FEDERAL INTERAGENCY SEDIMENTATION PROJECT PROPOSAL FORM

Proposal Title: Sediment Acoustic Index Development (SAID) Tool Enhancement

Project Chief: Timothy D. Straub

Project Chief Location: USGS Illinois Water Science Center

Proposed Start Date: November 1, 2012 Proposed End Date: October 31, 2013

1. **Relation to FISP goals** – The enhancement of the SAID tool is directly related to the FISP goal of utilizing acoustic surrogates for quantifying SSC and grain-size distributions. When SAID is fully implemented, it will have an immediate impact on sediment acoustic research, and on the many sediment acoustic monitoring sites currently in operation. The tool will also be a great supplement to the sediment acoustic index guidelines being drafted by the Sediment Acoustic Leadership Team (SALT).

2. Scientific Merit and Relevance – SAID is a MATLAB based tool that assists in the creation of regression models that relate acoustic parameters (from fixed-mounted stationary equipment) to suspended sediment concentrations by providing visual and quantitative diagnostics to the user. The current version utilizes data from the Sontek SL 500,1500, 3000, or Sontek SW3000 ADVM instruments. The background theory and methods used by the tool have been described in papers by Topping, Wright, Landers, Wood, and others. The current version of the tool is a great improvement over the use of spreadsheets to process the cumbersome data and methods, however the proposed enhancements would provide an even more powerful tool.

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ADVM Data			
Load ADVM Data	CK20110414 TO 20110518	Beam	1 •
Clear All		Avg Period (min)	5
		BS Values	SNR 🔻
		Intensity Scale	
		RMin (m)	0.5
		RMax (m)	1.6
		MinCells	4 💌
	•	Near Field Correction	
SSC Data Load SSC Data Sample Time Offset (min) Matched Samples: 39 Linear Model Explanatory Variables DayOfYear VelocityX VelocityX VelocityY VBeam Temperature MeanSCB alphaS	05579630_results.csv Total Samples: 350 Response Variable bg10SSC ▼ View Table Write Report Display Model	Matched Value MaxTime (mi Plots Plots Prots Residua Rav Ba	IS

3. Methodology – A current view of the SAID GUI is shown in the image to the left. The current version has been primarily funded by the USGS Midwest Area - River Sediment and Nutrient Initiative. The enhancements being proposed to the current version of SAID are listed in appendix A. All of the proposed enhancements would be funded by the FISP. The scope and content of the enhancements can be finalized by the FISP Technical Committee. The deliverables will be the source code, compiled program, and brief user's manual.

4. **Timeline, budget (Feasibility), and partners** – The proposed duration is a single year project. The total cost of the enhancements is \$9,000. These costs are primarily labor costs. A beta version of the enhanced tool will be available by the middle of the summer with a final version available by October 31, 2013.

Appendix A: Proposed Enhancements to SAID

- Data parser for additional accepted data formats
 - Additional manufacture specific data
 - NWIS
 - MATLAB data set
 - CSV (use MATLAB dataset class initialization method)
- Eliminate cells based on curvature of measured backscatter profile
- Transformations
 - user control on log10 for variables
 - centering (Helsel & Hirsch, section 11.5.3.1)
 - centered on mean
 - centered on median
- Add an arbitrary amount of explanatory variables (partially implemented)
 - Variance Inflation Factor for each variable
 - User defined explanatory variable
- Save/load model .mat file (can be loaded in MATLAB session)
 - Processing template options
 - LinearModel object
 - Processed ADVM dataset
- Time series prediction
- User plotting
 - Plot any two variables against each other
 - Plot two variables on time series
- Seasonalityoptions
 - Box plot of seasons
 - Seasons
 - Days
 - Months
 - Quarters
 - Sine/cosine terms (Helsel & Hirsch, section 12.4.3)
 - Include trend test?
 - Multiple pairs with different periods
- Comparison of multiple models or validation data
 - -Compare incompatible data sets