May 2024

MSAC utilized information from the Omaha District's RSM program proposal for portions of this report



Bottom Line Up Front (BLUF):

Omaha District has been partnering with the Missouri Sedimentation Action Coalition (MSAC) on a multiphase study to develop a Sediment Management Plan for Lewis and Clark Lake behind Gavins Point Dam. As a result of an SME led workshop in June 2021, bedload collection on tributaries was one of four management methods identified for further examination. In collaboration with the ERDC Environmental Lab, this project will place a 12-ft length bedload collector in the Niobrara River for at least one week to collect and analyze the efficiency of collection in the highbedload conditions prevalent on the Niobrara River.

MSAC will arrange a field day for stakeholders and elected officials, and results will be used to develop scaled estimates of the effectiveness of the method and its applicability in similar conditions across the USACE reservoir portfolio.

Missouri Sedimentation Action Coalition

Scott Kostal, executive director PH: 605-464-1067 msacdirector@keepitwwater.org

Sandy Stockholm, communications coordinator PH: 605-661-1594 msacinfo@keepitwater.org

www.keepitwater.org



Figure 3. Components of the Sediment Collector™ at the Fountain Creek, CO Install (Tucker et al., 2015)



Figure 4. ERDC-EL 12-foot Sediment Collector™ system for Pilot Project

Pilot Installation on Niobrara River

The Niobrara River has historically contributed just over 50% of the total sediment load to the Missouri River reach that makes up the Lewis and Clark Lake delta (USACE, 2013). The delivery of this sediment is chronic due to nearly unlimited sediment supply and base flow driven by springs through the basin. This makes sediment delivery from the Niobrara a 'chronic' condition, i.e. slow and continuous delivery which increases intermittently during flood events. This condition makes it an excellent candidate for this type of passive collection system that can operate continuously.

In the application case for a pilot on the Niobrara River, where much of the bedload material is in the 0.2-0.4mm range (USACE, 2013), similar to Material 1 tested by Lipscomb, bedload capture efficiency varies between 54 and 74% with velocity and depth of flow. In concept, the collection of bed material from the Niobrara could be scaled to capture the full width of the river channel. If 50% of the bedload could be captured, which can be up to 20% of the total load in the Niobrara that is annually delivering 50% of the estimated 2,600 ac-ft (as of 2011) to Lewis and Clark Lake, an effective 5-15% reduction in delta forming sediment could be extracted. Any reduction in sediment delivered to Lewis and Clark Lake can be expected to slow the progression of the delta face and increase the lifespan of the lake. Whether the percentage rate of sediment delivery reduction equals the same percentage increase in the lifespan of the reservoir is currently unknown.

The USACE Engineering Development and Research Center (ERDC) has been examining and testing bedload collectors for the past twenty years (Mr. Tim Welp – ERDC Coastal and Hydraulics Lab as author on Tucker et. al., 2007). Most of the previous work done by ERDC was with small collectors (2- to 4-ft width), or in conjunction with existing installs up to 30-ft width.

ERDC Environmental Lab (ERDC-EL), under PI Chuck Theiling, has a 12-ft long collector with the necessary connections, pumps, and separators, that could be used for a one-to-two-week sediment collection pilot project. Figure 4 shows the collector and separators of this system. An install of this system would require portable power, approximately one acre of river side access, and a roadway access capable of supporting at least 26T rated equipment haulers.

The production rate of the system is difficult to predict, but the ERDC-EL team expects that up to 1-2 tons/hour could be collected and separated in this pilot with Niobrara River sand. This system requires manual removal of the sediment from the separator tanks. This configuration is therefore separator limited, not collection rate limited. Increases in total sediment removed could be achieved with faster separation methods. A monitoring program during the pilot will provide more specific production and sediment capture rates, which will be necessary to estimate the footprint and cost of larger scale implementation.

While additional collection may not be necessary for the measurement and determination of collection rates, Geotubes™ could be used to collect a larger volume of sediment to increase the visual impact during the field day. MSAC is working with local groups to identify beneficial uses.

At the scale of the proposed pilot project, the benefit to Lewis and Clark Lake would be negligible, but the value in terms of proof of concept, scaling considerations, applicability to other USACE reservoir projects, and the public outreach and engagement is very high. Local collaborators including MSAC and its supporters are excited to partner with USACE on the pilot. Project partners are working with county and local entities, the National Park Service, US Fish and Wildlife Service, and appropriate state agencies for environmental review.

MSAC, a 501(c)3 non-profit, is supported by more than 40 governmental units, organizations, and individuals. Nebraska entities include the Santee Sioux Nation, Knox and Cedar counties, Niobrara, Lewis and Clark NRD, Lower Niobrara NRD. South Dakota entities include Missouri River Energy Services (representing members in 4 states), Yankton, Pierre, Springfield, Bon Homme and Yankton counties, Bon Homme Izaak Walton League. MSAC along with 10 stakeholders including the Nebraska Game and Parks Commission and South Dakota Game, Fish, and Parks are focused on building a sediment management plan for the Lewis and Clark Lake region.

Sediment Moved through RSM:

For the first time in the history of RSM, an Omaha District proposal IS identifying sediment will move through this RSM project. Total moved will depend on trap efficiency of the collector and separator, the ability to move and store sediment, and the duration of the pilot. For a week-long pilot run, 8 hours per day, the total could approach 100 tons (78 CY, or 5-10 truckloads). Beneficial uses for the sediment may include road maintenance or construction activities in the local area or other beneficial uses.



Possible collector sites for pilot project as of May 2024.