

University of Guelph
Arctic Ecology (BIOL*4610) – Course Information for 2017
(Jan. 10, 2017*)

Course Title:	Arctic Ecology. BIOL*4610 (0.75 credits).												
Instructor(s):	Dr. Sarah Adamowicz, Associate Professor, Department of Integrative Biology & Biodiversity Institute of Ontario, University of Guelph. Email: sadamowi@uoguelph.ca Office: Centre for Biodiversity Genomics 113. Phone: 519-824-4120 x. 53055 (Note: I am out of office during the 2016-17 academic year due to sabbatical. Please contact me by email during this time. In-person meetings are available by appointment during fall 2017 regarding research projects.)												
Dates:	Thursday July 20 th – Thursday August 3 rd , 2017												
Location:	Churchill Northern Studies Centre (https://churchillscience.ca/), Churchill, Manitoba												
Cost:	\$1500 (includes meals and accommodation, transport around Churchill region, research materials; does not include transportation to and from Churchill)												
Prerequisites:	University Ecology Course University Statistics Course University Invertebrate Zoology Course (recommended) University Course in Plant Ecology or Plant Systematics (helpful but not required) N.B. This course is intended for 3rd or 4th year students specializing in ecology, environmental studies, evolution, or aquatic biology.												
Enrolment:	20 students (5 for OUPFB; 15 for University of Guelph)												
Description:	Churchill is a diverse region for ecological study, being located at the junction of the boreal, Arctic, and Hudson Bay biomes. The first week of the course includes exploration of terrestrial, freshwater, and near-shore marine Arctic environments, as well as an overview of both aquatic and terrestrial collecting methods used to survey invertebrate biodiversity in these environments. Two group projects are performed. Evening lectures, discussions, and student-led presentations provide background on Arctic ecology and the use of genetic and statistical techniques for studying biodiversity and ecology. Weather permitting, excursions will include viewing estuary organisms including belugas. During the second week, students conduct independent research projects. Students have the opportunity to employ DNA barcoding in their research, depending upon the target taxon and project design. A major research paper is due in November. This course provides excellent opportunities to visit a spectacular sub-Arctic locality; to learn about Arctic ecology, Arctic biodiversity, and DNA barcoding methods; and to conduct an independent research project in ecology with faculty guidance.												
Evaluation:	<table style="width: 100%; border: none;"> <tr> <td style="width: 80%;">Short presentations</td> <td style="text-align: right;">2@5% each</td> </tr> <tr> <td>Two short field projects/quizzes</td> <td style="text-align: right;">2@5% each (1 in a small group, 1 individual)</td> </tr> <tr> <td>Participation and intellectual engagement</td> <td style="text-align: right;">10%</td> </tr> <tr> <td>Field notebook</td> <td style="text-align: right;">10%</td> </tr> <tr> <td>Data organization</td> <td style="text-align: right;">10%</td> </tr> <tr> <td>Individual research paper</td> <td style="text-align: right;">50%</td> </tr> </table>	Short presentations	2@5% each	Two short field projects/quizzes	2@5% each (1 in a small group, 1 individual)	Participation and intellectual engagement	10%	Field notebook	10%	Data organization	10%	Individual research paper	50%
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* **NOTE: This file contains a provisional course outline as well as additional information (e.g. regarding travel). The final course outline presented on the first day of the course will be the official version.**

COURSE OVERVIEW

I. INTRODUCTION

Arctic Ecology aims to provide students with an introduction to Arctic ecosystems through both group studies and individual projects carried out in the vicinity of Churchill, Manitoba. The first week of the course will focus on an exploration of biological diversity and ecological processes in terrestrial, freshwater, and near-shore marine environments of this area. These studies set the stage for individual research projects which ordinarily involve an experimental or analytical study of some organism, biological community, or problem identified earlier in the course.

