver. This is a coveted certification and opens many doors as these students seek careers, many of which are related to the Gulf of Mexico, watersheds surrounding the Gulf as well as research and exploration of marine environments. When weather permits, additional dives will be scheduled as necessary.

- Research, data analysis, product development

During the summer of 2017 All students and teachers who have shown exemplary interest, enthusiasm and performance will be invited back as researchers to continue data collection on the three reefs. This will include such data as examining data related to reef degradation such as height and circumference, coral growth as well as cataloging variety of fishes and numbers of fish populations. This three week summer session will focus on utilizing the science diving expertise gained in the first year of this project to gather data, analyze that data and make comparisons with baseline data as well as to determine solutions and present findings in formal settings. This second summer becomes the summer to apply learning for both students and teachers.

During the 2017-2018 school year students will again meet one Saturday per month, September through May for nine additional days to analyze data, to discuss finding and to determine the best solutions for any challenges the data identifies. When weather permits, additional dives will be scheduled as necessary.

The Question/Problem

In years past the marine environment in and around Panama City was not particularly stressed since visitors were sparse and most stayed on or near the World's Most Beautiful Beaches. Today that is certainly not the case with hundreds of thousands of visitors coming to the beaches and engaging in off shore activities, both commercial and recreational, such as fishing and diving. Over the years to enhance recreational opportunities, various governmental agencies have deployed various reef systems to attract fish and to create coral colonies. Those sites quickly became "go to" locations for recreational divers and fisherman and the pressure on these sites has only increased with the increase in tourism that the area has seen.

So the question that this project will address is: **What is the impact human pressure has on these older artificial reefs and the creatures that inhabit them?** In order to answer this question this project will have students and their teachers conduct a quantitative study on the deterioration of artificial reefs caused by human factors. It will measure the physical degradation of these reefs over time and will gather data on fish populations to determine whether there is a correlation between artificial reef reduction of mass and fish populations. This project will conclude with a proposal that addresses what actions could be taken by various agencies to reduce human factor impact. The proposal will be based on the student/teacher data analysis and research they have done that examines how other areas of the globe have dealt with similar issues.

The Activities

This proposed monitoring project is for the Florida State University, Panama City Campus to monitor and assess three historical artificial reefs off Panama City, Florida. The reefs will be assessed to provide new accurate reefs coordinates, assess the reefs to determine how much deterioration happens during the grant period and monitor the faunal communities to identify species population and abundance. The project will collect structural and relative abundance data on the three reef sites below:

TABLE

Deploy Date	Reef Name	Reef Type	Latitude	Longitude	Depth
07/16/1993	The Black Bart	Vessel Metal 180	$30^0$03.622' N	$85^0$49.444' W	79
04/30/1988	Hathaway Span #2-Midway Site	Bridge Spans Metal	$30^0$02.212' N	$85^0$49.444' W	70
unknown	Stage 2	Metal Offshore Platform	$30^0$07.244' N	$85^0$46.477' W	60

Material and Methods

a. Baseline:
   1) Each site will be visited by the students and teachers and FSU Panama City Advanced Science Diving Program faculty on FSUPC's SeaNole, a 42 ft. retired Coast Guard cutter. Each targeted reef will be photographed and measured to provide baseline data.
   2) Using the latest technology available, coordinates of the three reefs will be updated and provided to Florida Fish and Wildlife Commission and NOAA.
   3) Using Imagenix Multibeam Sonar, Marine Sonic Tec. Side Scan Sonar (900/1800 kHz), along with Didson Diver held multibeam sonar (Sound Metrics Corp.) these artificial reefs will be assessed to determine their exact measurements, gain an accurate footprint and navigational clearance.
   4) Using underwater drop cameras with recording capabilities and Ikelite underwater cameras, faunal communities at the twelve artificial reef sites will be monitored and assessed to identify species, population abundance and size.
b. Periodically during the project:
   1) Separate from the baseline and the final visit, each site will be visited by the team a minimum of two times during the project.
   2) Using underwater drop cameras with recording capabilities and Ikelite underwater cameras, faunal communities at three artificial reef sites will be monitored and assessed to identify species, population abundance and size.
c. Data Comparison and Report Preparation
   1) Data from each of the visits will be compared to determine whether or not deterioration occurred from the beginning to the end in the time the sites were observed; how much deterioration occurred; and whether or not there was a change in fish population/size/species between the baseline and the final visits.
   2) A final report with all of this information will be prepared and provided to NOAA at the conclusion of the project.

The first round of surveys will be performed in the summer of 2016 and the second round during the early summer of 2017.

Non-indigenous fish species-In addition to the above fish census data collection, the project team will also be surveying for and reporting on any non-native species of fish identified on the reefs in this project.

Several deliverables will be provided from this study, which will be summarized in a final report produced at the end of the study. All digital images and video collected in this study will be archived on DVDs and transferred to NOAA. Near the end of each summer of study, a compilation of data will be developed by students and teachers which follow requirements for official NOAA documents. Study results will be disseminated through public talks, social and print media and possible publications submitted to peer-reviewed journals.

NOAA itself, which operates a local laboratory on Panama City Beach has many resources that will assist students and their teachers as they pursue their study. In addition local NOAA personnel, who are regular participants in both Bay District School activities and FSU Panama City Summer STEM activities will be utilized to add their expertise to this project. It is expected also that based on findings and the amount of student expertise that can be developed, the scope of this project may be extended to perhaps not only recommending some solutions to the stated problem, but also recommending solutions to some other problems which might be identified during this research.

Through this project students and their teachers will operate in the real world of scientific research. They will operate in an underwater environment so learning to SCUBA dive as well as the physical and medical aspects of diving is required. The energy both physical and mental that is required by this project is significant.

In addition to adding to both teacher and student understanding of the challenges that face our Gulf waters and the flora and fauna that inhabit it, this project will provide both students and teachers access to the community where the public will be informed of the findings and suggested solutions. FSU Panama City regularly hosts meetings and conferences during which findings will be presented. Marine biology classes held at Gulf Coast State College will be informed and NOAA personnel housed at the Southeast Fisheries Science Center, Panama City Lab will become both recipients of the collected data as well as partners in this project.

Completion of this project ensures that these youngsters and their teachers fully understand scientific research, and they grasp the essential point that stewardship of our marine environment is integrally intertwined with our local economy in many ways. As pressures on and demand for these resources ramp up, these students and teachers will remain concerned about conserving these resources and will become the stewards of our Gulf as they move into their careers and our community.

FLORIDA STATE UNIVERSITY
PANAMA CITY

Bay County Teacher Application:

Preserving our Underwater Pastures

(Researching human impact on local historic artificial reef structures)

Name: _____

Years of Teaching: _____

School: _____

Degree: _____

Preferred: *Submission of a Letter of Recommendation from Department Head or Principal will enhance consideration of applicant acceptance.*

Applicants must be able to pass Basic Science Diver swim test by July 8, 2016:

1. *Swim 400 yard in 12:00 Minutes (any swim stroke)*
2. *Swim underwater on a breath hold for 25 yards*
3. *Tread water for 10:00 Minutes*
4. *Recover a 10 pound brick at 12 feet of water*

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I hereby waive any right that I may have to inspect and/or approve the finished product or the advertising copy that may be used in connection with, or the use to which it may be applied.

Date: _____

Full Name: _____

Signature: _____

Consent (if applicable):

I am the parent/guardian of the minor named above, and have the legal authority to execute the release above. I approve the foregoing and waive any rights in the premises.

Date: _____

Full Name: _____

Signature: _____