

# EARTH 444/BIOL462

## Project Guidelines 2017

### Project Objectives:

- Introduce and give students an opportunity to undertake a wetland-focussed project that is both applied and practical; it represents something that is current and very likely to be undertaken in the professional world
- Emphasizes the nature and need for multidisciplinary expertise when dealing with wetland issues in Ontario; wetland professionals often possess a broad range of expertise or at least is aware of what kinds of expertise is required (i.e. wetland ecosystem science, engineering design and compliance; provincial regulations and planning policy; execution success and monitoring of wetland projects)
- Introduce students to different kinds of provincial regulatory requirements governing wetlands; in so doing it blends the science with government policy

### General Instructions:

1. Project 1 or Project 2 must be completed, **NOT** both.
2. These are group projects to be undertaken in groups of 3-5 members each. Under exceptional cases will groups of 6 be permitted, but bear in mind, it is expected the final product should reflect a bigger effort. The final project mark will take into account the size of the group. My experience in previous years has shown that the best opportunities for learning and quality of final product most often are done where the group is mixed with biologists, earth scientists, engineers and others.
3. Grading will be based on (a) creativity and originality, (b) thoroughness and research, and (c) organization and presentation of report
4. I expect that individual workloads within the group will be equal. I expect group members will communicate with their fellow group members and come to some agreement as to who will do what and when in a balanced and fair manner. After all, that is how such projects are done in the work world, if you were assigned such as task while employed by a consulting firm, governmental office, or NGO agency.

**Grading:**

The report will be graded for quality not quantity. Reports are typically 25-35 pages including Table of Contents, figures, tables, and references.

Reports will be evaluated under the broad themes:

FORMAT     - organization

                 -presentation

CONTENT    -scope

                 -thoroughness

                 -conciseness

CRITICAL ABILITY -synthesis

                 -creativity

Syntheses that include original tables, charts, and diagrams are always a good way to summarize a great deal of information. Imagination and thought in report write-ups are particularly encouraged.

**Deadline:**

**All reports are due 4 pm, Monday December 4, 2017.** Electronic versions are preferred and are to be submitted in the Dropbox on LEARN. If you prefer, hard copies are acceptable too.

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## **Project 1: Designing a wetland for water quality improvement**

**1. Goal:**

Design a wetland system to process and treat domestic sewage from a single family home. Assumptions:

- the family is 2 adults and 3 children between the ages of 8 and 17
- the location is southern Ontario

- the wetland system must comply (or at least planned to comply) with Ontario Ministry Environment regulations for discharge of treated sewage waters.

***NOTE: If groups would rather design a wetland system to improve the quality of wastewater as a result of some other activity, I am open to groups doing so. However, please discuss the details with the Dr. Warner prior to commencing with the project. The important part is that your proposed design be something realistic and be in compliance with appropriate jurisdictional regulatory requirements. Please explain what these are in your report.***

## **2. Objectives:**

- (a) Assess feasibility of wetland technology for improving water quality; that is providing post-secondary treatment for typical site with wastewater characteristics.
- (b) Generate a design and specifications needed to construct a system that would comply with regulatory requirements
- (c) Provide suggestions and rationale for post-construction monitoring to evaluate performance and compliance

**3. Student Teams:** Groups of 3 to 5 students (ideally) are encouraged to work together. Individuals may work alone where there may be scheduling conflicts or other extenuating circumstances to permit group work.

## **4. Project Tools:**

The Alberta Environment (2000) "**Guidelines for the approval and design of treatment wetlands for water quality improvement**" is a good place to start. Here is the link: <https://extranet.gov.ab.ca/env/infocentre/info/library/5711.pdf>

The following references will be useful and are in the Davis Library, some are in e-book format. See list of references in Course Outline for complete reference title.

Jorgensen, S.E. 2009.

Kadlec, R. and Wallace, S. 2009.

Mitsch, W.J. and Jorgensen, S.E. 2004 (Chapter on treatment wetlands is helpful for calculations)

Vymazal, J. and Kröpfelová, L. 2008.

### Other Useful links

#### 1. Design Guidelines for Sewage Works

This link: <https://dr6j45jk9xcmk.cloudfront.net/documents/1122/72-design-guidelines-for-sewage-works-en.pdf>

is the “**Design Guidelines for Sewage Works in Ontario**”.

You will have to design a system that will perform so as to comply with provincial treatment guideless. Here is the link: <https://www.ontario.ca/document/f-5-1-determination-treatment-requirements-municipal-and-private-sewage-treatment-works-discharging>

#### 2. Provincial Water Quality Guidelines:

See this link for Provincial Water Quality Guidelines:

<https://www.ontario.ca/document/water-management-policies-guidelines-provincial-water-quality-objectives>

It describes the objectives set for water quality management in Ontario.

### Possible Outline for the Project Report

The following is provided as a guide only to help you prepare the report for the project. You need not adhere strictly to the following outline. These ideas are given for thought and consideration. Additional materials (ie. drawings, tables, figures) are encouraged.