Field Station

We will be based at the beautiful Churchill Northern Studies Centre (CNSC – see <http://www.churchillscience.ca/>) for the duration of the course. These facilities are located about 15 km out of the town of Churchill at the former Rocket Launch Facility of the National Research Council. The staff at the Centre will prepare our meals, provide an orientation session, and aid in resolving issues. Meals are eaten together in a common dining hall. Vegetarian and other diets can be accommodated; be sure to indicate any dietary restrictions on your application form. All who stay at the centre help out with some duties (e.g. dish duty) on a rotating basis. Accommodation is in shared rooms with bunk beds (4-8/room). There are showers and washer/dryer for clothes (\$5/load). The course fee includes 14 days/nights of accommodation, 3 meals a day, snacks, and access to designated CNSC classroom and laboratory facilities. If your travel schedule requires you to arrive early or stay beyond the last day of the course, additional days at the CNSC can be booked at a cost of \$60/night. (Please contact the instructor with information on your specific travel schedule, once you have your tickets booked.)

Faculty

In 2017, the course will be instructed by Dr. Sarah Adamowicz, assisted by a TA or a CNSC staff member. I have taught the course several times, and some of my lab group's research focuses on the biota of Churchill. We have investigated questions in biogeography, biodiversity, evolution, and the community ecology of invertebrates using the Churchill system. The course will also benefit from the long history of research in the Churchill region, as there are data sets and literature upon which we can build for the group and individual projects. You will likely also profit from encounters with other scientists and graduate students working at the CNSC as well as the experienced staff of the CNSC.

Schedule of Activities

Our schedule of activities will be dependent on the elements (rain, fog, snow, wind)! We will meet each day after breakfast to discuss the day's activities and objectives, before heading into the field. Whenever possible, field activities will occur between 9:00 a.m. and 5:00 p.m., with a break for lunch and returning to the centre in time for supper. When there is heavy fog and poor visibility, we will not be in the field due to concerns over polar bear safety. (Churchill is known as the "Polar Bear Capital of the World".) If we are fogged out for certain time periods, we will use those times for discussions, software tutorials, individual project planning, and data entry or specimen sorting. We may also visit the very interesting Itsanitaq Museum in the town centre of Churchill, which features Inuit Art as well as exhibits on the cultural and natural history of Churchill. Evenings during the initial phase of the course will be devoted to presentations and structured discussions. The evening schedule on the first day of the course will be light, as many students will have traveled overnight on the train to Churchill. Otherwise, evening activities often run between approximately 7-9:00 PM.

There will be flexibility in schedules once the transition to individual project mode has occurred. Days and evenings during the second week are typically spent working on individual projects. For safety reasons, field work will take place in groups. Therefore, there will be some logistical constraints upon the design of individual projects. In prior years, we had freshwater and terrestrial research teams visiting a shared set of sites. This approach led to interesting synergies. We may have 1-2 social evenings out in the town.

Discussion Topics

The following themes will be considered in our evening discussions. Although faculty will take the lead on some evenings, active student participation is expected, in the form of questions and discussion as well as short presentations (see further below).

Topics may include:

1. Introduction to Churchill and CNSC facilities, brief review of course goals.
2. The Arctic (a survey of habitat diversity in Canadian polar regions) / History of Arctic scientific research.
3. The Arctic environment: stressors and adaptations.
4. DNA barcoding and how to use genetic tools to study biodiversity (presentation and BOLD computer tutorial).
5. Life in inland waters.
6. Life in marine waters.
7. Life in terrestrial environments.
8. Measuring and comparing diversity, research design, and statistical data analysis (tutorial and exercises in small groups).

II. COURSE EVALUATION

Activities and assignments completed during the course (total 50%)

Short presentations	2@5% each
Two field projects/quizzes	2@5% each (1 in a small group, 1 individual)
Participation and intellectual engagement	10%
Data organization	10%
Field notebook and natural history journal	10% (due Fri. Sept. 19 th , 2017. 4:00 PM)

Major research paper due in the fall semester (total 50%)

Individual research paper	50% (due Fri. Nov. 17 th , 2017. 4:00 PM)
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This course has an explicit focus on applying tools and concepts, analyzing and interpreting data, and creating knowledge – not only memorizing facts.

