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Mapping Marine Debris through the Coastal Communities of Belize: Plastics, Pollution,  
and People

**Introduction:** Geographic Information Systems (GIS) technology has immense usability for both understanding problems of marine debris and managing it with community participation. Although there are numerous studies about the impacts of marine debris, there are fewer examining the dynamics of spatial relationships using GIS on beaches. This study is the first to analyze marine debris in coastal communities of varying densities and industries using GIS throughout the country of Belize. Marine debris tracked in this work as found on beaches included glass, metal, styrofoam, fishing debris, and plastics.

**Methods:** Fifty meter stretches of coastline were mapped using Juno Trimble hand held units, programmed with an extensive data library. Data points were then collected at smaller subsets of five paces and arms reach. The map design process for these data collected was created by statistical analysis of abundance, which was then visualized through critical cartographic processes to reflect details of each point of data. Maps were made for all four communities using ArcMap 10.1.

**Results:** Of the four communities analyzed (San Pedro, Caye Caulker, Punta Gorda, Monkey River), plastics were the most abundant form of litter observed. San Pedro and Caye Caulker featured similar patterns, while Monkey River and Punta Gorda, in the

southern district of Belize, had very different patterns. Categorical data found specific types such as bags and bottles most prevalent regardless of location. The maps designed expose detailed information about the types of plastic debris density observed at each point; they also show categorical patterns such as types of plastic items observed at each point.

**Discussion/Conclusion:** Through the process of hands-on fieldwork, methods were tested that can be replicated by and with local participation, and can contribute to long term investigation of temporal trends. This research sets a baseline framework for monitoring marine debris issues at varying spatial scales. GIS was an efficient means of collecting accurate and extensive quantitative and categorical data. These data allowed for use of critical cartographic representations that will be beneficial to coastal communities of Belize for education and management purposes related to marine debris issues.

**Key Words:** Marine Debris, GIS, Shoreline Monitoring, Critical Cartography, Artography, Geography, Geosciences