**Project Number:**2016NH201B

**Start Date:** 2017-03-01 **End Date:** 2018-02-29

**Principal Investigators:** Amy Villamagna

**Abstract:** The impacts of thermal variability and salt loading on freshwater biota have garnered attention and study in northern states, but it remains unclear how thermal and salt stressors synergistically impact biota across the community, population and molecular levels. Traditionally, biotic response to water quality degradation is measured using broad-based community metrics and/or assessing populations of bio-indicator species (e.g., EPT). Rapid biological assessments examine community composition and the presence of indicator species to assess overall stress; however, these methods are largely reliant on the loss of individuals and/or species, which could have cascading effects on biodiversity and the ecological function of streams. To truly avert the loss of species and ecosystem function, we need to develop techniques that will provide an early-warning signal of ecosystems in jeopardy.

At the molecular level, heat shock proteins (HSPs) have been used as a sub-lethal biomarker of stress, and hold great promise as an early-warning sign of ecosystems in peril. The expression of HSP70 as a sublethal biomarker of stress may help us understand how shifts in stream thermal and salt regimes may influence species distribution. Moreover, by examining HSP70 expression in a target species in conjunction with population and community-level assessments, we can evaluate the tolerance range for key species and their natural ability to acclimate to the presence of elevated stressors.