

# Researchers developing framework to detect damage to dams from earthquakes

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The UT Arlington-Tarrant Regional Water District project will evaluate the dam at Eagle Mountain Lake. Credit: Tarrant Regional Water District

A UT Arlington researcher is developing a comprehensive, reliability-based framework to analyze North Texas dams and detect damage from seismic activity.

Anand Puppala, a professor of civil engineering and associate dean for research in UT Arlington's College of Engineering, is overseeing a three-year, \$1 million project from the Tarrant Regional Water District to analyze data taken at the Eagle Mountain Lake dam, which he will then use to create a framework that future investigators can use to determine if a dam has sustained damage from earthquakes.

"It is important to develop this framework because we know that more earthquakes are happening in North Texas even though we don't know why," Puppala said. "Dams in this region were not designed to withstand [seismic events](#), so we want to be able to test them ahead of time to determine if they are in danger of failing."

Puppala and his team will look for three key indicators of damage caused by earthquakes: liquefaction, dynamic slope stability and lateral spreading.

Liquefaction is when a saturated or partially saturated soil loses strength and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in stress condition, causing it to behave like a liquid.

Dynamic slope stability is when an earthquake exerts extra forces on a slope that can make the slope less stable,

Lateral spreading happens when the soil cracks and breaks into pieces.

Tejo Bheemasetti, a post-doctoral student, and Santiago Caballero, a doctoral student working in Puppala's lab, will use geo-statistics to do spatial correlation analysis to create a good model of the entire dam. He will help to create a picture of the soil properties around the dam, which researchers will then use to identify which layers are subject to failure.

"We will spend a lot of our time on how we are doing the instability testing so that it can be applied to any structure, including roads, pipes and bridges, because even if we find that seismic events don't affect dams, they may affect other structures," Puppala said.

Louie Verreault, a dam and levee safety engineer for the TRWD, said that Puppala's research will enable engineers to evaluate structures and see what would need to be done to existing structures to bring them up to current standards.

"This project is part of an ongoing evaluation of our infrastructure," Verreault said. "With the increase in earthquakes in recent years, it's important to have an understanding of what damage may result from not only a high-magnitude earthquake, but from smaller ones as well. The management and Board of Directors of the TRWD have been proactive and supportive of efforts for dam safety, giving us the opportunity to create a risk-based framework to analyze our infrastructure."

Khosrow Behbehani, dean of the College of Engineering, praised Puppala's work for its potential benefits to the sustainability of the region.

"Dr. Puppala and his team will help the Tarrant Regional Water District to maintain and improve critical infrastructure that will lead to more sustainable urban communities for years to come," Behbehani said. "This research will help to ensure that our water supply is safe from natural disasters, and add to our knowledge of the effects of increased seismic events in our region."

Provided by University of Texas at Arlington

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