Expected Learning Outcomes

The overall learning outcomes for the Ontario Universities Program in Field Biology (<http://www.oupfb.ca/>) apply to this course as well. Additional learning outcomes or those specific to the Arctic Ecology field course are indicated in *italics*.

1. Appreciate novel natural ecosystems and explore and discover what factors regulate the distribution, abundance, diversity, or other features of local organisms. (*Arctic Ecology – We will focus upon developing an appreciation and understanding of Arctic ecosystems.*)
2. Develop a research program using your current understanding of ecological processes (from your prior course work such as BIOL*2060, BIOL*3110, or Biol*3060) in order to advance understanding of or answer a question about ecological processes in a natural system local to the field site.
3. Pursue process-oriented research (why is it there? mechanistic/ process/causal understanding) as distinct from descriptive research (who/what is there?) by applying the scientific method, which develops hypotheses and testable predictions, and gain facility with making observations through sampling techniques. (*Arctic Ecology – We will also explore the interplay between discovery and hypothesis-driven research. Descriptive or exploratory*)

projects that include a quantitative, statistical component will also be welcome. Please discuss this with the instructor while you are designing your independent research project. An expectation would be to use a portion of your Discussion section to discuss new hypotheses that could be tested, arising from your findings.)

4. Evaluate the quality of evidence for statistically-based conclusions using your understanding of applied statistics (from your prior course work, such as STAT*2040 or STAT*2230), and independently apply standard statistical methods to effectively summarize, compare, and communicate patterns in collected data that are used to test predictions and infer ecological process.
5. Practice critical thinking and making judgments and conclusions based on logic and evidence rather than opinion during all stages of your research, including: identifying research goals; expressing your thinking and judgement in oral and written form; evaluating information in the face of uncertainty; identifying and using relevant scientific literature to motivate and contextualize your research.
6. Practice effective and pro-active collaborative skills in your research group and with course instructors to solve problems related to performing your research, constructively critique the work of others, and manage timely completion of group projects.
7. Develop and practice effective communication skills, particularly through writing up field notes, oral presentations of research proposals, and writing about your original research contribution.

A. FIELD COURSE PARTICIPATION AND ASSIGNMENTS (total 50% of grade)

Field Notebook and Natural History Journal (10%)

- Your field journal is a time machine. It is meant to take you back to a specific SPACE and a specific TIME and enable you to recreate the specific conditions and observations that you made on that day in that space. You will keep a field journal describing your activities and observations each day. You will record specific field information, including the date, location names, GPS co-ordinates, and weather. You will also record your own activities and observations. Employ a colloquial style and include sketches/diagrams/maps when relevant. You will use this notebook throughout the course, including during your own individual research project during week 2. Try to write legibly (for your future self as much as for the instructor!).
- Your field journal must be submitted on or before **4:00 pm Friday, September 29, 2017**. This is your **original, hard copy, hand-written field journal** into which you made observations throughout the course. Using a different colour ink (you may wish to leave a space after each day's journal entry in the field), you may add annotations if you wish after the end of the field course period, such as adding further interpretations regarding your observations after consulting references. You are also welcome to add retroactive observations, but any such notes that are added later rather than on the day of the field work should be dated. (An example might be to go back and note that a particular day was anomalously cold.) It is recommended that you would have already completed data digitization for your individual research project prior to this due date for submitting your field book. Your field journal will be returned to you within two weeks so that you may further consult it as you complete your individual research paper. (For any students based far from Guelph, touch base about the submission format, such as sending a scanned copy if you don't want to mail your hard copy.)

Participation and intellectual engagement during the course (10%)

- Active involvement! Examples include: being on time for morning meetings, participating in discussions, arriving prepared, being an active audience member for your colleagues' talks (listening, asking questions afterwards, offering insights and comparisons), actively participating during field collecting, persevering through logistical challenges, interacting respectfully and collaboratively with others, seeking advice and working with your peers and instructors to solve problems, and taking care with collecting high-quality data throughout the course.

