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SUBLACUSTRINE GEOMORPHOLOGY AND DEEPWATER CHEMOSTRATIGRAPHY REVEAL EFFECTS OF DAM INSTALLATION AT JACKSON LAKE (WYOMING, USA)

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Modification of inland waters by dams is a profound mechanism of aquatic ecosystem engineering and a critical aspect of water management in the American West. The transformation of natural lakes into reservoirs via dam construction provides an opportunity to assess the effects of major transgression and subsequent water level oscillations on lacustrine sedimentary processes and stratal development. In this study, we used CHIRP seismic reflection profiles and deepwater sediment cores to reveal the influence of dam installation on Jackson Lake in Grand Teton National Park (Wyoming, USA). Seismic datasets reveal four lake floor acoustic facies types, including a series of prograding clinoforms submerged ~11-12 m below the air-water interface along both axial and transverse margins. These features are consistent with Gilbert-type deltas that were drowned and abandoned with shoreline transgression, following dam construction over the lake's Snake River outlet from ~1908 to 1916 CE. In deepwater, short cores were dated using ^{210}Pb, ^{137}Cs, and reservoir-corrected ^{14}C to establish the history of recent sedimentation and make inferences about environmental history. High resolution chronological data, integrated with lithofacies characteristics, physical properties, and major element sediment chemistry data, were used to precisely pinpoint the datum corresponding to dam installation in the stratigraphy, which marks the initiation of considerable increases in both sediment accumulation rate and organic matter content. Deepwater chemostratigraphic patterns suggest that dam installation resulted in a shift in nutrient status that altered the Jackson Lake depositional system to conditions unseen prior to the early 20th century. Our results reveal that Jackson Lake is an outstanding natural laboratory to study the influences of high frequency environmental and limnological changes on the stratigraphy of an overfilled glacial-tectonic lake basin.

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