Minutes
Subcommittee on Sedimentation (SOS)
Lakewood, Colorado
October 13, 2011

8:45 AM Establish Communications for call in — Arneson

9:00 AM Call to Order and Roll Call — Römkens

The meeting was called to order at 9:02 by Matt Römkens. Thanks to Larry Arneson for the beautiful meeting facility.

Present: Matt Römkens, ARS, Committee Chair, Director National Sedimentation Lab, and Researcher in erosion processes, Oxford MS; Doug Glysson, USGS, Hydrologist, Office of Water Quality, WDC; John R. Gray, National Sediment Specialist, Office of Surface Water, USGS; Jerry Bernard, NRCS, National Geologist, WDC; Larry Arneson, FWA, Principal Hydraulics Engineer and Hydraulics Technical Service Team Manager; Amanda Cox, Colorado State University, Research Scientist at CSU Hydraulics Lab; Marie Marshall Garsjo, Geologist NRCS-alternate, National Design, Construction, and Soil Mechanics Center, Fort Worth, TX; Jeff Bradley, ASCE, Salem, Oregon; Tim Randle, USBR, Manager Sedimentation and River Hydraulics Group, Lakewood, CO; Meg Jonas, USACE, WDC, alternate for Jerry Webb; Sonya Bechtell, FWA, Assistant to Larry Arneson.

Call in: Joseph Schubauer-Berigan, EPA; Paul Makowski, FERC; Matt Collins, NOAH; Marian Muste, University of Iowa representing CUASI, joined after break.

9:20 AM Review Agenda and Changes — Römkens

9:30 AM Acceptance Minutes May 27 SOS-meeting — Römkens
Moved: Jeff Bradley
Seconded: Tim Randle
Unanimous

9:40 AM RESSED — Gray, Jonas, Bernard

ACWI Resolution—Presentation included as Appendix B.2, in a separate .pdf file.

Comments from John Gray, 8/19/11: (1) Feather in SOS Cap: The first "sub-resolution" commends the SOS for our efforts on RESSED. This is the first such recognition SOS has received from the ACWI since 1939. This effort is of national significance. (2) Clear Statement of Desire for RESSED Support: The last "sub-resolution" makes it clear that the ACWI would like to see the RESSED application supported. SOS concurs, however, SOS's concurrence is not binding in committing funds, particularly if there are no such support funds available. Hence, Gray continues to seek support from internal and external sources. (3) Jerry Bernard brought the RESIS database to the SOS's attention circa 1997. It only took 14 years to get this formal recognition. Sometimes persistence pays off.

The BOR will contribute $80K for FY-2012. Tim Randle suggested that the BOR's contribution could be a model for other agencies. The cost for a detailed sediment survey is $100,000. A very general survey cost is $20,000-25,000. Value of earliest data: priceless. RESIS is a "cul-de-sac" of information. We need an interactive version. 1985 is effectively the last date that additional information was added, but the *average* last date was 1960.

Prospects/Plans for Long-term Support

RESSED "21" is for the 21st Century—John Gray put together a four-page paper on the elements required. In spite of the ACWI resolution, no long-term support mechanism for RESSED has been identified. Without a base-funded program, it will be difficult if not impossible to develop a publically available/useable version of RESSED.

USGS will work with BOR and USACE to address their specific needs to be included in the proposal.

Perspective

Jerry Bernard commends USACE (Meg Jonas), BOR (Tim Randle), and USGS (John Gray) in bringing RESSED to life in a relational database. He recommends: Committee needs to stand up and take on this task as a major project for the SOS. First, they must set minimum data requirements. For example, NRCS is doing sediment surveys on a case-by-case basis for dam rehabilitation, which usually leads to a 2-3 page report that gets buried in the engineering files, and is not being included in a database. Next, they should put out a **data call**, first priorities are situations where public safety is at risk. Other necessary tasks include replacing the old Form SCS-ENG-34, and updating the ASTM standard.

Tim Randle: the current data collection is good; the issue is getting it reported and included in the database. ASTM Standards need to be updated. Tim Randle could get a task group together with 3-4 people from each agency to work on the update. They could revise it piecemeal, rather than redoing it all at one time. Ron Ferrari, who works for Tim, could chair the work group.

Doug Glysson: as long as this group recommends it and leads it, it will get done. "Guidelines" can be written as appendices to real standards. This would be a logical task for the RESSED committee. [Committee: Meg Jonas, Tim Randle, Jerry Bernard, John Gray is chair of task group, Meg Jonas is going to work with TVA to get them in].
Moved: Tim Randle
Subcommittee should direct the RESSED task group to work on data call with minimum data requirements and ultimately an update to the ASTM standard.
Seconded: Jeff Bradley
Jerry Bernard comment: This will cause a ripple effect with each agency revising their requirements.
Unanimous

10:00 AM Break

10:15 AM RESSED discussion continued briefly. RESSED committee will meet at noon today.

10:40 AM STREAM Morphology Database Workshop, April 27-28, 2011 Collins, Gray
Outcomes/Recommendations of the 1st National Stream Morphology Database Workshop
Matt Collins (NOAA), and Faith Fitzpatrick, Marie Peppler, and John Gray (USGS)
Summary Report presentation to the SOS is included as Appendix C.2, in a separate .pdf file.

John Gray: This summary is an update of that posted in July on the SOS website for review by all 33 workshop participants. We received a number of comments, the most substantial of which were from Thom Garday, Eric Hersh, and John Potyondy. Matt Collins incorporated their excellent input into the text, and I did a quick 'comb' to render it ready for the SOS review. Matt Collins, our co-workshop organizers Faith Fitzpatrick and Marie Peppler, and I look forward to any suggested revisions/additions to the tome, and on the SOS position on 'where do we go from here' -- if anywhere -- with this concept."