Short within-course presentations (2 @ 5% = 10%)

1. 5-6 min presentation, prepared in advance and delivered during week 1. Example topics are given below. This assignment encourages reading and preparation before arriving in the field as well as collaborative learning for the whole group. It is encouraged to use Powerpoint slides. You would prepare 5-7 slides for a 5-min presentation. Please do practice and time your presentation at least twice in advance; you are welcome to practice with peers and provide one another with feedback.
2. 5-10 minute presentation during week 2 about your independent research project proposal. This presentation is prepared after the course has started and is delivered while you are in the early stages of your individual research project.

Potential topics for presentation #1

Topics listed below are not to be considered exhaustive, and others will be considered. Contact the instructor with your first and second preferred topics at least one month prior to departure for the course. There will be a limit of 2 students (i.e. 2 presentations) per topic.

- A) Northern Arthropod Temperature Adaptations
- B) Endangered Species in the North
- C) Early Biological Exploration of Canada's North
- D) Climate Change and Canada's North
- E) Life Cycle of Beluga Whales and Their Usage of the Churchill River
- F) Patterns of Recent Sea Ice Change and Impacts upon Marine Wildlife
- G) History of Human Habitation of the Churchill Region and Uses of Wildlife
- H) Tree Species of the Churchill Region and their Adaptations to Sub-Arctic Life
- I) Growth Forms of Arctic Lichens and their Role in Arctic Ecosystems
- J) Actual and Potential Impacts of Shipping Industry on Churchill and other Arctic Ecosystems
- K) What is "The Tree Line" and How is it Changing?
- L) Invasive Species in the North

An example outline for a 5-minute presentation, by slide. The general rule of thumb for staying on time is one slide per minute, typically excluding the title slide. You might have slightly more slides than that if you have a few slides that are photos only. You should practice with a timer.

1. Title slide. Include your presentation title and your name.
2. Introductory slide. What is the main topic/problem/question you are investigating? And, why is it important? Why should the audience care? (For a short presentation such as this, you would need to narrow in on a particular aspect of the above general topics. For example, for a talk on belugas, you might choose to focus on the social structure of belugas. For a talk about polar bears, you might focus specifically on the impact of declining sea ice cover, for example.)
- 3-4. The next 2 (or 3) slides would include the main evidence you are presenting. Even though this presentation is short, you should consult at least 2 articles from the primary scientific literature. You are also welcome to consult major governmental websites (e.g. Government of Canada websites for information on: demographics, economic metrics, sea ice coverage metrics, long-term temperature data, etc.). If you cite any sources from the regular news media, be sure to indicate so clearly. Such sources can be used for opinions or to discuss ethical considerations associated with development in the North. Consult the original scientific article, if one is cited. Opinion vs. fact must be clearly distinguished. Include your information sources (e.g. as a footnote on the slide).
5. Next steps. What remains unknown relating to your topic? What are the most important next research steps to address this question?
6. Conclusion. Briefly reiterate your main point. What is the take-home message of your talk?

The following webpage of the Department of Integrative Biology includes helpful links that can assist you in creating an effective presentation. There is also information there about scientific writing that will assist you in being successful with other course assignments.

<https://www.uoguelph.ca/ib/academic-resources-UG>

Field project/quiz (2 @ 5 % = 10%)

1. Short field project (approximately one full day) to be completed in a small group during week 1, demonstrating principles of field research: asking a question, designing a study, collecting data, and interpreting data. This assignment will be a shared learning experience and preparation for your individual research project.
2. Short individual quiz based on taxa, observations, and manifestations of ecological principles we have discussed. To be completed while we are in the field.

Data organization and digitization (10%)

- This assignment will assist you with clarifying your study design for your individual research project (including establishing your independent and dependent variables, units of replication, and planned statistical analyses). We will discuss these principles during week 1. During week 2, you will commence data organization and digitization during your individual project. (Note that it is acceptable if you complete full data entry from your field notebook and your analyses after you return from the field course; this assignment relates to establishing a data organization system suitable for your study question. The data do not need to be all entered during the course.) The assignment is based upon completing a provided sheet of questions about the data for your individual research project. Peer review of this document and discussion about your individual research project among your peers is encouraged; however, this is an individual assignment, and the writing should be in your own words. You will also show the instructor your data entry system and describe your planned analyses. This worksheet must be completed (and you will have the discussion about your study design and data with the instructor) by the penultimate day of the course, at the latest.

