

WaterSMART

Internal Applied Science Project



BUREAU OF
RECLAMATION

Reservoir Sedimentation Database

Need for Storage Capacity Database

Reservoir storage capacity – the amount of water impounded in a reservoir – is an important Reclamation asset, enabling water delivery, flood mitigation, and hydropower production. While the original storage capacity of the Bureau of Reclamation’s (Reclamation’s) reservoirs is recorded information, current storage capacities are not always known due to the deposition of sediment and the lack of reservoir surveys.

Rivers naturally transport sediment and dams can block over 95 percent of the sediment from continuing downstream, reducing a reservoir’s storage capacity over time. Reservoir sedimentation surveys detect changes in the reservoir bed to determine the present-day reservoir storage capacity. Unfortunately, the data associated with the reservoir surveys was not centralized or available Reclamation-wide.

The goal of this project was to develop a centralized database that hosts new and historical reservoir surveys along with an easy-to-use interface tool that allows users to query and download data. The centralized database will support operational decisions by having the most up-to-date information available Reclamation-wide.

Reservoir Survey Data Repository

This project created the Reservoir Survey Data Repository (RESDATA). The survey data repository stores three key data items: (1) a report detailing the survey methods, data, and metadata; (2) an updated area-capacity table generated from the survey; and (3) the geospatial topographic and bathymetric surface used to generate the area-capacity table. Centralizing this data now allows Reclamation to track capacity loss through time and facilitates sedimentation projects without first having to amass the data. Figure 1 showcases some of the data stored in RESDATA. The repository has over 300 area-capacity tables at 200 reservoirs, which includes original and re-survey data.

The repository hosts digital formats of topographic and bathymetric data as well as paper maps for future digitization. RESDATA also provides an ArcGIS online dashboard (Figure 2) that displays the status of survey availability and incorporates planning tools such as estimated survey costs. In addition, Reclamation’s Asset Management Division made the entire reservoir asset table viewable to Reclamation users on ArcGIS online.

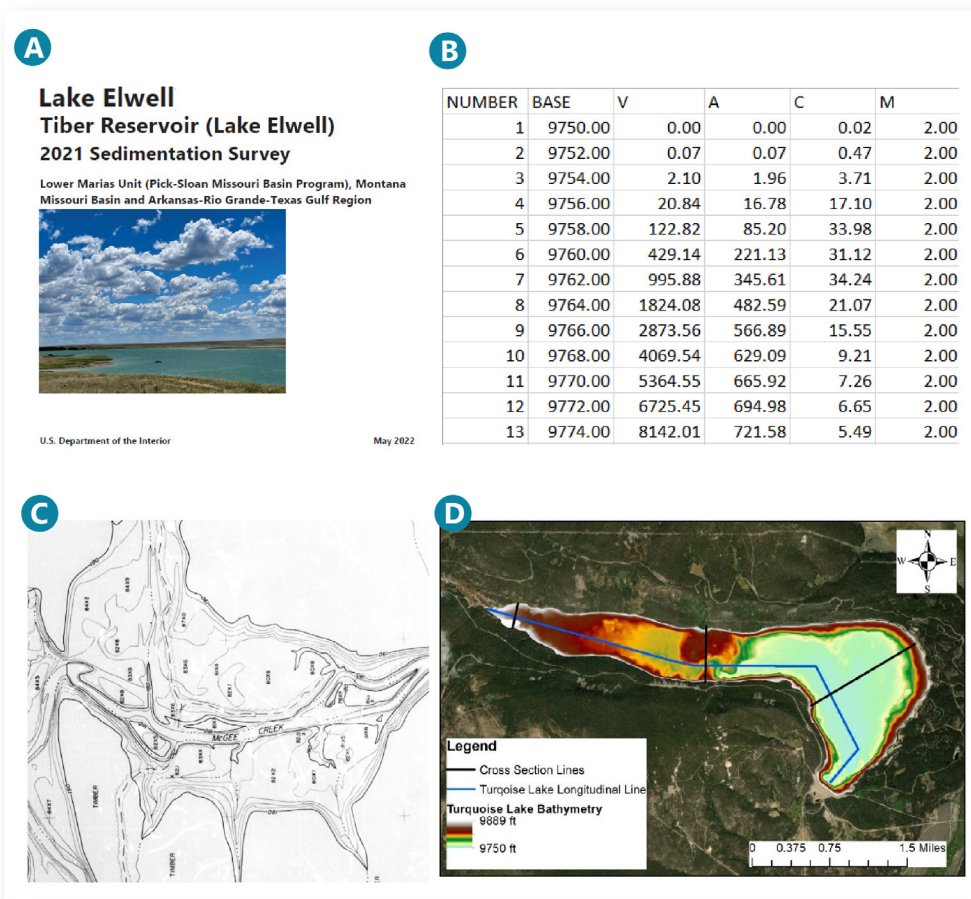


Figure 1. Examples of data requested for RESDATA are presented in images 1A, 1B, 1C, and 1D. Image 1A illustrates a report associated with a sedimentation survey. Image 1B shows an area-capacity table with elevation (Base), capacity (V), area (A), and variables used to interpolate data between measured elevations (C and M). Images 1C and 1D show examples of topographic-bathymetric data, including a contour map (1C) and digital terrain surface (1D) shown on satellite imagery.