John Gray Comments at SOS meeting: This group will not initiate any new studies, it will just collect existing and new data using similar protocols.
The workgroup (seven-person) will continue this task, and will put together a second workshop, which may be proposed at next SOS meeting. The workgroup consisted of Faith Fitzpatrick, Marie Peppler, Matt Collins, John Gray, Joe Schubauer-Berigan, Meg Jonas, and Tim Randle.
Moved: Matt Collins
Standing workgroup, above, will formulate a smaller subgroup which should meet before the end of CY-2011. Recommend they investigate existing platforms, but firstly investigate the kinds of databases they may be using. Request progress report by next meeting. At the next meeting we will finalize a completion date.
Seconded: John Gray
Unanimous

11:10 AM Sediments Hydro-Acoustics Workshop Gray
Co-sponsors: CUASHI, USGS
SOS sponsorship for March 19-23, 2012 Workshop at the Fish and Wildlife Training Facility in Shepherdstown, WV

Proposal is included as Appendix D.

John Gray expects that the Consortium of Universities for the Advancement of Hydrologic Science, Inc (http://www.cuahsi.org/docs/What-is-CUAHSI.pdf), together with the USGS, and perhaps FISP, will put up the lion's share of support needed for the workshop. If the SOS considers this proposed workshop worthwhile, and if JFIC funds are available, we might seek as much as (but not more than) $7,500 from SOS to sponsor the workshop. He added that for the last workshop that SOS sponsored, 1st Stream Morphology Database, SOS only had to put up 42% of the maximum available amount of $8,000. These things are done as inexpensively as possible. For an example of outcomes from a June 2011 CUAHSI-USGS-sponsored Optics Workshop, see: http://www.cuahsi.org/ws-usgs-synopsis.html.

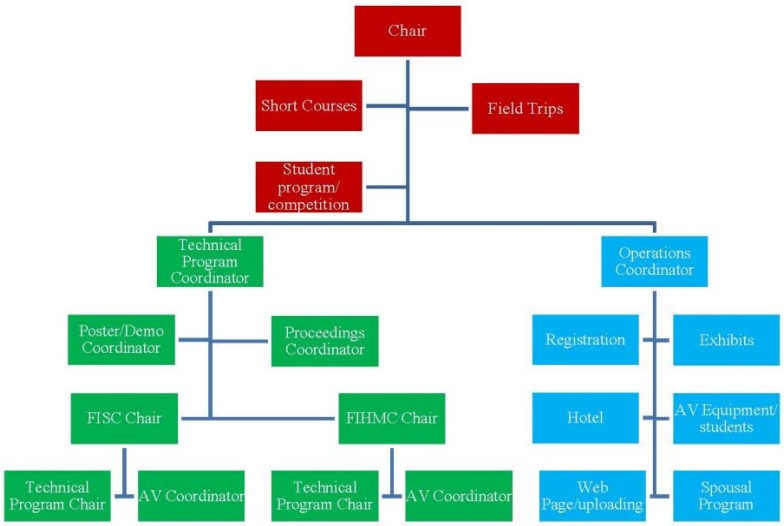
John Gray indicated that many of us inside and outside USGS are confident that hydroacoustics represents the future for a broad spectrum of the Nation's sediment-monitoring needs.

Comments at SOS meeting:
This is the wave of the future for measurement of suspended sediment, but bugs will need to be worked out. And there are a lot of bugs.
A memo will be distributed announcing the workshop. The workshop won't necessarily be by invitation only, but will have a specific audience. The $7,500 will likely be used for paying invited speaker's travel costs and facility rental fees. A registration fee of about $100 may be charged to help defray workshop costs.
Meg Jonas noted: Mississippi River at Vicksburg had measured dunes in the bed that were 30 feet high, 250 feet long, with a river velocity 14 ft/s.
Moved: Marian Muste
The SOS committee will provide a maximum of $7,500 to Sediments Hydro-Acoustics Workshop. It is tentatively scheduled for March 20-22, 2012 at the Fish and Wildlife Training Facility in Shepherdstown, WV (http://www.cuahsi.org/ws-hydroacoustics.html).
Seconded: John Gray
Unanimous

11:30 AM Lunch

Reconvened at 1:00
1:00 PM 2010 JFIC meeting Glysson, Bernard

3rd JFIC 2014
Draft Organizational Chart



Doug Glysson hasn't yet sent out the 2014 RFP due to the uncertain economy.
There is more overlap between hydrology and sediment presentations. ONE person will be in charge of all technical programs/agenda. The 2010 FISC put out only one set of proceedings for both groups. We have lost money on only the 1996 meeting (and the next one, but that was by design).

Discussion:

What would be the impact of changes in government budgets on attendance? Besides Las Vegas and Reno, what location should be considered? (Other possible venues are Tucson, New Orleans.) If the attendance will be 500 people, then there is a much wider variety of venues. The hotels are anxious to sign contracts and there are a lot of good deals. Consideration might be given of a day/half day out of the conference for 4 different workshops. Jerry Bernard suggested the University of Mississippi could accommodate only a limited attendance. Also, a university with smaller venue capacity would be more complicated from a logistics standpoint, such as meals, transportation, and housing capacity. Government budgetary policy always includes an escape clause in hotel contracts. We should adopt this practice here as well. 60-70% of registration fees go to catering, and those costs are higher in New Orleans. Doug Glysson will send RFP out in January, 2012. Then we'll know more about funding and costs

Key element: Doug Glysson and his superb negotiating skills.

Moved: Tim Randle
SOS directs 2014 selection committee to host a conference of similar size to 2010 conference.
Seconded: Meg Jonas
Unanimous

Agenda item for the next meeting: appointment of Technical Program Chair and Conference Chair for sediment side.

1:50 PM Proposed Reservoir Sustainability Workshop, See Appendix E Randle
Agenda of the workshop focuses on sustainability. For example, "retiring" San Clemente Dam will cost $40 million to buttress, and $80 million to remove and relocate sediment to different parts of the watershed. There is an opportunity to invite more international people. Japan and China have huge, huge sediment problems, due to building tunnels and dredging.

