LECHI

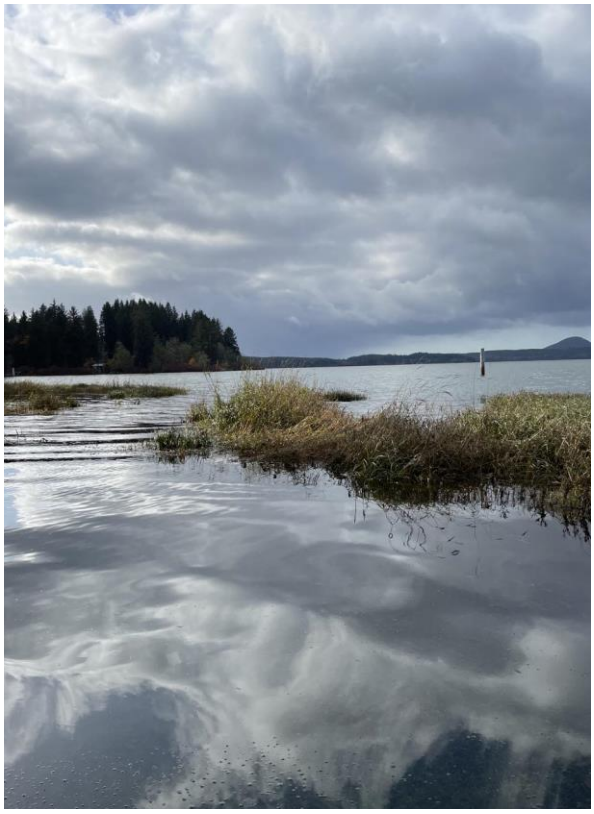
Lentic Chironomidae

The Lentic Chironomidae project (LECHI) project focuses on community analysis of chironomids from lakes, particularly large, deep, saline, ancient, or alpine lakes.

Overview. The LECHI project originated with research on the large, ancient Lake Hövsgol in Mongolia beginning in 1995 (NSF INT-9504867) Other lakes studied include Lake Tahoe, Crater Lake, and saline lakes of the Nebraska Sandhills and western Mongolia, Lake Quinault, Washington, and wetlands and bogs of Western Washington. I am particularly interested in the strong environmental variables and filters that structure taxonomic and functional diversity of chironomid communities in these lakes. My research interests and collaborations also include study of the entire macroinvertebrate community.

Collaborators. Scott Herrmann (Colorado State University Pueblo) and Jim Sublette (deceased), Sudeep Chandra (University of Nevada, Reno), Annie Caires (University of Montana), Jon Gelhaus (Academy of Natural Sciences of Drexel University); Len Ferrington (deceased) and William Bouchard (University of Minnesota).

Objective. The objective of this project is to study the biodiversity and species/environment and trait-environment interacts in lakes to increase our knowledge and for use in conservation.



Alpine lake in Western Washington illustrating a collecting location for Chironomidae pupal exuviae

Saline lakes in the sandhills of Nebraska (top) and western Mongolian (bottom).

Major findings. Eight papers published, one paper submitted for publication, and nine presentations resulting in these major findings:

- Nutrient concentration, salts, and surface temperature were stronger predictors of adult chironomid biodiversity than were elevation or lake size in high alpine lakes of southern Colorado.
- Bathymetric distribution of chironomids from Lake Hövsgol varies by benthic plant community, latitude, and substrate composition.
- Spatial variation in nearshore macroinvertebrate communities of Lake Tahoe and Lake Hövsgol indicate a high degree of complexity in the littoral environment of large lakes.
- Strong gradients in salinity structure chironomid communities in lakes of western Nebraska and western Mongolia.
- Chironomid communities were useful in linking lake trophic status to function in a bicontinental comparison of Lake Hövsgol, Lake Tahoe, and Crater Lake.
- Declines in benthic macroinvertebrate communities of Lake Tahoe corresponded to increasing eutrophication.

Publications

- Herrmann, S., J. Sublette, and B. Hayford. *Submitted*. Species Diversity, Distribution, and Ecology of Chironomidae (Diptera) in Twelve Alpine Lakes of the Sangre de Cristo Range, Colorado, USA. Western North American Naturalist.
- Bouchard, R.W., Jr., B. Hayford, L.C. Ferrington, Jr. 2022. Diversity of Chironomidae (Diptera) along a salinity gradient in lakes of the endorheic Great Lakes region of western Mongolia. *Hydrobiologia.* https://doi.org/10.1007/s10750-022-04856-2
- Hayford, B.L., A. Caires, and S. Chandra. 2016. A Tale of Three Lakes: A Comparison of Biodiversity between Lake Tahoe and Crater Lake, USA, and Lake Hövsgöl, Mongolia. *Mountain Views: Brevia.* 10(1): 37-42.
- Hayford, B., A. Caires, S. Chandra, and S. Girdner. 2015. Patterns in benthic biodiversity link lake trophic status to structure and potential function of three large, deep lakes. *PLOS One* 10(1): e0117024. doi: 10.1371/journal.pone.0117024
- Hayford, B. B. Boldgiv, and C. Goulden. 2013. Spatial heterogeneity in macroinvertebrate density from Lake Hövsgöl, Mongolia. *Journal of Species Research*. 2(2):159-166.
- Caires, A., S. Chandra, B. Hayford, and M. Wittmann. 2013. Four decades of change: dramatic loss of zoobenthos in a large oligotrophic lake exhibiting gradual eutrophication. *Freshwater Science* 32(3): 692-705.
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- Hayford, B. and L. Ferrington. 2006. Distribution of chironomids in Lake Hövsgöl, Mongolia. *The Geology, Biodiversity and Ecology of Lake Hövsgöl, Mongolia,* C. Goulden, T. Sitnikova, J. Gelhaus, B. Boldgiv, editors.

Ongoing research. Current projects include analysis of chironomid communities in salt lakes of western Nebraska, biodiversity surveys of lakes in Western Washington.

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Research Interactions. This research is linked to the MAIS, CPEN, and MACRO projects.