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An Application of Microtopography: Using UAS LiDAR to Quantify Burrowing Shrimp Mounds in Willapa Bay

Willapa Bay tidal flats in Washington state contain aquaculture operations (oyster/clam farming). Native burrowing shrimp form burrows and mounds in the mud, liquifying it in the process. This can cause shellfish to sink in the mud and die, posing disruptions to aquaculture. There is a need to better understand the extent and distribution of burrowing shrimp populations in the bay in order to assess the impacts of their presence and/or removal. Quantification of shrimp mound density serves as a proxy for shrimp population. This research investigates methods for quantifying shrimp mounds through UAS LiDAR-derived terrain analysis. High resolution true-color imagery (1.33cm) and LiDAR data (~4cm point spacing) was acquired for mudflats in Nahcotta. Using a sink-fill algorithm on a 5cm DSM derived through kriging interpolation along with a corresponding hillshade allowed for reasonable qualitative identification of shrimp mound regions. Using SAGA GIS's *Vertical Distance to Channel Network* tool along with a threshold, a mound area percent cover of 37.5 was identified. This was compared to percent cover values from 100 quadrat samples. Accuracy of the LiDAR-based quantification shows high sensitively to the average mound radius used for the quadrat samples. Radii values from 3 – 5cm produce percent errors that range from -53 to +30.5, with 3.5cm showing less than 5 percent error. Overall, mound density quantification proved more viable than individual mound identification. Classification methods employing true-color and/or hyperspectral imagery can likely supplement this method and provide a means for further validation.