Proposal: conduct actual *WORK*shop with report as end product, with 40-60 participants, most would be invited. Three days, in summer 2012, first day talks in AM and tour to Strontia Springs-like field trip, then the next two days in work groups.
Moved: Tim Randle
Have the SOS sponsor workshop and provide a maximum of $7,500 to provide meeting facility costs, and travel costs for people we want that could not otherwise attend, Gregg Morris in Puerto Rico for example.
Seconded: Jeff Bradley
Unanimous

Tim Randle requested participant input from each agency. He also updated the Committee on the development of Guidelines for sediment removal in dam reservoirs. Progress has been made on distributing a draft to workshop participants. The process has been slow. The intent is to have it distributed by January. Consideration should be given to posting the Guidelines on the US Society on Dams website—the process would be much simpler than that required by ASCE. The USSD website could have links to other documents. They like the idea of web-based publication, as a scientific paper isn't that useful for this subject. He would like to also have it on the SOS web site.

2:00 PM Work on USGS Retrospective on National Streamgage Database Glysson
This is a summary of work that has been done, and what more needs to be done. Sediment Retrospective, National Water-Quality Assessment Program, (NAQUA Cycle 3). Each cycle has

been 10 years. Sediment is the leading reason that dams do not meet the intended use; 70% of EPA's 303(d) list consists of sediment-impaired reaches.
The retrospective approach would look over the history of streamflow and sediment-data collection and analysis through time and spatial scales, for quality assurance and to identify trends. Data could be used in SPARROW—a model that EPA uses in TMDL processes, originally developed by USGS to compute nutrient loads to Chesapeake Bay. It would lead to a characterization of how natural and human forces affect streams. There are currently 4,270 stream gages on database. Total instantaneous sites number 4,544. Data collection is ongoing. There are some problems with different sampling techniques and equipment. There is information missing on daily sites. In some cases the entire site was missing, while in other cases years of information was missing although the site was there. Not all data were being put in the same place, and some couldn't be released to public because it was stored incorrectly; although the descriptive information for the site is available. They have since released 1,100 records. It would take $38 million in costs to re-gather data.

Plans are to produce an internet-based map of quality-assured sediment and sediment-related data, including interpretations of loads, yields and trends. He feels that this project has greatly improved the quality of their sediment data. Presently there are not many people using this data, and the changes would make it more accessible so its use should increase.

3:05 PM Break

3:20 PM Mobile-bed model using SIAM, Sediment Impact Analysis Method
Amanda Cox

Amanda is developing a computer application for the Biedenharn Group that works with the existing SIAM program in HEC-RAS to allow sediment routing and mobile-bed modeling. SIAM is used as a screening tool to evaluate sediment impact caused by local changes on the system from a sediment continuity perspective, used to quickly evaluate multiple alternatives. Program computes multiple iterations and computes local balance including. Separate material into wash load and bed load and then identify the sediment balance between aggradation and degradation. Not as computationally intensive as more complex models.

3:30 PM SOS Award Summary Gray

John Gray and Jerry Bernard presented SOS Project Development Award to Dr. Jerry McFaul, July 27, then travelled to the USFS International department to present one to John Potyondy on September 29, who retired Oct. 1st.

"The RESSED FilemakerPro Development Team following presentation of the SOS Project Development Award at the Tortilla Factory, Herndon, VA, July 21, 2011; counter-clockwise from front-right, recipient Dr. Jerry McFaul; Kevin Laurent; Jennifer Bracewell; David Stewart; Meg Jonas; and John R. Gray."

New award: Career Recognition Awards presented to Jerry Bernard for just under 40 years and Doug Glysson for over 41 years.

3:50 PM Other Business Römkens

Larry Arneson - FHWA is finalizing three new publications. (1) HEC-18 - Scour at Bridges, Fifth Edition, and (2) HEC-20 - Stream Stability at Highway Bridge Crossings, Fourth Edition incorporate the results of $10 million dollars and ten years of scour research into existing guidance. The material in these two publications is being incorporated into (3) the National Highway Institute's (NHI) Course Number 135046 - Stream Stability and Scour at Highway Bridges.

A three-day pilot course presenting these new materials will be held in December, 2012. They are also working on a new publication on bridge hydraulics titled, HDS-7 - Hydraulics of Safe Bridges. This publication is an update of an earlier FHWA publication titled HDS-1 - Bridge Hydraulics. The material in this new publication will be presented in NHI Course Number 135090 - Hydraulics of Safe Bridges. A pilot course presenting these new materials will be held in January, 2012.

There are 600,000 bridges “over water” on National bridge inventory, that have to be prioritized and a rehab/repair plan of action developed. New category innational bridge inventory: bridges with unknown foundations. Highway overpasses are not considered to be “over water” but they are responsible for them as well. At the next meeting he will have product to show.

New officers

Craig Goodwin, BLM, elected to the position of vice chair at the September 28, 2010 meeting; will automatically advance to Chair of the SOS.

Nominations for Vice Chair and research on membership status must be submitted to Matt Römkens via email by October 28.

