What is Low-Cost Side Scan Sonar Habitat Mapping?

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A Low-Cost Remote Sensing Technique is Needed for Waterscape Research in Navigable Systems

- Producing detailed, landscape level habitat maps of turbid, non-wadeable systems is costly or impossible using traditional methods.
- Side scan sonar is an active remote sensing device that uses reflected sound to produce images of underwater features.
- The inexpensive Humminbird® Side Imaging system ($2000-2700) generates high resolution imagery and employs a small, adjustable transducer.
- Over the last 5 years we have pursued the development of a complete method for mapping with the S1 system, incorporating several complementary objectives (listed below).
- Our work has focused on streams and rivers of Georgia and Florida.

Objectives of this Initiative
1) Develop approaches for field sonar surveys
2) Develop techniques for georeferencing and transformation (ie. geoprocessing) of sonar imagery for use in a GIS
3) Produce detailed maps of instream habitat features (eg. substrates, LWD, depth) via image interpretation and manual digitization
4) Evaluate/validate the techniques and map accuracies through field studies
5) Develop and offer the tools, products, and training to interested professionals
6) Continue testing and developing new applications of low-cost sonar habitat mapping.

The Process of Sonar Habitat Mapping

Step A: Conduct Sonar Survey
Step B: Geoprocess Sonar Data
Step C: Develop Classification Scheme
Step D: Create Habitat Map
Step E: Assess Map Accuracy

How long does each step take?
A. 11 min/km
B. 3 min/km
C. varies with effort
D. 128 min/km
E. varies with effort
Total: 2.5+ hrs/km

What Do I Need to Get Started?

Hardware
- Humminbird SI system creates images
- GPS (~$200)- provides coordinates, captures detailed track/depth log
- Seko S057 Interval timer ($90)- aids in capture of consecutive images

Software & Training
- ArcGIS ArcView level 9.2+ or 10.0- image geoprocessing and map production
- Irfanview & ET GeoWorks- freeware used during geoprocessing
- Sonar processing tools- VBA scripts created by Thom Litts and delivered in a GIS project (provided freely at your request)
- A copy of our "Sonar Imagery Geoprocessing Workbook"
- Method training offered in workshop format, soon delivered as a free, web available "Guide to Low-Cost Sonar Habitat Mapping"
- Next workshop offered- Southern Division APS, in Biloxi MS, Jan 26-29, 2012

Applications are Widespread & Diverse
- Organism-habitat research in systems and at scales not previously feasible
- Studies of individual habitat use and behavioral patterns (eg. radiotelemetry), identification/quantification/prediction of critical habitat (eg. sturgeon spawning habitat)
- Landuse associations with in-stream habitat (eg. patterns of LWD distribution with respect to riparian landuse)
- Monitoring habitat change over time (eg. sediment redistribution)
- Similar applications in lakes and reservoirs possible (eg. littoral zone mapping)
- Habitat map layers can be viewed in Google Earth and on smart phones

The Future of this Initiative
- To demonstrate the utility of low-cost sonar mapping we are applying the method in ongoing studies of turtle, fish, and freshwater mussel habitat use and availability, and time-lapse detection of changes in substrate deposition
- To receive email announcements of new training products, or make inquiries contact Adam at adam_kaeser@fws.gov

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- Affordability, speed, flexibility, ease of training, and access to software are key traits of low-cost sonar habitat mapping. The future is now for waterscape research.