

## Hydrophone-based Underwater Sound Recorder

### **Background**

The traditional method of collecting physical bedload measurements is an expensive and time-consuming endeavor that seldom captures the spatial and temporal variability of sediment transport. Technological advances can improve monitoring of sediment transport by filling in temporal gaps between physical sampling periods.

The sound level magnitude and acoustic frequency of underwater sounds produced by riverbed particle collisions are proportional to the magnitude (volumetric quantity) of bedload sediment transport. Therefore, the audio data can be analyzed and used as a surrogate to traditional physical measurements of sediment transport. The sounds travel through the water and are detectable by hydrophones. Hydrophones use a piezoelectric element to convert the pressure waves to an electrical signal. The electrical signal is proportional to the pressure acting on the hydrophone.

### **Abstract**

The present invention is a hydrophone-based recording system designed to record the sediment generated noise (SGN) resulting from collisions of coarse particles in gravel-bedded rivers. The device periodically collects short recordings of underwater sounds at pre-set time intervals and stores the audio data on removable electronic media for later retrieval.

### **Opportunity**

Scientists at the U.S. Geological Survey have developed and field-tested an invention that is an improvement of current methodologies allowing for more accurate data collection in a timely and cost efficient manner.

This invention provides many benefits to current known applications. The recorder is a safe, low-cost, lightweight, long-term way to collect bedload sediment data in coarse (gravel-bedded) rivers. The recorder is compact, portable, and waterproof. A liquid detection sensor and programmable power timing circuit reduce power consumption, allow the recorder to take frequent samples (e.g., hourly recordings), and can be operated unattended for extended periods. Scientific research institutes, engineering groups, and government entities will benefit from the application of this technology.

### **Keywords**

- Sediment deposition
- Sediment erosion
- Hydrophone

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This technology is protected under U.S. patent application 62/147,948. The U.S. Geological Survey is looking for a partner to further the commercialization of this technology through a license agreement or Cooperative Research and Development Agreement (CRADA). Interested parties should contact:

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