16:15 PM Next Meeting, Place and Date Römkens
Tuesday January 24 for teleconference
Consideration of combining face-to-face meeting with Elwha Removal Site Visit

16:30 PM Meeting adjourned Römkens

Appendices:

A: Denver Water Dredges Fire Debris from Strontia Springs, *Utility Uses Pumps, 'Giant Straw' To Send Slurry 10 Miles Downstream. By Lance Hernandez, 7NEWS Reporter*

B.1: ACWI Resolution for RESSED, John Gray

C.1: Stream Morphology Database Workshop, 4/27-28/11, Summary Report to the SOS, John Gray

D: Sediment Hydroacoustics Workshop, John Gray

E: Proposed Reservoir Sustainability Workshop, Tim Randle

Separate files:

B.2—RESSED ACWI ppt jrg_10_13_2011.pdf

C.2—J.Gray Stream Morphology Database WrkSp_10_13_2011.pdf

F.—Glysson NAWQA Cycle 3 presentation.pdf

Appendix A

Denver Water Dredges Fire Debris from Strontia Springs

Utility Uses Pumps, 'Giant Straw' To Send Slurry 10 Miles Downstream

By Lance Hernandez, 7NEWS Reporter

UPDATED: 9:41 am MDT July 14, 2011

http://del.icio.us/post?title=Denver%20Water%20Dredges%20Fire%20Debris%20From%20Strontia%20Springs&url=http://www.thedenverchannel.com/news/28542179/detail.htmlhttp://digg.com/submit?phase=2&title=Denver%20Water%20Dredges%20Fire%20Debris%20From%20Strontia%20Springs&url=http://www.thedenverchannel.com/news/28542179/detail.htmlhttp://www.facebook.com/sharer.php?u=http://www.thedenverchannel.com/news/28542179/detail.html&src=sc&pos=top&from_posted=1http://reddit.com/submit?url=http%3A%2F%2Fwww.thedenverchannel.com%2Fnews%2F28542179%2Fdetail.html&title=Denver%20Water%20Dredges%20Fire%20Debris%20From%20Strontia%20Springshttp://www.thedenverchannel.com/rss/javascript:popUp('/print/28542179/detail.html','width=460,height=400,scrollbars');javascript:popUp(%22http://cf.thedenverchannel.com/den/sh/toafriend/index.cfm?page=http://www.thedenverchannel.com/news/28542179/detail.html%22,%22width=450,height=250%22);

DENVER -- It's been 15 years since the Buffalo Creek Fire burned through the South Platte watershed and nine years since the Hayman Fire did the same thing. Both wildfires contributed to massive erosion. Following flash floods, nearly a million cubic yards of sediment and debris have washed into Strontia Springs Reservoir.

That debris is making it much more expensive and much more difficult to treat water. So Denver Water has begun a project to remove as much of it as possible. "I call it the giant straw," said project manager Doug Raitt. The giant straw is a massive dredging project designed to remove more than 625,000 cubic yards of sediment and debris. "This kind of dredging project has never really been done before," Raitt said.

Work crews are using a 150,000 pound dredge to drill into and vacuum the sediment and then send it down a high pressure slurry pipe to the mouth of Waterton Canyon. "We're trying to get the sediment load back to where it was before the fires," Raitt said. He said, "Burnt needles and burnt pine trees have a high load of manganese. Manganese is the black stuff in your pipes that nobody wants." "We have to clean the magnesium out of the pipes and it's adding to the cost of treating water," Raitt said.

By removing the sediment and debris from Strontia Springs, the utility hopes to be able to lower the cost of treating water. Work crews are dredging 24 hours a day, six days a week, removing about 4,000 cubic yards of sediment a day. The sediment and debris, mixed with water, is being pumped 10 miles downstream in a massive slurry pipe. Booster pumps have been set up every mile along the route. Raitt said the slurry is processed at a de-sanding plant. The water is removed and sent on down to the Highline Canal. The sand and sediment is being shoveled into a great big pile.

How much is 625,000 cubic yards? "I think we described that at one time as filling Invesco Field at Mile High over 200 feet high," Raitt said. The dredge, which is like a rotary plow, moves back and forth across the fan shaped deposit of debris at the shallow end of the reservoir. They hope to finish the $30 million project by the end of the year.

Raitt told 7NEWS that they've run into a few snags. He said they inadvertently vacuumed a rock about a foot in diameter and sent it down the slurry pipe. "We had to shut down and take the pipe apart to remove the rock," he said. "In the end," he said, "it will make it much easier and less expensive to treat the water."

Strontia Springs Reservoir holds 7,863 acre feet of water. It is six and one-half miles upstream from the mouth of Waterton Canyon. Water from the reservoir is diverted into a 3.4 mile long tunnel under the mountains to the Foothills Water Treatment Plant.

Appendix B.1

RESOLUTION

of the

Advisory Committee on Water Information

Supporting Maintenance and Development of a Permanent, Publically Accessible Reservoir Sedimentation Database, RESSED, of the Subcommittee on Sedimentation

Whereas: The Advisory Committee **on** Water Information (ACWI) is charged by the Office of Management and Budget through its Memorandum No. M-92-01 (Dec. 10, 1991) to recommend to the Federal government procedures to coordinate funding, staffing, and the provision of other resources needed to support water-information activities for ensuring the best use of available resources; and

Whereas: OMB Memorandum M-I0-30 (July 21, 2010) guides agencies to pursue transformation solutions to the Nation's practical challenges through interagency collaborations that include development and maintenance of datasets that are open to the public in accessible, useful formats; and

Whereas: Knowledge of reservoir capacity-loss rates is important for numerous reasons, including (a) to calculate the useful lifespan of a reservoir, (b) design reservoir sediment-storage allocations, (c) manage sediment deposits, (d) rehabilitate aging or damaged reservoir structures, (e) design sediment-sluicing and other sediment-management structures, (l) estimate the mass of captured solid-phase constituents, and (g) assess contributing watershed erosion rates; and

Whereas: Reliable and sufficient reservoir-capacity information is fundamental with respect to irrigation, flood control, power generation, recreation, maintaining sufficient flows for fish and other wildlife, downstream channel morphology, in addition to public water supply; and

Whereas: The ACWI Subcommittee on Sedimentation (SOS) has, within existing SOS-member resources, developed, published, and placed on-line the static Reservoir Sedimentation (RESSED) database (http://ida.water.usgs.gov/ressed) and currently is developing the capability to add new bathymetric-survey information to RESSED, and to provide reports based on the stored data; and

