

STANDARDIZED AND COST-EFFECTIVE BENTHIC HABITAT MAPPING TOOLS FOR MARINE AND HYDROKINETIC SITE ENVIRONMENTAL ASSESSMENTS

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Baseline benthic habitat characterization and subsequent monitoring at MHK sites have used a variety of tools and techniques applied in many different combinations. The lack of standardization has led to expensive efforts that often prove confusing and contentious among regulators and stakeholders evaluating these sites. Benthic habitat maps have traditionally been developed from a suite of geophysical data sets including multibeam echosounder (MBES) bathymetry and backscatter, sidescan sonar, submersible or remotely operated vehicle observations and video, sediment sample data, and specific surveys of benthic communities (e.g., box cores, video surveys, trawls). With funding from the Department of Energy's Office of Renewable Energy and Energy Efficiency, Integral is developing a computer vision (CV) system for automating the measurement of key physical and biological features in Sediment Profile Image (SPI) and Plan-view (PV) imagery (Figure 1). The CV system uses a unique combination of machine- and deep-learning techniques (e.g., convolutional neural networks) for grain size classification, interface delineation (e.g., the sediment-water interface), and object detection (e.g., identification of organisms and biogenic structures). This custom CV system is a key component of a more comprehensive benthic habitat mapping toolset for MHK sites that combines MBES bathymetry and backscatter with SPI and the PV camera technology to rapidly and efficiently develop meaningful soft-bottom benthic habitat maps. Data from the imagery are obtained using our CV system and are used to inform the interpretation of the acoustic maps, and the collection of images rather than bottom samples, allows for a much higher density of ground truth data points. Figure 2 shows sample density the substrate texture map developed for Sequim Bay, WA using this technology combination in the spring of 2017.

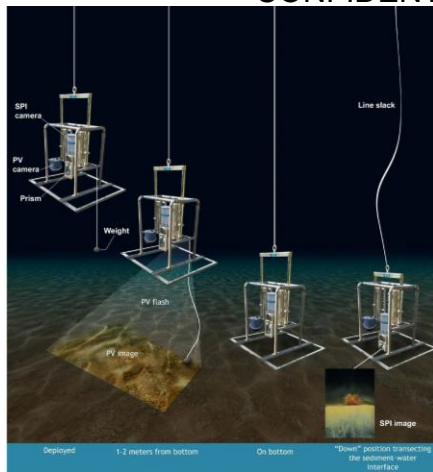


Figure 1. The SPI/PV Camera System

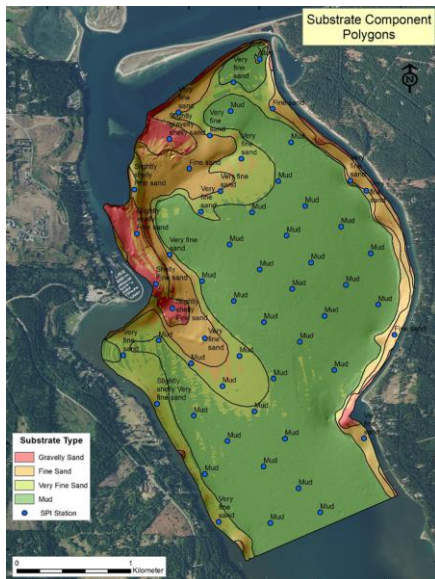


Figure 2. SPI/PV Station Grid

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