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GIS in Water Resources Project Proposal
The Effects of Anthropogenic Parameters on Texas Seagrass Distribution

As a graduate student in the marine science program, I am interested in the ways that the coastal ocean ecosystems function, and the ways in which human presence affects the biological and chemical processes that govern coastal ecology.

Using ArcGIS, I intend to model the effects of human presence on the seagrass beds on the Texas coastal bend. Seagrass beds perform a host of key ecosystem services, from wave attenuation and sediment stabilization to providing habitat for fish, stingrays, and other marine organisms. In spite of their enormous value, however, seagrass coverage has been steadily declining around the world for a number of decades. These declines have been attributed to a variety of factors, including disturbance, pollution, disease, and declining water quality (Waycott et al., 2009). Researchers at the University of Texas at Austin Marine Science Institute have been monitoring seagrass beds along the coastal bend since 2012, and have shown that year-to-year changes in species distribution are relatively common. In my project, I will attempt to draw connections between anthropogenic parameters and the seagrass species distribution of the five species that occur in the UTMSI monitoring area: *Halodule wrightii, Thalassia testudinum, Halophila engelmannii*, *Syringodium filiforme,* and *Ruppia maritima*.

I will use publicly available data to map population density, farm location and fertilizer use, heavy metal concentrations, highway proximity, and recreational activity in order to determine if human presence and, more specifically, nutrient influxes, pollution, and anthropogenic disturbance have an effect on the seagrass species that dominate the Mission-Aransas estuary, Corpus Christi Bay, and Laguna Madre year-to-year. I hypothesize that in areas where there is a significant amount of recreation activity (such as snorkeling, boating, surfing, etc.), significant nutrient and/or heavy metal influxes, and proximity to major highways, hearty seagrass species such as *Ruppia maritima* will occur more frequently, while in more pristine, less impacted areas, more sensitive species such as *Halophila engelmannii* will be present.

Seagrass distribution is also significantly impacted by natural phenomenon, such as drought or significant inputs of freshwater, and the accompanying fluctuations in salinity (Short & Wyllie-Echeverria, 1995). In order to determine the impact of varying flow and salinity on seagrass species distribution, I will map the flow on major rivers that drain into these systems, including the Nueces River and Oso Creek. I hypothesize that in years where flow from these freshwater inputs is reduced, halotolerant species such as *Thalassia testudium, Syringodium filiforme,* and *Ruppia maritime* will be present with more frequency.

I will be using data available from the Texas Seagrass Monitoring program at the UTMSI to map seagrass species distribution and NHD Plus data to map river flow. I have not located sources for all of the data I would like to map, but will be searching datasets available from the National Ocean and Atmospheric Administration, the Mission-Aransas Near Estuarine Research Reserve, the Department of Transportation, GulfBase.org, and Texas Fish and Wildlife for the information I will need to complete this project.

Sources:

Dunton, Ken. (2015). *Texas statewide seagrass monitoring program.* (web). Retrieved from http://texasseagrass.org/index.html.

Short FT & Wyllie-Echeverria S. (1996) Natural and human induced disturbance of seagrasses. *Environ Consem, 23*: 17-27.

Waycott et al. (2009). Accelerating loss of seagrasses across the globe threatens coastal ecosystems. *PNAS, 106(*30).