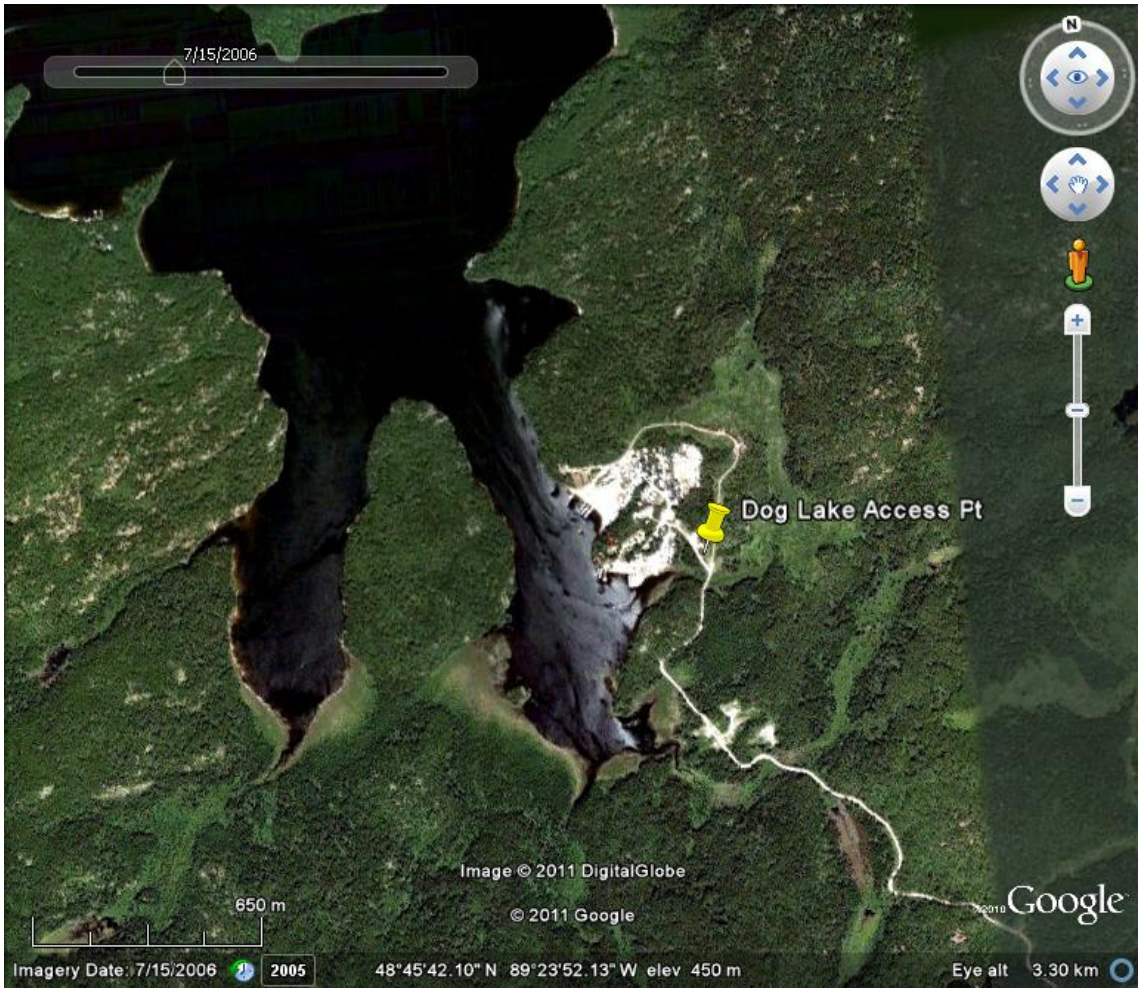

BIOLOGY 4710FA

LIMNOLOGY

FALL 2013

Dr. Peter Lee

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Contents

About the Cover and Acknowledgements

This image (from Google Earth) is the south end of Dog Lake, the focus of your formal limnological report for 2013.

Growth chambers, glassware, water analysis standard operating procedures (SOPs), and technical assistance are provided to students courtesy of Lakehead University Environmental Laboratory (LUEL). LUEL is an ISO17025 laboratory accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). For more information about Dr. Lee's lab, visit their website at http://lucas.lakeheadu.ca/luel/. Job opportunities in the lab may be available through Dr. Lee's research funding or the Lakehead University Work Study Program. Feel free to drop off a resume to Johane Joncas, Lab Manager in CB3022 any time!

I. An Introduction to Limnology Laboratories

> Yes, as everyone knows, meditation and water are wedded forever. Why did the old Persians hold the sea holy? Why did the Greeks give it a separate deity, and own meaning. And still deeper the meaning of that story of Narcissus, who because he could not grasp the tormenting, mild image he saw in the fountain, plunged into it and was drowned. But that same image, we ourselves see in all rivers and oceans. It is the image of the ungraspable phantom of life; and this is the key to it all.

