**MULTI-LAKE GROUP PAPER**ZOO 316 – Fall 2021 | written by GM Wilkinson

**INTRODUCTION:** Comparative limnology, or evaluating variables across a gradient of environmental conditions, is a powerful tool for understanding how lakes are structured and how they function. By substituting measurements from many lakes in a landscape with varying features for measurements in one lake over time, limnologists can easily test hypotheses about the processes that drive lake dynamics. For this group project you will aid in collecting data on multiple lakes in the Northern Highland Lake District which your group will use to pose and test a hypothesis. Through this group project, you will work on developing critical skills including:

* Limnological sample collection and laboratory analysis
* Reading and synthesizing scientific literature
* Generating testable hypotheses and predictions
* Data analysis and visualization
* Science writing with a focus on organization and synthesis

**PART 1: Data Collection** (Trout Lake Field Trip)  
As a class, we will travel to Trout Lake Station in northern Wisconsin to collect data on 20 lakes for this project. Each team of students will sample two lakes and the data from all lakes will be pooled for analysis by your project group. You will sign up to attend one of the two possible trip weekends. See the "Field Trip Logistics" below for more information. Attendance and active participation in the data collection efforts during the field trip is worth 10% of your course grade.

* Field Trip Logistics - check out this page for detailed information about the field trip
* Data: In addition to collecting samples from each lake, there are also static properties of each lake that can be used to test hypotheses (see part 2 below)
  + Collected in each lake: alkalinity, pH, conductivity, water color, chlorophyll a, turbidity, zooplankton
  + Static Characteristics: surface area, maximum depth, landscape position, fish community

**PART 2: Annotated Bibliography**  
Scientific discovery does not happen in a vacuum. In other words, scientists build on what is currently known (based on what has been reported in the peer-reviewed literature) to identify gaps in our understanding and generate hypotheses. You will work with your group to create an annotated bibliography of scientific papers that will help you generate hypotheses to be tested using the data collected from the 20 lakes.

* Presentation on Annotated Bibliography Assignment (click to download PDF)
* Reading List and Abstracts (click to download PDF)
* ASSIGNMENT: Annotated Bibliography (Due Sept 22 or 23, 2021)

**PART 3: Generating Questions, Hypothesis and Predictions**  
Scientific inquiry begins by formulating hypotheses that can be tested using data. Your groups job will be to generate a research question and formulate a hypothesis from that question. You will then generate predictions that can be tested using the data we collected as a class from the 20 lakes near Trout Lake Station.

* Presentation on generating hypotheses and predictions (click to download PDF)
* ASSIGNMENT: Hypotheses (Due Oct 13 or 14, 2021)

**PART 4: Outline and Figures**The analysis and interpretation of data to address your group's hypothesis is arguably the most important component of a scientific paper. Additionally, a good scientific paper is well organized, following the norms of the discipline. One of the best ways to ensure that your group is writing a well-organized paper that includes all of the necessary components is to start with a detailed outline. During this guided exercise, you will work together in class to analyze your data and generate a detailed outline for the paper. You will receive feedback on your outline and figures from your TA and can use the outline to generate writing assignments for each group member.

* Presentation on how to Outline a Scientific Paper (click to download PDF)
* Scientific Paper Outline worksheet (click to download PDF)
* ASSIGNMENT: Outline and Figures (Due Oct 27 or 28, 2021)

**PART 5: Full Draft**  
Using the detailed outline and writing assignments, your group will produce a full draft of the paper. Each group member is expected to contribute writing to the draft and each member is expected to edit the draft prior to submission. Use the grading rubric to ensure that all of the necessary components are included in the paper.

* Academic Phrase Bank (Links to an external site.)
* ASSIGNMENT: Full Draft (due Nov 17 or 18, 2021)

**PART 6: Final Draft**  
The process of writing doesn't stop at the first draft. Prior to publication, scientific papers are reviewed by multiple experts to ensure accuracy and rigor, and multiple editors to ensure proper grammar, organization, and formatting. Your TA will provide extensive comments on the science and writing of your initial draft. Your group's job is to respond to those comments/edits and revise your paper accordingly. The final draft assignment will require your group to briefly describe how the paper was improved based on comments from your TA.

* Response to Reviews Template (click to download)
* ASSIGNMENT: Final Draft (due Dec 15th for both sections)