B. INDIVIDUAL RESEARCH PROJECT (50%)

- Your individual project should be written up as a scientific paper (i.e. include abstract, introduction, materials and methods, results, discussion, and references). Your paper should include figures, and likely also tables, depending upon the nature of your study. Your reference section should follow the format employed by the scientific journal *Molecular Ecology*.

Four criteria will impact the evaluation of your report:

1. Identifying an interesting question where there is an opportunity to contribute new knowledge.
 2. Quality of study design, data collection, analysis, and interpretation.
 3. Clarity of presentation, adherence to grammatical rules, and logical flow of ideas.
 4. Placement of results in a broader scientific context.
- Your individual major research report must be submitted on or before **4:00 pm Friday, November 17, 2017**. This must be typed. Use 12-point font and double spacing. You may use colour figures. For students based in Guelph, this should be submitted in hard copy to CBG 113. Also submit an electronic copy in either Word (preferred) or PDF format by email to: sadamowi@uoguelph.ca. (For students not based in Guelph, the electronic version is sufficient.)
 - TIPS: You should not still be writing new content on Nov. 16th! I'd recommend commencing work on your paper immediately after your return from the field. Proofreading and revising your work is essential to submitting a high-quality paper. In addition to being scientifically well done, you should aim for your submission to be clearly written, grammatically correct, and free from punctuation and spelling errors. Such problems distract from conveying your meaning. Your reference list should be complete. All references cited

in the text should be listed in the reference list. The reference list should include all articles cited and only articles cited. The reference list should be formatted correctly and ordered correctly. See author instructions for the reference list for *Molecular Ecology*. Tables and figures should be numbered in the order in which they are first cited in the text. For example, Table 1 would be the first table that is cited in the text, Table 2 would be the second table mentioned in the text, etc. You can cite your tables and figures multiple times, in any order following the first mention. Check that you reference the correct table and figure numbers in the prose. Each table and figure should have a clear description that is understandable separate from the main prose. This can be placed on the same page as the table or figure (above the table for tables and below the figure for figures). Place all tables and figures at the end of your document. If you have large tables of raw data, you should include these as supplementary materials. It is fine for such tables to be in electronic format only (such as a CSV or Excel file). Also, include as a supplementary file any other information that would be helpful for understanding and replicating your research. For example, you could include a file with the R commands that you use for your statistical analysis, if you perform your work in R.

III. ITINERARY

- July 19 Individuals flying direct to Churchill should arrive on Wednesday, July 19th. Individuals who are arriving in Churchill via train should travel on the overnight train, leaving Thompson on the 19th and arriving in Churchill on the morning of Thursday, July 20th. See: www.viarail.ca
- July 20 Tour of CNSC and Churchill area. Discussion of course objectives.
- July 21-26 Survey of biological diversity and ecological processes in terrestrial, freshwater, and near-shore marine habitats near Churchill. There will also be small group research projects. Weather permitting, this week will include:
- Half-day tours of all major biological zones of the Churchill region (tundra, boreal forest, fen, bog, freshwaters, marine).
 - Half-day tour of the estuary for beluga viewing.
- July 27-Aug 2 Individual research projects
- Aug 3 Departure by train or plane.

Notes

You can stay at the station for an extra day or two before or after the course if you can't get flights on the exact needed dates. However, note that the course fee only includes exactly 14 nights at the station. Additional nights are \$60/day and require a reservation. Inform the course instructor of your travel plans.

VII. MODES AND APPROXIMATE COSTS OF TRAVEL

NOTE: These are approximate costs only and are included here to help you with planning your travel. There is no guarantee about the prices listed here. Travel tickets prices were researched in November, 2016.

The meal costs are estimates only, based upon \$20 per travel day. Such a rate would require taking some food with you and only making basic meal purchases. The meal cost would likely be higher than this for many people. Hotel/motel costs are estimates only.