Whereas: The ACWI SOS has demonstrated from existing data for 1,365 RESSED reservoirs through extrapolations of capacity losses to 2010 (mean date of last bathymetric survey—1960) that 39% of RESSED reservoirs may have lost at least 60% of capacity, and 24% are estimated to be filled with sediment. These national statistical results can be neither confirmed nor refuted based upon readily available information due to the dearth in RESSED data availability over the last quarter century (see the appended handout with figures from the July 2010 ACWI meeting, "ACWI Subcommittee on Sedimentation's RESSED"); however, use of Google Earth to view some of the reservoirs has shown a number that are sediment-filled; and

Whereas: That after FY 2010, the ACWI SOS has no funding to either maintain the RESSED database, nor expand RESSED into a truly national, dynamic, maximally informative and useful

reservoir sedimentation database;

Now Therefore Be It Resolved: that the ACWI commends the SOS for publishing and posting online the static RESSED database, and for efforts to develop a means to update the database and to develop credible reports on reservoir sedimentation rates; and

Be It Also Resolved: that the ACWI recognizes the value of understanding the rates at which the Nation's reservoirs are losing capacity, so that proactive measures might be taken to ensure the long-term viability of public water supplies and other water needs; and

Be It Also Resolved: that the ACWI encourages the USGS to incorporate the RESSED database into an appropriate ongoing program and to provide the requisite financial support to maintain the RESSED database in FY 2011 and thereafter. Further, the ACWI encourages the USGS to collaborate with ACWI's member agencies and organizations in developing and expanding the database.

This resolution was approved by the ACWI membership on July 13, 2011.

John's comments: See yellow highlights. Twelve years ago the ACWI recommended the National Streamflow Information Program that now has a budget of $17,000,000; so their recommendations, while non-binding, are well received.

Appendix C.1

1st National Stream Morphology Database Workshop

April 27-28, 2011

Organized and led by Matt Collins (NOAA), and Faith Fitzpatrick, Marie Peppler, and John R. Gray (USGS)

Summary Report to the Subcommittee on Sedimentation

INTRODUCTION

The subject workshop, sponsored by Subcommittee on Sedimentation (SOS), Advisory Council on Water Information and hosted by the U.S. Geological Survey Wisconsin Water Science Center in Middleton, Wisconsin, took place on April 27-28, 2011. A total of 33 invitees participated (28 in person, 5 by WebEx) representing eight Federal agencies, five universities, three State agencies, and one private-sector firm.

The workshop had three goals:

1. Explore the scope, scale and costs of developing a National Stream Morphology Database (**NSMD**).

2. Bring people together from a range of organizations and backgrounds that are collecting stream-geomorphic data, designing and populating related databases, and using geomorphic data to evaluate the need and tractability of developing a national stream morphology database.

3. Develop a set of recommendations to the SOS on the conceptualization and development of a stream morphology database.

Presentations germane to these goals provided context to the discussion. The multi-sector mix of attendees who represent the fields of stream geomorphology and database design imparted various compelling perspectives on stream morphology data-acquisition, -storage, and -dissemination. The workshop included an April 27 afternoon field trip to two sites of geomorphic interest where the in-person participants were able to interact individually and collectively on subjects germane to the suite of presentations that morning.

On April 28, three breakout groups convened entitled:

1. Scale and Data Model Issues (led by Matt Collins),
2. Scope Issues (led by Faith Fitzpatrick), and
3. Ways and Means (led by John R. Gray),

The groups produced verbal and draft written summaries of their deliberations.

This summary presents to the Subcommittee on Sedimentation the salient outcomes and recommendations from the workshop.

OVERARCHING RECOMMENDATIONS

The following overarching recommendations are presented for consideration by the Subcommittee on Sedimentation:

- Maintain the SOS National Stream Morphology Database (NSMD) Work Group; the SOS is a natural inter-agency and national lead organization for a NSMD.

- Organize a group of experts (field folks, database folks) to evaluate results of this workshop and provide a Big Picture recommendation on how to proceed, with perhaps a specific set of steps to address the Big Picture recommendations.

- Identify a desired NSMD scope: Agreement among workshop attendees was that it should be national, although the effort might be piloted on a regional basis.

- Identify a desired NSMD architecture: should this be a data-level or metadata level approach? A national metadata clearinghouse would store information about datasets and would support searches against this metadata but data access would be through contact with the individual dataset 'owner.' An explicit database design with individual data elements loaded into a standardized data framework would greatly simplify data access and would facilitate data synthesis and analysis but would require additional front-end time and effort for development and additional on-going effort for data loading. Workshop participants agreed that the base data elements should be x, y, z and time (t) coordinates, but there was a strong preference to also record the network address (i.e., the sample location, or address, along a stream network. Based on discussions, the National Hydrography Dataset was the preferred stream network). There was also a preference to avoid recording and storing derivative data (i.e., interpreted and calculated data such as bankfull width, depth, area, etc.)

- Encourage communications between managers of extant databases; database experts; geomorphologists; and data users to identify options – both technical and financial.

- Consider the alternative approaches of building off of an extant database or develop a new, minimalist one.

DETAILED WORKSHOP OUTCOMES: OBSERVATIONS, DELIBERATIONS, AND CONCLUSIONS

Confirmation of Need for a National Stream Morphology Database (NSMD): Although a veritable explosion of stream morphology data production has taken place over the last quarter century, no common/central data archive exists. A plethora of data-collection protocols and instrument types, as well as a lack of consistent data reporting standards, render much of the data incomparable and incompatible.

During and following the workshop, the participants made it clear that compiling or otherwise organizing disparate sources of stream morphology data for the "common good" was a concept that has been due for a decade or more (although workshop participants agreed that the database should only collect new data that are created and older data sets should be represented only through metadata—i.e., no attempts would be made to retroactively collect the raw data for older data sets). Major cost savings (Federal, State, and other organizational levels) should result from SOS coordination of a NSMD by reducing duplication of effort and maximizing sharing of

information. Development of (or piggy-backing on) a central data repository (or search-engine based repository) might be accomplished cost-effectively and result in unparalleled access to synthesis-ready data across the country.

