

# Conservation of Coupled Human-Mangrove Systems

## Research, Teaching, & Capacity Building on the Costa Alegre, Mexico

James Adams Wilson, Undergraduate Student, Department of Geology, University of South Florida, jawilson@mail.usf.edu

USF Students in GLY 4780 & 6739 Ecohydrology of Mexican Mangroves

UNR Students in NRES 485 & 701 Special Topics in Natural Resources Management

### Introduction

Approximately 1 billion people lack safe drinking water and approximately 2.6 billion people lack basic sanitation. These people live in relatively poor regions that lack the political institutions and financial resources necessary to develop the water supply infrastructure necessary to support both human and natural environments. Many of the remaining people have safe drinking water and basic sanitation only at the expense of water-dependent ecosystems in the natural environment. This is often due to a lack of political will-power to control growth that may be associated with a lack of education or refusal to consider the consequences of consuming the water that is required for ecosystem sustainability.

### Costa Alegre

Translated as "Happy Coast", the Southwest Pacific Coast of Mexico is a region that now lies at a crossroads where informed decisions about development can be fostered and implemented, conserving these water dependent ecosystems while allowing economic growth.



La Manzanilla

### La Manzanilla

A small fishing village nestled in Tenacatita Bay faces adversity. With a population of about 1,200 residents, the population doubles when seasonal residents and tourists visit during the dry winter and spring. This influx of people stresses the hydrologic resources through groundwater withdrawal and wastewater disposal while the resources are already naturally stressed via the dry season. This translates to saltwater intrusion being a real threat to the groundwater resources. To further exacerbate the issue, two of the four groundwater wells in town are owned by a neighboring five-star resort and golf course, El Tamarindo.



### Interdisciplinary Research

Five modules allow an interdisciplinary approach to understanding the relationships between ecosystem and water resources. Each module is student driven by individuals from a variety of scientific academic backgrounds.



#### Vegetation and Primary Productivity

- Quantify mangrove species composition & net primary productivity
- Quantify the effects of hydrology on mangrove species composition & net primary productivity



#### Water Quality and Food Web

- Quantify nutrient concentrations & invertebrate community structure
- Model energy flow through the food web, from fixed carbon to fish



#### Fisheries

- Conduct baseline surveys of mangrove, reef and bay ecosystems to quantify fish community structure
- Identify key indicator species and monitoring protocol



#### Birds

- Conduct baseline surveys of the mangrove ecosystem to quantify resident & migratory bird community structure
- Identify key indicator species and monitoring protocol



#### Hydrology

- Quantify water sources and hydrodynamics in the mangrove ecosystem
- Develop a basin-scale numerical model to generate hypotheses regarding potential future conditions

### Solutions Based Approach

Our group consists of principal investigators, student researchers, Earthwatch volunteers and the local community.



### Field Based Teaching



This research project is entirely run as a field course by considering all student participants as fully-engaged student researchers. The field experience is composed of field discussion, lecture, data acquisition, presentation and sharing, student-student team interactions and gives



the students researchers flexibility to create new research avenues or reshape the modules. Nearly 100 students have joined or will soon join our program in 2007 and 2008 alone.

### Capacity Building

Although the program seeks to understand the relationships within human-mangrove systems, one of the primary goals is to educate local key resource managers and others through local town hall meetings, community outreach, working with the local school, and giving presentations at the local



university, Universidad de Guadalajara. By educating those living in La Manzanilla, those in charge of water resources and the local government, we seek to preserve and protect the mangrove from unintentional harm while ensuring local economic success.

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