GROUNDWATER RISK AND RESILIENCE IN SOCIAL-HYDROLOGICAL SYSTEMS

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Groundwater is an essential, yet limited resource. Across the globe, including the Kenai Peninsula Lowlands, Alaska, a great percentage of the water that is used for domestic, commercial, industrial, and agriculture purposes is groundwater. However, groundwater is not only used by people, but also by groundwater-dependent ecosystems, including many wetlands, streams, and estuaries. In the Kenai Peninsula Lowlands, groundwater discharge from seeps and springs plays a fundamental role in supporting streamflow, modulating stream temperatures, and delivering nitrogen subsidies from hillslopes to streamside wetlands and streams. These processes are critical for maintenance of stream habitat for salmonids. As human population continues to grow in the area, the consumptive use of groundwater also continues to grow, further stressing this limited but shared resource. Lacking a shared understanding, information, and tools to facilitate communication, continued groundwater depletion could lead towards economic, ecological, and cultural collapse. Therefore, stability and resilience of communities, like the one in the Kenai Peninsula Lowlands, depend on well-informed, science-based, collaborative decision-making. In this study, we seek to identify areas where groundwater resources, including aquifers and the seeps and springs they support, are most vulnerable to anthropogenic impacts using GIS-based Multi Criteria Decision Analysis (MDCA) framework. MCDA is a methodology for appraising alternatives on individual criteria and combining them into one overall assessment which can then be used to compare different plausible outcomes and aid management decisions. The results of this study include information, including visualizations, identifying areas with higher degrees of groundwater vulnerability to anthropogenic impacts under specific conditions. These products will then be used to inform local discussions and decision-making regarding groundwater management and will further showcase the use of groundwater vulnerability modeling and collaborative decision-making to other communities facing competition for groundwater so they, too, may consider this approach.

PRESENTER BIO: Edgar is a PhD candidate at the University of South Florida and a NOAA Margaret A. Davidson Fellow at the Kachemak Bay National Estuarine Research Reserve in Homer, Alaska. His research focuses on understanding the interactions between hydrologic processes, human activities, and water dependent ecosystems.