Benefits of a NSMD include:

- Easily find available data for evaluation and synthesis: spatially-based with a time element
- Water-quality management: utility for TMDLs
- Engineering design and navigation
- Ecological restoration: Dam removal, channel design, fish passage design, watershed sediment management
- Transportation: culvert and bridge assessment/design
- Floodplain and land-use management: Flood forecasting/inundation mapping, rainfall-runoff modeling, hydraulic model calibrations
- Development of hydraulic geometry characteristics for use in digital hydrography databases (such as Arc Hydro) and regional/national hydrology and stream habitat models.
- Applied research/monitoring: short- and long-term effectiveness of habitat improvements and or/channel modifications (e.g., dam removal)
- Basic research: climate change, channel stability, sediment sources and sinks, improved understanding of channel formation and maintenance processes
- Facilitate multidisciplinary studies – link stream morphology data with streamflow, ecology, habitat, reservoir-sedimentation, sediment-transport, water-chemistry, and flow-statistic data sets
- Facilitate long-term trend studies (upgrade of Vigil Network)

One Measure of Value for a National Stream Morphology Database: The proposed NSMD is predicated on compilation and receipt of extant stream morphology data. The NSMD itself will not be in charge of collecting data, but data will be entered by those already collecting the data through ongoing programs and studies. The cost of a single site "record" for data collection and office compilation and analysis is on the order of $1,000s. In contrast, the cost of developing (or, adapting) and maintaining a NSMD would be a small fraction of the value of the 'donated' data if considered over the timeframe of years or more. In turn, the value of those readily accessible data and accompanying metadata to end users is substantial. One goal of an effort such as the NSMD is to increase the value of monies already spent or allocated for field sampling and thus to increase the return-on-investment of those past or present efforts.

Attributes of a National Stream Morphology Database: A NSMD should be:

- Free and accessible on-line
- Platform independent
- Comparatively inexpensive to develop, implement, and maintain
- A database with incorporated metadata provisions, but *NOT* a metadatabase;
- Flexible and understood to be ever-evolving
- Receptive to new data with flexibility for adding historical data in the future

- Built on data elements that include georeferenced (x, y, z) and temporal (t) coordinates
- Independent of interpretation of process (i.e., not based on the bankfull or other interpretative concept)
- Responsive to the needs of multiple end users and receptive to user updates
- Based on top-down and down-up boundary conditions
    - The top is the real functions that we want the system to support – user stories (use cases are created from these)
    - Prioritizing the use cases will be important to progress (prevent analysis paralysis) (governing body needed)
    - Down is making sure that it is realistic for the users to actually use
  - Sufficiently simple and intuitive to avoid being a barrier to contributors/contributions
  - Based on identifiable protocols, but not necessarily a small and rigid suite of protocols
  - Based on a controlled vocabulary for variables and other data elements
  - Based on reporting standards for the base data elements of x, y, z, and t
  - Georeferenced and ideally compatible with the National Hydrography Dataset, StreamStats, NAWQA, and other relevant national, multidisciplinary datasets
  - Linked with existing streamflow and sediment databases at USGS stream gages
  - Compatible, to the extent possible, with future remote sensing data and other sampling platforms and data types
  - Able to accept and store metadata that describes important data quality information such as measurement uncertainties
  - Capable of storing both raw and derived data as well as the capacity to identify both as such

Data Types Suggested or Sought:

Mandatory: x, y, z, and t coordinates also recorded with a network address (e.g., reach code and reach measure within the NHD)

Recommended/Acceptable:

- Channel geometry (cross-sections, stream profiles, planform, benchmarks, control points)
- Longitudinal profiles of water surface, thalweg, and bank elevations
- Instantaneous stage and water discharge at the time of sampling
- Water-surface and/or channel slope in reach
- Water temperature
- Bed-material particle-size distributions and perhaps other characteristics (embeddedness, porosity, others)
- Suspended-sediment concentrations and particle-size distributions (x-section or at-a-point)
- Bedload transport rates and particle-size distributions
- Bank erosion (quantitative)
- Channel materials (inorganic, organic)

Other:

- Specific streamflow gage rating curves
- Stability assessments (stable, incising, aggrading)
- Location of grade controls, and of headcuts
- Stage in channel evolution model, if appropriate
- Biological data
- Photographs, ideally georeferenced
- Field maps and notes
- Rapid channel assessments/river walks
- Bank descriptions and data
- Valley/floodplain cross sections
- Channel and floodplain core descriptions and profiles
- Geochemistry and geochronology
- Stream classification

Data, Database, and Protocol Sources—Potential Linkages: A number of extant databases of potential relevance are "owned" by the USGS; Fish and Wildlife Service; Forest Service; Army Corps of Engineers; Dave Rosgen; Bill Emmett; and others. These should be identified in a matrix of attributes. Additionally:

Data Sources (in general order of priority to catalogue)

- Federal, State, and County agencies
- Universities
- Tribes
- Nongovernmental organizations and environmental consultants
- Data archives associated from grants

Data Categories:

- Project-level data
- Baseline data
- Monitoring data
- Basic data vs. interpreted data

Protocols:

- Goal is data compatibility.
- Cannot 'mandate' acceptance of a given data type based on a single protocol, but can mandate that any data stored meet specific reporting standards and be accompanied by metadata that describe important data collection and quality information.
- All data require georeferencing.

