

Summit information and product manuscript outline

Summit goals:

- 1) Create an **informative, accessible, attractive and citable** summary of the history of winter research on the Laurentian Great Lakes (LGL), main research priorities and hypotheses for moving science forward and some ideas of how to get there. Ideally, this will be published in a “general” interest journal such as Global Change Biology (as a ‘report’-type contribution), BioScience, Frontiers in Ecology and the Environment, etc.
- 2) Facilitate exchange of ideas and catalyze future collaboration between researchers interested in LGL winter limnology.

Authorship:

All workshop participants will be included as co-authors on the product MS (as long as they contribute to discussions/ writing/ editing). Workshop organizers will be listed first, followed (alphabetically) by sub-group leaders (see below), followed (alphabetically) by everyone else.

Timeline:

- June 30: Draft of the product MS circulated to all workshop participants for comments and edits.
- July 31: Comments and edits due.
- August 31: Final draft circulated to all participants.
- September 30: Submission.

Data, figures and literature to share during meeting:

Consider bringing a few relevant data figures/ slides (from winter work on LGL or other systems) that you can share with other summit participants to catalyze discussions and illustrate interesting winter processes. Please also consider bringing a list (or pdf copies) of literature you believe will be useful for our discussions and writing.

Manuscript outline:

The main goal of the summit is the production of a publishable manuscript on winter limnology in the LGL. Much of our time will be spent in small working groups (see below), drafting elements of the manuscript text. To expedite this process, a draft outline of the manuscript is presented below. Please look over the outline and note any suggestions you wish to make; we will have time to discuss the manuscript outline on Tuesday morning.

Winter limnology research on the Laurentian Great Lakes: history, priorities and prospects

History and neglect of winter limnology in the LGL

- Winter limnology has received relatively little study in general.
- Especially true for Great Lakes, where logistical challenges make it very difficult to study winter [Figure: satellite image of ice-cover on LGL?]. In some ways, challenges similar to polar oceanographic work but without the research infrastructure and logistics in place.
- Brief summary of the history of winter research on the Great Lakes and comparison of the number of studies on different topics through time (physics, phytoplankton, zooplankton, fish).
- Results of simple bibliometric analysis on publication trends in Great Lakes [include table/ figure?].

Why is it important to study winter in the LGL?

- First of all, what is winter on the LGL? Discuss how to define “winter” in LGL. [a task for working groups- come up with definition of winter; include definitions as a “box”]
- We know very little about winter in LGL, so additional information will improve our understanding of what is happening in lakes for 4-5 months of the year.

- Existing studies show that all kinds of interesting and important things are happening in winter, from physics to fish (allude to results of some studies that we review in a bit more detail in the “theme” sections).
- Winter in LGL watershed is rapidly changing (ice cover, temperatures, precipitation, cloud cover, wind, etc.). [Composite figure showing change in winter temp, precipitation and ice cover?]
- There is increasing evidence that physical, chemical and biological processes taking place in winter have important year-round implications.
- With these changes there is potential for changes in ecosystem function and services. Given the large number of people that rely on the LGL for transport, fisheries, drinking water, recreating, etc., need to be able to better forecast what will happen in future.

Research themes, priorities and hypotheses (main portion of the MS).

This will be the main part of the manuscript, discussing the various subtopics of the meeting (“physics and climate”, “biogeochemistry”, etc.) in the context of winter. Detailed outlines for the below sections will be created by each working group during the workshop. Each group will nominate a “group leader”, who will be responsible for the text of the section after the end of the summit and for communicating with group members and the organizing committee after the meeting.

Recommendations & future directions

- Brief summary of the main research priorities and why they are important.
- An overview of how to address these priorities given the difficulties of winter work: increased cooperation with Coast Guards, increased use of autonomous platforms, call for increased work in “accessible” areas (e.g., large bays), research consortia/networks, financial support for winter-specific research, etc.

Working groups:

Each working group will:

- Create a brief (2-3 paragraphs) overview of existing winter-specific information for LGL (and other lakes?) on each topic.
- Identify main research gaps and priorities related to their theme (2-3 paragraphs).
- State 1-3 specific, testable research hypotheses related to each of the main research gaps identified.
- Suggest one graphic (data, photo, conceptual diagram) or table that can accompany their section.
- Come up with ideas on how to close research gaps/ address hypotheses. These will then be used in the final section if the manuscript (“Recommendations & future directions”).

Working groups/themes:

- **Climate, ice cover, physics**
Jay Austin, Alex Forrest, Ayumi Fujisaki-Manome, Guy Meadows, Allison Steiner, Matthew Wells, Jia Wang, Andrew Barmburger, Steve Ruberg
- **Biogeochemistry**
Dave Depew, Rebecca North, Mark Rowe, Michael Twiss, Maggie Xenopoulos, Ted Ozersky, Jia Wang
- **Phytoplankton and bacterioplankton**
Maureen Coleman, Melissa Duhaime, Michael McKay, Arthur Zastepa, Andrew Bramburger, Hank Vanderploeg
- **Microzooplankton, mesozooplankton and benthos**
Hunter Carrick, Stephanie Hampton, Beth Hinchey Malloy, Hank Vanderploeg, Ashley Elgin
- **Fish and food webs**
Louise Chavarie, Aaron Fisk, Sapna Sharma, Ashley Elgin, Ted Ozersky