

North Dakota Water Resources Research Institute (NDWRRI) Seminar Series

“Can Hydraulic Structures Handle Ice?”

Presenter: Dr. Robert Ettema, Colorado State University

Date: Monday, December 7, 2026

Time: 3:30–4:30 PM (CDT)

Zoom link: <https://ndsu.zoom.us/j/98591740209>



Abstract

This seminar poses the question: *Are hydraulic structures designed to handle ice?* The answer is a qualified no. Though progress has been made in understanding ice interaction with hydraulic structures, concerns regarding ice and hydraulic structures remain, and the possibility exists that ice is forgotten.

The question entails three spatial scales: global, hydraulic structure, and molecule. At the global scale, cold regions (where frigid weather occurs) occupy approximately half the land surface of Earth's Northern Hemisphere and primarily affect water temperature. Hydraulic structures primarily influence water pressure (a highly variable scale, including dams, bridges, and their components). Temperature and pressure dictate the molecular behavior of water, the liquid phase of the chemical compound H_2O .

Southwards in the Northern Hemisphere, weather patterns and frequency become increasingly important considerations when considering ice and hydraulic structures. In North Dakota, these considerations may cause unforeseen multi-hazard failures.

Speaker biography

Dr. Robert Ettema applies cold-regions expertise to hydraulic engineering, hydraulic structures, and river engineering. His approach is based on principles of engineering physics, moderated by practical experience.

He pursued his engineering education at Auckland University in New Zealand, earning the Ph.D. degree in 1980. Prior to becoming a Professor at Colorado State University (CSU), he worked at the University of Wyoming (8 years) and, before that, at the University of Iowa and the Iowa Institute for Hydraulic Research (27 years). Since June 2024, he has been a Senior Research Engineer at CSU.