Potential NSMD linkages among existing databases or data models

- National Hydrography Dataset
- Streamflow – NWIS
- USGS StreamStats
- Habitat/Ecology – USGS NAWQA
- Water quality – USGS NWIS
- Fluvial sediment – USGS NWIS (instantaneous and daily-value data)
- Reservoir sedimentation – SOS RESSED

- USGS Vigil Network
- CUAHSI Hydrologic Information System (HIS)

Toward Implementation of a NSMD:

- A phased approach is probably the most prudent
- A "charter" with Objectives; Scope; Deliverables should be developed
- Project would require the following elements:
    i. Budget
    ii. Advisory Team
    iii. Project Manager
    iv. Requirements statement
    v. System architecture
    vi. Standards and data design
    vii. Implementation plan
    viii. Operations
    ix. Delivery
    x. Maintenance
    xi. Communication
    xii. Improvements (cycles back to design)

Potential Impediments to Developing a NSMD:

- Demonstrable need and benefit: Although considerable interest has been expressed in the NSMD concept, it is difficult to quantify the cost-benefit ratio for its development and maintenance; i.e., we must be able to answer the "who cares?" question.
- Cost: Development of a NSMD would presumably require a manager and technical support to develop the application. Additionally, any useful database requires long-term maintenance. Entering data would require time not accounted for in existing projects and studies.
- Leadership: Identifying an agency or organization that can manage, maintain, and support the database.
- Robbing Peter to pay Paul: No organization should be asked to support a NSMD effort "out of its own hide."
- Complexity: Concern that the varied data types will result in difficulty on parts of users to store their data in the NSMD.
- No existing database meets all of the aforementioned desired criteria for a NSMD without some degree of modification.

Appendix D

Sediment Hydroacoustics Workshop

March 19-23, 2012
U.S. Fish and Wildlife Service Training Center
Shepherdstown, WV

Organized by Mark N. Landers, Federal Interagency Sedimentation Project and USGS
Marian Muste, University of Iowa
Jim Chambers, University of Mississippi
Peter Wilcock, Johns Hopkins University
David S. Mueller, USGS
John R. Gray, Subcommittee on Sedimentation and USGS

Sponsored by: U.S. Geological Survey; CUAHSI; Federal Interagency Sedimentation Project; and possibly the Subcommittee on Sedimentation, Advisory Committee on Water Information

OVERVIEW, OBJECTIVES, AND SCOPE

This workshop will convene scientists, engineers, manufacturers, and managers interested in hydroacoustic technology applications for measuring/monitoring suspended load, bed load, bed material, and related hydrodynamic characteristics in rivers and streams. The workshop foci will include:

- technological advances,
- calibration and uncertainty issues,
- applications, and
- potential opportunities to use the technology to address new research questions.

The gathering will provide the opportunity for those working in different environments and disciplines to share information and to evaluate opportunities to advance the technology and its broad-scale operational use.

The workshop will address technological applications in rivers and streams, but discussion will be included on the relevance of this technology in lakes, reservoirs, estuaries, and the coastal zone. Fluxes and other characteristics of suspended sediment and bedload will be addressed, as will bed-material composition, bed topography, and hydrodynamics as it relates to sediment transport.

SYNOPSIS OF HYDROACOUSTIC TECHNOLOGIES IN SEDIMENTOLOGY

Manually intensive technologies for monitoring of sediment transport in rivers that originated in the 1940s-60s are being augmented by technologically advanced means for monitoring that require only periodic manual in-stream calibrations. Hydroacoustics is arguably the most compelling of a number of technologies that can provide a continuous time series, including light-based (nephelometry, laser, and digital optics), and pressure-difference technologies. The advantages of hydroacoustic metrics as surrogates of suspended sediment include a large sample

volume, environmental robustness, and simultaneous velocity measurement. However, best methods have not been broadly discussed or agreed upon for measuring acoustic attenuation, adjusted backscatter amplitude, and sediment-size class effects.

When deployed in situ in sideways or upward-looking configurations, the continuous active acoustic backscatter sensor (ABS) – as a single frequency, or, more effectively, in multiple-frequency modes – can provide continuous data on suspended-sediment concentrations and in some cases particle-size classes. The ensonified volume of streamflow sampled by the technology typically is orders of magnitude larger than those using an automatic-pumping sampler or sensed by a point-monitoring device. Additionally, it is possible to evaluate profiles of sediment concentration through or across a stream channel. Instrument fouling is of minimal concern given that the acoustic signal is more or less independent of the biological accretions that can impair the signal quality of an optical sensor. The velocity measurement obtained from the same signal data (assuming Doppler-technology enabled) can be used in computing sediment flux, which is often the principal monitoring objective, and may also be used in evaluating erosion and transport capacities. Additionally, hydroacoustics are in broad-scale operational use for velocity measurement, and the amount of new sediment data that could be obtained from these metrics is enticing.

Hydroacoustics is also being evaluated for inferring bedload transport in gravel- and sand-bed rivers. Passive hydroacoustics relying on in situ hydrophones or geophones have been shown to provide analog data for bedload transport using empirical relations developed from physical bedload-sampler data. Acoustic Doppler Current Profilers (ADCPs) have been used to infer sand-bedload transport in the ensonified region of the bed.

Finally, hydroacoustics are being used to infer particle-size classes of bed material in lotic and lentic waters.

Although none of the previously described technologies are yet used in large-scale operational sediment- and water-quality monitoring programs, these hydroacoustic technologies show considerable promise toward revolutionizing the way sediment transport is monitored in the Nation’s and world’s rivers.

SUGGESTED FORMAT AND AGENDA

A 2.5-day workshop is proposed with the following suggested format/agenda:

Day 1 Morning:

Welcome and Introductions (30 min)

PLENARY TALK-- Current “Toolbox” of sediment-surrogate technologies: relative advantages and status of implementation (45 min)

PLENARY TALK – Overview of physics of hydroacoustics and effects of sediment characteristics on hydroacoustic metrics (1 hour)

CONCURRENT BREAKOUT SESSIONS (10 for break plus 50 minute session) times 2

BREAKOUT 1: Overview of traditional methods for suspended sediment measurement and monitoring in:

- Rivers
- Lakes and Reservoirs
- Estuaries
- Marine

BREAKOUT 2: How acoustic signals are processed to obtain profiles and bed material characteristics

BREAKOUT 3: How acoustic technologies (hardware and software) are similar and distinct, and how this affects metrics related to sediment (a non-proprietary, ad-free information session)

