**Relationships Between Environmental Changes, Contaminant Trends, and Human and Wildlife Health Along the Rio Grande from Laredo, Texas, to the Gulf of Mexico**

Purpose: Provide public health specialists with a tool that will aid them in identifying human populations at risk for health-related problems based on environmental quality.

Project Objective: to determine if evidential relationships between general environmental or water quality variables and fish or human health can be detected.

Approach: The objective will be accomplished with two primary tasks. We will utilize a weights-of-evidence and weighted logistic regression approach by applying geospatial statistical tools to consider the spatial relationship of various indicators of environmental quality (e.g., contaminants, water quality, soil geochemistry, land use) relative to measures of fish and human health. In addition, we will analyze relationships between water quality trends (e.g., pathogens, BOD, contaminants) and human and fish health.

Project Background:
Human populations have so greatly impacted the environment that most all ecosystems are stressed to varying degrees. The type, magnitude and rate of these anthropogenic changes, as well as an ecosystems' ability to buffer change, will be reflected in the overall health of the environment and consequently may provide important information about human health conditions. Under that premise, the U.S. Geological Survey (USGS) Border Environmental Health Initiative (BEHI) has described, documented, and depicted environmental quality along the US-Mexico border through integration of US and Mexican datasets and made this information publicly available. A second goal of this initiative is to foster and support the use of these integrated datasets to examine and analyze the linkages between human health and environmental health.

The watersheds within the Lower Rio Grande basin from Laredo, Texas to the Gulf of Mexico were chosen as the study area for this demonstration project due to the growing urban population and availability of environmental data. The analyses will apply a GIS-based quantitative weight-of-evidence and weighted logistic regression (WOE/WLR) model in an attempt to associate identified areas of poor environmental quality with areas where human health may also be impaired. This method is a multi-dimensional application of an epidemiological-based approach. The WOE/WLR model will be applied at the watershed level to characterize areas of good and poor environmental quality using extant environmental data (e.g., contaminants in biota, potential sources of contaminants, water quality, soil geochemistry, land use and land cover trends) as predictors of fish and human health. Additional field data collection will augment the existing environmental datasets as needed for the model. Using training sites, biological condition (ie., impairment) of fish health is associated with predictor variables (ie., environmental stressors) then spatial interpolation predicts distribution of the biological condition. Additionally, the weighted logistic regression analysis can identify specific potential stressors for each watershed. The model can be expanded to use human health data, either specific georeferenced disease cases or general human health indicators to analyze potential causal linkages between potential environmental stressors and human health. An additional evaluation will analyze water quality trends with indicators of human waterborne diseases.

Expected Outcomes:
Results will provide watershed maps for the Lower Rio Grande Valley depicting predicted probability distributions of biological impairment based on fish health, , identification of those environmental stressors that most strongly predict impairment, and correlations of measures of human health with predicted areas of poor environmental health or trends in water quality.

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