Herman Melville. Moby Dick.

The collection of accurate limnological data from water bodies is necessary for an understanding of the status of wetlands and watersheds. Lake classification systems based on trophic status aid the management of these important resources. Limnological data includes:

- Morphometric measurements: Physical factors (shape, size, structure, etc) that determine the lake basin.
- Physical characteristics: Lake models depicting hydrodynamics of water movement including stratification and the distribution of temperature, dissolved gasses, nutrients, and biota.
- Chemical parameters: Nutrients, major ions, and contaminants within the lake basin.
- Biological characteristics: Lake biomass, population numbers, and growth.

At the completion of this course, students will have the skills required to:

- Plan a successful limnological data collection field trip.
- Identify and use suitable limnological field equipment.
- Carry out calculations to estimate morphometric parameters of lakes.

- Construct maps and graphs depicting major morphological and physical characteristics of a lake.
- Identify suitable chemical analyses techniques to measure major inorganic and organic fractions of water samples.
- Calculate some biological characteristics of lakes.
- Determine the trophic status of a lake from a collection of limnological data.
- Understand the importance of water treatment processes in protecting lakes.
- Understand the importance of appropriate QA/QC protocols when carrying out limnological analyses.

The major practical section of this course will involve a field trip to a lake near Thunder Bay. You will conduct a lake (or partial lake) survey and practice water sample collection techniques. By the end of the course, you will have determined the trophic status of the lake. In additional weeks, you will explore additional limnological skills via practical exercises.

A. Required textbook

Limnology 3^{rd} ed., R.W. Wetzel, 2001. Academic Press, San Diego, CA.

B. Laboratory development

Information for completing a lake survey and map production has been adapted from Part I of the Manual of Instructions: Aquatic Habitat Inventory Surveys, Ministry of Natural Resources 8th Ed., 1987 (MNR 1987). A PDF has been posted on D2L. Further labs have been adapted from (APHA et al. 1992; Lind 1975; Strickland and Parsons 1968; Wetzel and Likens 1979).

C. Lecture schedule for 2013

Lecture topics and corresponding chapters of Wetzel (2001) for 2013.

Classes begin		**Sept. 9, 2013**
Topic 1	Importance of Limnology	Chapter 1
Topic 2	Lake Formation	Chapter 3
Topic 3	Light	Chapter 5
Topic 4	Heat Budgets of Lakes	Chapter 6
Topic 5	Water Movement	Chapter 7
Topic 6	Oxygen	Chapter 9
Topic 7	Carbonate Cycle	Chapter 11
Topic 8	Chemical Constituents of Lakes	Chapter 12,13,14
Topic 9	Phytoplankton and Zooplankton Ecology	Chapter 15
Topic 10	Productivity of Aquatic Systems	Chapter 24, 25
Last day of classes		**Dec. 1, 2013**
Examination period		**Dec. 5-17, 2013**

D. Laboratory schedule for 2013

Please note the lab schedule for 2013 is subject to change due to inclement weather. Your participation on the field trip is mandatory! Labs are held Wednesday afternoons from 2:30 to 5:30 pm in CB3013.

Classes begin			**Sept. 9, 2013**
Lab Intro.	Overview & Safety	Assignment	Sept. 11
Lab 1	Field Trip Prep	Formal Report	Sept. 18
Lab 2	Lake Field Trip	Formal Report	SEPT. 22
Lab 3	Maps & Morphometry	Formal Report	Sept. 25
Lab 3 con't	Maps & Morphometry	Formal Report	Oct. 2
Lab 4	Heat Budget	Ind. Lab Report	Oct. 9
THANKSGIVING	NO CLASS MONDAY		Oct. 14
Lab 5	Nutrients & LUEL	Formal +Assign.	Oct. 16
Lab 6	Alkalinity	Assignment	Oct. 23
Lab 7	Algae Enumeration	Ind. Lab Report	Oct. 30
Lab 8	Chlorophyll *a*	Assignment	Nov. 6
Lab 9	Toxicity Testing	Ind. Lab Report	Nov. 13
Lab 10	Sewage Treatment	Assignment	Nov. 20
Lab 11	QA/QC	Exam material	Nov. 27
Last day of classes		GROUP LAB DUE!	**Dec. 2, 2013**
Official examination period			**Dec. 5-17, 2013**

II. Mark Allocation

Marks for this course are as follows:

LABORATORY	**45%**
LECTURE	**55%**
COURSE TOTAL	**100%**

A. Lecture marks

The **lecture component** will be evaluated as follows:

Midterm	15%
Final exam	40%

The **midterm** will be written during class (date TBD) and the final exam will be written as scheduled during the formal exam period (date TBD).

B. Laboratory marks

The **laboratory component** will be evaluated as follows:

Individual Lab Reports (3)	15%
Group Formal Lab Report (1)	15%
Assignments (5, drop lowest)	15%