Climate Change vs Everything Else
Where Do We Focus Our Efforts?

We’re inundated with predictions of ecosystem collapse, biodiversity loss, extreme weather and societal upheavals due to climate change. The behavior of policy makers and common sense suggests ecological and societal adaptations will occur slowly (or not at all) in the face of slow climate changes.

How can we be most effective at making a difference and adapting to the new normal? Where should we focus our efforts on protecting and restoring aquatic ecosystems?

This seminar tackles tough realities that human dominated ecosystems are subjected to a plethora of physical, chemical and biological stressors - which in part are related to 1) land uses, 2) societal and political norms, 3) economical constraints, and 4) the sensitivity and resilience of the regional ecosystems. These components vary across geographies and vary as system drivers. It is important to understand the contribution of each of the 4 drivers and how they are intertwined in the face of climate change.

Without such an understanding, management efforts to protect and restore aquatic ecosystems likely will fail. Examples of these system drivers and their typical stressors: Urban and agricultural runoff of excess nutrients results in a loss of
biodiversity and harmful (toxic) algal blooms. This same runoff and wastewater discharges contain high levels of metals, pesticides, synthetic and petroleum-based organics, erodible soils, tire wear particles, plastics and microplastics, and dynamic increases in pathogen loadings, stream flow and habitat destruction. These many stressors vary in their extent and magnitude depending on socio-economic conditions, education, and cultural/historical traditions.

In general, increased poverty shifts the importance of managing stressors to sewage, erosion control, and habitat destruction; and in urban areas also managing flashy runoff and plastic litter. In addition, parasites, fungal and viral infections and “invasive” species are radically changing many regions, driven by ecosystem warming and global connectivity.

While it is critical to understand the scientific issues relating stressors to ecosystem health - it is equally important to understand how society and economics drive the prevalence of these stressors. **How will various societies and their economies be affected by climate change and how will this exacerbate the effects of stressors on ecosystem health?** Management strategies must be region-specific, as “one size does not fit all”.

We’ll compare the importance of stressors across a range of ecoregions, hydrology types, and socio-economic extremes; then address pragmatic approaches for ranking and managing stressors, despite climate change.

**Class objectives**
1) Examine current and emerging stressors by global regions; 2) Identify strategies for identifying the most important stressors, considering their ecological, societal and economic context; 3) Develop restoration strategies for the near-term (next decade); and, 4) Determine how current restoration, mitigation, and regulatory efforts could be enhanced. In the end, we will have a better understanding of how to manage the most important aquatic stressors in a wide range of common geographies and socioeconomic systems.

**Class format and grading**
Assigned readings from recent literature with student & instructor led discussions. Occasional lectures from Dr. Burton and invited speakers followed by class discussion. Presentations (50%) and class participation (50%). One or 2 papers assigned for each class. Students rotate as lead for presenting papers.