RESERVOIR SEDIMENTATION AND SUSTAINABILITY IN USACE: STATUS REPORT

Meg Jonas, Senior Hydraulic Engineer, USACE Headquarters, Engineering & Construction, Washington, DC, meg.m.jonas@usace.army.mil;

Abstract Sediment deposition in Corps reservoirs reduces the useful life and can severely impact authorized project purposes including flood risk management, hydropower, recreation, water supply, and environmental quality. Within the United States, the US Army Corps of Engineers (USACE) maintains and operates almost 400 dams and reservoirs for flood damage reduction. Sedimentation affects (or will affect) all these projects to some degree, and may be one of the most significant impediments to long-term sustainable operation. Reservoir sedimentation and sustainability are closely linked. Anticipated future conditions (decreased firm yield due to climate change, along with increased demand for water) will work in conjunction with the diminished reservoir storage due to sedimentation to reduce our reliable water supply. This paper will discuss the current status of data on Corps projects and types of impacts that have been observed. It will also cover ongoing Corps activities related to reservoir sedimentation and sustainability, including efforts that are proposed or underway at various Corps projects to mitigate the impacts of reservoir sedimentation. Activities related to reservoir sedimentation fall under multiple components of USACE. This paper will review and summarize those activities across the organization. USACE is involved in the Reservoir Sustainability Task Committee and the National Reservoir Sedimentation Team (under the ACWI Subcommittee on Sedimentation). This paper will provide an update on USACE activities related to reservoir sustainability.

INTRODUCTION

Reservoir sedimentation problems affect multiple business lines within the Corps, and related activities are funded by multiple programs. This paper will identify current ongoing efforts and stakeholders within the Corps.

RESERVOIR SEDIMENTATION SURVEYS

Reservoir sedimentation surveys are performed by each individual Corps district. Funding normally comes out of reservoir project funding. Surveys are often deferred in order to fund higher priority items. However, other funding sources may become available: funds that cannot be expended on other projects, or unusual funding sources such as ARRA. These other funding sources often have a very short window of opportunity, and the key to obtaining them is the district's ability to move quickly, that is, their readiness to take advantage of funding that comes up suddenly. Sponsors also fund surveys.

All the aspects of a reservoir sedimentation survey are determined by the district, including:

- Type of survey (range line or bathymetric)
- Extent of survey (entire flood control pool or a portion thereof)

- Use of aerial survey data to augment hydrographic survey data
- Who performs the survey (contractor or in-house staff)
- Method of data reduction, and who performs it (contractor or in-house staff)

There is significant variability among Corps districts in all aspects of reservoir sedimentation surveys.

RESERVOIR SEDIMENTATION DATABASE

USACE has been working with USGS on a reservoir sedimentation database, RESSED, to facilitate national reporting of reservoir sedimentation survey results, survey status, and other items (sediment management measures, sedimentation problems, etc.) One key element is obtaining data from each individual Corps district to populate the database.

Under the Responses to Climate Change program, the Corps is evaluating the potential impact of climate change on reservoir sedimentation. Multiple activities are being performed under this program. One activity includes reviewing available sediment information to identify data gaps and estimate the costs required to bring reservoir sedimentation information up-to-date.

CORPS PROGRAMS AND ENTITIES WITH INTEREST IN RESERVOIR SEDIMENTATION

Multiple Corps programs and entities have aspects related to reservoir sedimentation. The most significant are listed below.

Operations. The operation of each reservoir project is affected by reservoir sedimentation and related problems, which may include lack of access to boat ramps, inability to operate outlet works, blockage of water supply intakes, and other impacts.

Water Supply. Sedimentation normally has the most significant impacts on water supply storage.

Responses to Climate Change (RCC). Climate change may impact sediment yields. The RCC program has funded work on reservoir sediment information (discussed above), as well as other studies such as paired reservoir studies. A study of Coralville Reservoir by Rock Island District evaluated the impacts of storage loss due to sedimentation (under current conditions) on spillway flows for simulations of historic flood events.

Committee on Channel Stabilization. This Headquarters-level committee is composed of experts in alluvial channel processes and river engineering from throughout the Corps. Reservoir sedimentation falls under this committee's area of expertise, and the committee (or individual committee members) have been involved in many ongoing efforts.

RESEARCH AND DEMONSTRATION PROGRAMS RELATED TO RESERVOIR SEDIMENTATION

There is no program dedicated solely to reservoir sedimentation and sustainability research. The research and demonstration programs listed below cover multiple items, some of which are related to reservoir sedimentation:

- Flood Risk Management Research Area
- Regional Sediment Management
- Engineering with Nature
- Great Lakes Tributary Modeling Program

GUIDANCE RELATED TO RESERVOIR SEDIMENTATION

The following Corps guidance addresses reservoir sedimentation:

Engineer Manual (EM) 1110-2-4000, Sedimentation Investigations of Rivers and Reservoirs. Provides guidance on procedures for river and reservoir sedimentation investigations (1995, currently being updated).

Engineer Regulation (ER) 1110-2-4001, Notes on Sedimentation Activities. This regulation prescribes general requirements for submittal of annual reports on Corps of Engineers activities in the field of sedimentation (1981).

Engineer Regulation (ER) 1110-2-8153, Sedimentation Investigations. This regulation prescribes the procedure and rationale for conducting sedimentation investigations in support of the hydrologic analysis and hydraulic design of civil works projects, and environmental impact analyses (1995).

TRAINING RELATED TO RESERVOIR SEDIMENTATION

There is currently no Corps training offered related to reservoir sedimentation. Corps personnel are assisting in the short course on reservoir sedimentation and sustainability at the 2015 SedHyd conference.

EXAMPLES OF DISTRICT PROJECTS RELATED TO RESERVOIR SEDIMENTATION

The list below gives some examples of district activities.

Baltimore District, Susquehanna River Basin. Watershed assessments and sediment transport modeling have been performed to evaluate alternatives at Conowingo Dam, with the goal of protecting water quality, habitat and aquatic life in the lower Susquehanna River and the Chesapeake Bay.

Tulsa District, Neosha River. The Kansas Water Office has requested approval to dredge sediment from the conservation pool of John Redmond Reservoir in order to restore water supply storage capacity that has been lost to sedimentation.

Kansas City District, Kansas River Basin. Reservoir sustainability efforts have been initiated to evaluate alternatives for sediment management alternatives at Perry Lake and Tuttle Creek Lake.

Omaha District, Missouri River. The district is evaluating sediment flushing at Gavins Point Dam in Phase II of its Lewis and Clark Lake Sediment Management Study as part of the Missouri River Recovery Program.

Los Angeles District, Santa Ana River. Orange County Water District (OCWD) is proposing a demonstration project in which sediment would be removed from behind Prado Dam, and conveyed to the Lower Santa Ana River below the dam for re-entrainment.

INTERAGENCY ACTIVITIES RELATED TO RESERVOIR SEDIMENTATION

The Corps is represented on the ACWI Subcommittee on Sedimentation (SOS). The Corps also has representatives on the SOS working group on reservoir sedimentation and sustainability (the National Reservoir Sediment Team). The SOS passed a resolution on reservoir sustainability, which was recently approved by ACWI.

OTHER ACTIVITIES

Personnel from Omaha District are working on projects in the Mekong River Delta, along with personnel from the US Bureau of Reclamation.

SUMMARY AND CONCLUSIONS

There are many Corps activities related to reservoir sedimentation and sustainability. This is a “first cut” at listing all pertinent Corps activities, and is no doubt incomplete. Next steps include making the list of activities more complete, and improving coordination between these activities.