LUNCH

PLENARY TALK—Demonstration of hydroacoustic-sediment surrogate methods to obtain SSC in fluvial environment (*suggest this be Wright or Landers…using 'USGS, empirical method to obtain attenuation from profiles)* (40 mins)

PLENARY TALK – Demonstration of hydroacoustic-sediment surrogate methods to obtain SSC in marine environments (*suggest this be, ideally, academic who has worked with* ***computed*** *attenuation such as Alex Hay, < http://oceanography.dal.ca/person/Hay_Alexander_E.html>)* (40 mins)

PLENARY TALK—The need for and obstacles to standardized methods for sediment hydroacoustics – (40 mins)

CONCURRENT BREAKOUT SESSIONS

BREAKOUT 1: Workshop style application of SSC hydroacoustic methods discussed in Plenary Talk # 1 (possibly encourage attendees to bring their lap tops; step them through the procedure w/ an example data set workshop style) (30-40 min)

BREAKOUT 2: Workshop style application of SSC hydroacoustic methods discussed in Plenary Talk # 2 and or other methods not presented in plenary talks (possibly encourage attendees to bring their lap tops; step them through the procedure w/ an example data set workshop style) (30-40 min)

PLENARY MODERATED DISCUSSION – Is standardization of hydroacoustics for SSC characteristics possible, and what kinds of guidance, tools, and metadata are needed? (30-40 min)

ADJOURN FOR DAY

POSTER SESSION?

Day 2 Morning: Plenary presentations (1.5 hours max)

PLENARY TALK --Evaluating sediment size from multi-frequency acoustics in fluvial environments Yellow River, GA, and/or Co River, AZ (Landers)

PLENARY TALK --Evaluating sediment size from multi-frequency acoustics in marine environments

BREAKOUT 1: Options for standardized methods for acoustic attenuation

BREAKOUT 2: Metadata Requirements for standardized hydroacoustic methods
BREAKOUT 3: Options for standardized methods for size class characterization from multi-frequency

LUNCH

Day 2 Afternoon

PLENARY TALK: Bedload field application – Trinity River, CA; and Fraser River, Canada;

PLENARY TALK: Bed material field application – Ohio River, KY, and/or USA reservoirs

BREAKOUT 1: Overview of traditional methods for bed-load and bed-material measurement and monitoring in Rivers, Lakes and Reservoirs, Estuaries, and Marine environments

BREAKOUT 2: Possibilities and obstacles toward standardized methods for bed-load estimation

BREAKOUT3: Possibilities and obstacles toward standardized method for bed-material characterization

ADJOURN FOR DAY

VENDOR SESSION?

Day 3 Morning:

PLENARY Synthesis Discussion
PLENARY KEYNOTE? INITIAL FORMATION AND SEPARATE MEETINGS OF WORKGROUPS FOR STANDARDIZED METHODS OR SPECIFIC RESEARCH FOCI?

WORKSHOP ADJOURN

SUGGESTED ATTENDANCE, VENUE, AND DATES

Attendance will be limited to about 40, with no more than about half representing Governmental agencies; about that number representing academia; and the rest vendors (perhaps 3-5 manufacturers of hydroacoustic equipment).

The National Conservation Training Center, U.S. F&WS, in Shepherdstown, WV, is the first choice for the workshop.

Dates for the 2.5-day workshop are being discussed, with the week of March 19 or the June 4 as viable to some of the committee (10/7/2011, to be resolved).

PRODUCTS

- An on-line summary posted by CUAHSI similar to that developed for the June 8-10, 2011, Joint USGS-CUAHSI Workshop, "In Situ Optical Water Quality Sensor Networks" (http://www.cuahsi.org/ws-usgs-synopsis.html).

- An AGU-EOS synopsis of the goals and outcomes from the workshop.

- A summary of outcomes and recommendations to all sponsoring organizations.

POTENTIAL SPONSORS

In addition to CUASHI and the USGS, the Federal Interagency Sedimentation Project (FISP), and ACWI Subcommittee on Sedimentation (SOS) might act as sponsors. Other potential sponsors include NASA, Penn State University, Johns Hopkins University, and the National Center for Physical Acoustics, University of Mississippi.

NEXT STEPS

1. Revise this proposal and submit to CUAHSI, USGS, and other potential sponsors
2. Submit updated proposal to FISP, SOS, and other appropriate organizations
3. Informally poll potential participants to gauge interest/availability
4. Alert potential vendors
5. Advertise Workshop in EOS, November, 2011

Appendix E

Proposed Reservoir Sustainability Workshop

Tim Randle

Objectives

Develop and describe practical options for managing sediment for long-term reservoir sustainability.

- What are the various types of reservoirs and sedimentation issues?
    - Reservoir geography, geometry (narrow and wide, large and small), design purpose and operational practice
    - Existing reservoir sedimentation and future reservoir sediment inflows
    - Clean and contaminated reservoir sediment
- What frequency is needed for reservoir sediment monitoring? When will reservoir and dam facilities (dam and reservoir intake structures, boat ramps and marinas, recreational surface area) be impacted by reservoir sedimentation?
- How can downstream impacts of reservoir sedimentation be reduced?
- Review past sediment management practice successes and failures.
- What types of reservoir sediment management actions would be needed for various circumstances and what might they cost?
- When reservoirs cannot be sustained, then recommendations for retirement planning

Sponsors

- Reclamation
- SOS
- ASCE
- US Society on Dams

Participants

- SOS
- Gregg Morris
- George Annandale
- Kansas Water Resources Institute
- Rolland Hotchkiss (BYU)
- Denver Water Board
- New Mexico

Workshop Format

Three-day Workshop in Denver, CO (summer 2012?)

Day 1: Morning introductions and afternoon field trip to Strontia Springs Reservoir

Day 2: Workshop subgroups with periodic reporting to large group

Day 3: Workshop subgroups with periodic reporting to large group