No Way In, No Way Out: The Realities of Small-Reservoir Dredging

James R Guistina, P.E., CED, Colliers Engineering & Design

Dredging small dam reservoirs can be deceptively complex, particularly when site access and water control options are limited. The 4 subject NRCS designed earthen dams from this CED designed project serve as flood control as well as habitat for wildlife in rural Chautauqua County (1 hour south of Buffalo, NY). Over the past 50 to 75 years the four individual dams accumulated sediment from the contributing watershed (enhanced by farming operations) that have built up to the point of reducing effectiveness of the dams as flood control devices. Typically, and in the case with these four dams, small earthen dams have a lack of infrastructure or flexibility found in larger reservoirs to handle the sediment effectively. When maintenance dredging is finally required, engineers and managers face a unique set of challenges—balancing the technical, environmental, and logistical constraints of confined, difficult-to-reach sites. The sponsor, Chautauqua County, requested CED to provide design services for the four dams to dredge and dispose of the accumulated sediment. The project challenges included limited access for equipment and property owner involvement (the dams sit on easements and are not public property). Additionally, environmental considerations for work periods and sediment contaminations were included in design. Limited water control options constrained the design operations as the dams lacked functional low-level outlets and/or valves to draw down the reservoir safely. Without the ability to lower water levels or isolate work zones, sediment removal must occur under wet conditions, which increases turbidity, complicates sediment containment, and limits visibility and control. For this reason, it was decided to repair and clear the low-level outlets and gates as part of this project to complete the sediment removal in relatively dry conditions. Successful dredging in such constrained settings depends on integrating geotechnical, hydrological, and operational perspectives early in project planning. Approaches such as phased dredging, geotextile dewatering systems, and partial drawdown methods can reduce risk and improve efficiency. Collaboration among dam owners, engineers, regulators, and contractors is essential to develop feasible, site-specific solutions. This presentation offers lessons learned from the four small reservoir dredging projects where access, environmental, social, and water control were extremely limited. It highlights strategies for balancing technical feasibility, dam safety, and environmental performance—offering practical insights for practitioners tasked with maintaining the capacity and functionality of small but vital flood prevention infrastructure. Construction was completed in 2025.