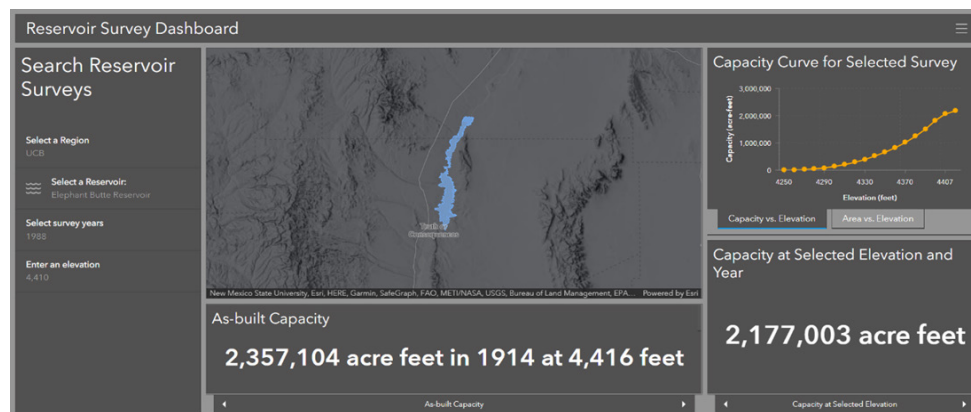


Figure 2. ArcGIS dashboard associated with the reservoir survey repository. On the left, the user can select the region, reservoir, survey year, and optional elevation of interest. The central map displays the reservoir. The bottom central panel shows the as-built capacity. The top right panel includes graphs of capacity and elevation or area and elevation (capacity is shown here). The bottom right panel shows the capacity data for the selected survey-year and elevation.

Communication

Communication between Reclamation offices is key to the success of RESDATA. Establishing communication pathways facilitates quick resolutions for any problematic or incomplete data flagged during quality-control queries. A workflow diagram (Figure 3) was created to foster this communication and includes updates to related databases that are either required or recommended following a new survey. The workflow focuses on the delivery and transfer survey reports, topographic and bathymetric data, area-capacity tables, and any associated metadata.

Project Benefits

A centralized repository meets the objective of making reservoir sedimentation data more accessible across Reclamation. Tools built into the RESDATA dashboard interface allow operators and managers to view the existing data and prioritize sites for resurveys and potential costs to conduct a resurvey.

The RESDATA dashboard is currently being used to predict present-day sedimentation and future sedimentation rates at all Reclamation reservoirs. This enables Reclamation to use the most recent data and projections to quantify the current available water storage capacity across Reclamation.

Continued Coordination

Because some data gaps remain, it will be important to continue to expand the data sets as part of future data inquiries. In addition, Reclamation is requiring reservoirs to schedule and formulate reservoir sedimentation plans at sites without a reservoir sedimentation monitoring plan. Continued coordination will help to designate the proper reservoir manager or responsible data steward for each Reclamation reservoir and ultimately create a workflow and data repository that meets operators' needs and eases their ability to update and access data.

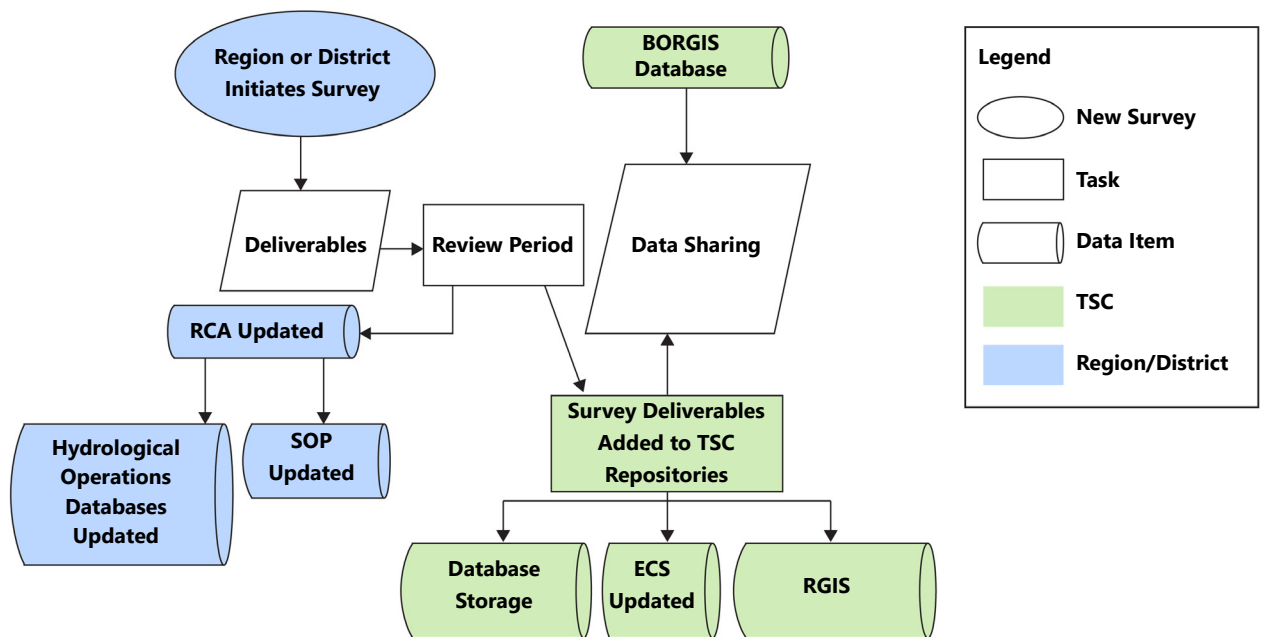


Figure 3. Proposed workflow for communication and data delivery following new reservoir surveys.

Additional Information



Useful Links for Applied Science:

<https://www.usbr.gov/watersmart/appliedscience/index.html>



WaterSMART Website:

<https://www.usbr.gov/watersmart>

Study Lead:

Melissa Foster - Denver Office

- 303-445-2511
- mfoster@usbr.gov

WaterSMART Contact:

Avra Morgan

- 303-445-2906
- aomorgan@usbr.gov

