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This site of a catastrophic failure provides the perfect hands-on lab for geotechnical engineers

Oct. 30, 2015 - Standing at a lookout on the upper banks of the Teton River in Southeastern Idaho, a handful of civil engineering students try to imagine the giant structure that should be standing firmly in front of them.



The 300-foot-tall Teton Dam was supposed to be a triumph of American engineering, but all that's left is a wind-swept heap of earth and graffitied remnants of a catastrophic failure.

Civil and Environmental Engineering Associate Professor John Rice brings his students to this spot every year. It's not a pretty site. Vandals have tagged every square inch of concrete still standing, and forensic investigators have torn apart what was left of the giant embankment in search of clues as to what went wrong back on June 5, 1976. The location is an outdoor classroom, a laboratory, where Rice – pen and portable white board in hand – illustrates the complexities of dam construction and geotechnical engineering.

"The Teton Dam site is probably the best site in the country, if not the world, where students can come and see all of the elements of earth dam construction exposed for observation and discussion," said Rice. "It also provides a great setting for discussing the design and construction mistakes that were made at Teton. All of this reinforces the concepts we discuss in class."



Rice leads the group to the dam's foundation where he points to cracks deep in the rock that he and other experts say should have been grouted during construction to reduce seepage. His students scurry up the loose grade to inspect the formations. At every turn Rice and his colleague, Professor Emeritus Loren Anderson, see an opportunity to educate these future engineers.

"The site really impresses on the students the responsibility they have as civil engineers," said Rice. "Whether they are building a bridge, a building, or a dam the safety and well-being of others is genuinely affected by the job they do."

Dam construction in the U.S. has undergone a major shift in recent years. In the 1950s, '60s and '70s, engineers were erecting dams as fast as they could. The era was a heyday of civil engineering feats, and nearly all dams – even those built similarly to Teton – continue to serve their intended purpose. However, our understanding of dam design has evolved significantly.

The focus in dam engineering has shifted away from new construction and onto risk assessment and maintenance. In fact, the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation – the U.S. agencies responsible for Teton Dam and hundreds more – are getting out of the dam construction business; concentrating on maintaining and upgrading existing inventories.



Projects to improve the safety and functionality of dams dot the globe, and civil engineering students from USU are among the top experts who are leading the cause.

One of Rice's students, Lourdes Polanco-Boulware, is one such future leader. In April, she received the \$10,000 scholarship awarded annually by the United States Society on Dams for her research on analyzing underseepage in levees. This innovative work is critical to the safety of levees across the U.S. – especially in regions of Central California and Mississippi where many of these types of levees are in need of evaluation and improvements.

"In our program we strive to produce geotechnical engineers who are able to apply the principal geotechnical concepts they are taught to a wide variety of situations," said Rice. "Gone are the days where a standard 'cookbook' approach is acceptable."

The Teton Dam site gives students a chance to see how well-intended engineers made critical errors by not completely understanding the conditions they were dealing with.

"It teaches them that they will be the ones responsible for understanding the conditions they'll work in," said Rice. Today's engineers need to be able to assess a wide variety of site conditions and determine the appropriate analyses to use in their design. It's been said that if we don't learn from our history we are doomed to repeat it."