1. Report Summary
2. Introduction and/or Background Information
3. Site Description and Environmental Setting (if you choose to identify a potential field site for your wetland design)
4. System Design
  - (a) Design Type and Rationale
  - (b) Plant Selection

- (c) Size (length, width, configuration)
  - (d) Construction Materials (ie. soil/substrate materials)
  - (e) Hydrology/hydraulic considerations
  - (f) Chemistry
5. Construction Issues (constraints, opportunities) and/or Feasibility
  6. Performance Monitoring (what do you do if performance does not comply with provincial regulations?)
  7. Other concerns, issues, etc (if any)
  8. References

**NOTE REGARDING ASSESSMENT:** I am not expecting a detailed and accurate account of a fully functional wetland system. I am most interested in your approach, logic, and rationale for what you are proposing. You should what and why you did. You may have to make many assumptions (for the purposes of this project). Please explain why you made these assumptions and what you expect as a result.

I cannot check your calculations but it will be obvious if you are way off in your estimates.

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## **Project 2: Evaluation of a wetland using the Ontario Wetland Evaluation System (OWES)**

### **Objectives:**

The objectives of this exercise are to introduce students to wetland evaluation of a wetland using the Ontario Wetland Evaluation System. Groups may choose any wetland so long as it is a wetland. In the case of larger sites, the entire wetland need not be evaluated for the purposes of this exercise. Students should realize that in reality the complete wetland is normally evaluated for planning and management purposes.

### **Information sources:**

*The OWES manual:*

You will need a copy of the following manual. It is available for free from:

**<https://www.ontario.ca/page/wetlands-evaluation>**

MNR. 2014. Ontario Wetlands Evaluation System – Southern Manual. 3rd edition. Version 3.3. Ontario Ministry of Natural Resources, Toronto.

*Site specific information:*

You will find information and reports in our library or from sources online. Google Earth images and maps are good. Also, there are various maps and aerial photographs available in the Library, especially for the most local sites.

You may also find information in the Natural Heritage Information Centre database. You should be able to gain access to enough information (for the purposes of this project) without having to receive the Sensitive Data Use Licence. You may have to make some assumptions about your site given you will be unable to do fieldwork or will not know your site for all seasons of the year. Please explain your assumptions (for the purposes of this project), why you made them and what you think they mean.

Here is the link:

<https://www.ontario.ca/page/get-natural-heritage-information>

**The group effort:**

The class will work in groups of 4 or 5 people. Groups cannot be larger than 5 or 6. The group should get together to organize themselves and divide up work. They should develop a schedule for meetings, a timetable of project milestones, the content of the report, and the contribution of each individual to the overall final report.

The authorship of the entire project will be alphabetical with the understanding that each contributor has given equally. The report will contain several sections, subsections, and further subdivision if necessary. I encourage many sections and subsections because this helps to organize the report. Each section/subsection will be authored to indicate the contribution of each member of the group. The overall report will likely be similar to the sections of the OWES.

Individuals are permitted to contribute to more than one section/subsection in which case the multi-authored section will be in descending order of strength of contribution to the section. The final section is a list of recommendations for future work, which should be authored by all members of the group.

**The study site:**

Any wetland in southern Ontario may be used for this project, although for convenience I recommend local sites in the Kitchener-Waterloo area. The first aim of the project is to ensure it is a wetland as best as you can tell. Dr. Warner may have some suggestions if you are having difficulty identifying a site.

All work can be accomplished using google maps and aerial photographs and doing research in the library or from other sources. Though not necessary, if you choose to do any fieldwork, it is the responsibility of all members of each group to work safely and maturely while conducting fieldwork. It is also the responsibility of all students to acquire all necessary permissions to trespass onto private property, if necessary. Neither Dr. Warner nor the university will be responsible for trespassing violations nor will they be responsible for any damages to property of landowners or personal injuries or losses.

There are many potential natural area sites within Kitchener and Waterloo. Here are some possible study sites that are close to the university:

Laurentian Wetlands, Kitchener

Borden Wetlands, Kitchener

Lakeside Park, Kitchener

Idlewood Park on River Road, Kitchener

Lakeside Park, Homer Watson and Stirling Roads, Kitchener

Spring Valley, McKenzie King Home, Kitchener

Wetland at corner of University Ave. and Erb St., Waterloo

Optimist Camp, Heidelberg

Erbsville Swamp

Bechtel Park, Waterloo

Wetlands in and around Laurelwood and Laurel Creek Reservoir

### **Organization of the report:**

Reports will be typed and double-spaced throughout. The report should have some internal organization. You may follow the format in the wetlands evaluation

manual. It is not expected that a complete evaluation as per the manual be done for this exercise. It is up to group member to choose what be done. I suggest that one member of the group be responsible for one component of the evaluation system.

You may want to include additional information on your wetland from literature sources, reports, or any other relevant references. Please include your raw score sheets in appendices.

*A possible outline might be:*

Title page

Abstract/Summary (not to exceed 1 page)

Table of Contents

List of Figures

Acknowledgements (if any)

1. Introduction -general introductory comments
  - rationale for site choice
2. Geological/geomorphological or any other component that you think might be useful, however, you need not do so if you do not think it is not useful
3. Biological/ecological component
4. Social component
5. Hydrological component
6. Special features component
7. Discussion
  - effectiveness of the evaluation system, with respect to your specific study site and with respect to the evaluation system in general
  - suggestions for improvements
  - other relevant points



8. Recommendations for further work
9. References
10. Appendices - score sheets