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More than 27,000 Natural Resource Conservation Service (NRCS) dams have been constructed throughout the United States, almost all of which have an earth-cut auxiliary spillway. The majority of the earth-cut auxiliary spillways at these dams were constructed more than 50 years ago using quasi-empirical methods and engineering judgment, without any formal analysis of their performance during the design storm. Auxiliary earth-cut spillway design criteria adopted by the Soil Conservation Service (SCS) at the time the dams were designed allowed significant damage to the auxiliary spillway as long as it was activated infrequently with relatively short periods of flow duration, the crest of the auxiliary spillway was not breached, and the main dam was not endangered by the spillway flows. Unfortunately, many earth-cut spillways that have been activated have not performed satisfactorily, and some have completely breached.

As dams are being re-assessed and rehabilitated, the integrity and hydraulic performance of their earth-cut auxiliary spillways are also being evaluated using new tools developed by the ARS and NRCS, such as the SITES and WinDAM B software. To properly apply these tools and understand the results, it is helpful to understand past design criteria and practices.

The purpose of this paper is to present the history and rationale of early earth-cut spillway design using examples from the past. Both good and bad examples of NRCS earth-cut spillway designs and their performance will be presented. Use of SITES and WinDAM B software for performing screening level assessments using limited data, and comprehensive analyses using detailed subsurface data will be discussed. The authors will share lessons-learned and provide recommendations on how to best use available information, whether it be old or new, to perform spillway integrity analyses and evaluate the performance of earth-cut auxiliary spillways.