There are five main travel options leaving from Guelph or the Toronto area. There is no road that goes all the way to Churchill. You must fly or take the train for part of the journey. You can get to Churchill more affordably if you are willing and able to take your time getting there. Doing all or part of the journey over land can be a highly memorable experience!

Table 1. Air+train travel option. Approximately 3 days of travel in each direction.

Travel option #1	Costs	Notes
Air and adventure tundra train!		
Toronto-Winnipeg flight	\$ 627	Watch out for seat sales through West Jet and Air Canada to see if you can get a better rate than this. However, note that travel into and out of Churchill can be unpredictable. I'd suggest getting a ticket with reasonable change policies and change fees in case you are delayed on your return trip.
Winnipeg-Churchill train	\$ 674	Note: 21 hours of travel each way. So, you'd need to leave Winnipeg for Churchill on July 18th. This is with ViaRail. This price is for people up to age 25.
Overnight in Winnipeg on outgoing and return trip - shared basic hotel room with 2-3 people	\$ 100	Estimate. You might need to stay overnight in one or both directions. Leave lots of time for your air/rail connection, especially on the return trip. Delays are common on this rail line.
Meals en route	\$ 120	Estimate.
Total Estimate	\$ 1,521	

Table 2. Air only travel option. 1-2 days of travel in each direction.

Travel option #2	Costs	Notes
Flying the whole way		
Toronto-Winnipeg flight	\$ 627	Watch out for seat sales through West Jet and Air Canada. Travel into and out of Churchill can be unpredictable even in the summer, due to wind and fog. I'd suggest getting a ticket with reasonable change policies and change fee in case you are delayed during your journey.
Winnipeg-Churchill flight	\$ 854	Calm Air. Note that, the past few years, Calm Air has changed its flight schedule after people are already had bookings. So, I'd recommend to leave yourself plenty of time between flights as you need to change airlines to make this journey entirely by air.
Possibly needed - Overnight in Winnipeg on outgoing and return trip – shared basic room with 2-3 people	\$ 100	Estimate. (An overnight in Winnipeg could be needed in one or possibly both directions, depending upon your connection. Give yourself lots of time between flights, as you need to change airlines.)
Meals en route	\$ 80	Estimate.
Total Estimate	\$ 1,661	

Table 3. Carpool+train travel option. Approximately 3-4 days of travel in each direction.

Travel option #3		
Carpool and train	Costs	Notes
Carpool Toronto to Thompson, MB	\$ 150	Sharing gas expenses with ~3 people. Fuel cost estimate was \$144 in each direction for a 2012 Toyota Corolla, using an online calculator. Chipping in together towards mileage, in addition to fuel, would be reasonable as well, for a total of approximately \$150 per person.
Road-side motel (basic room, 2-3 people/room, total of 4 nights)	\$ 200	Sharing basic motel room for 2 nights per direction, during the road trip from the Guelph or Toronto area to Thompson, MB. Estimate only.
Train between Thompson and Churchill.	\$ 214	Through ViaRail. Price is for people up to age 25. This is an overnight train, leaving Thompson on July 19 th , arriving in Churchill on July 20 th . Leave extra time to be sure to arrive in Thompson on time for departure. You would need to park in Thompson for the duration of the course.
Meals en route	\$ 160	Estimate.
Total (estimate)	\$ 724	

Table 4. Bus+train travel option. Three days of travel per direction.

Travel option #4		
Bus and train	Costs	Notes
Bus Toronto, ON to Thompson, MB	\$ 346	Note: 2 days of travel each way. With Greyhound Bus. The price listed requires an ISIC card.
Train Thompson, MB to Churchill, MB	\$ 214	Through ViaRail. This price is for people up to age 25. Note this is an overnight train.
Meals en route	\$ 120	Estimate.
Total (estimate)	\$ 680	

Table 5. Train. Approximately 5 days of travel per direction.

Travel option #5		
Train	Costs	Notes
Train Toronto to Churchill	\$ 946	On Via Rail. This trip takes approximately 5 days each way, with an overnight in Winnipeg recommended. This price is for youth up to age 25. The cost would be higher if you wanted to book a sleeping bunk.
Hotel	\$ 100	Basic hotel room shared between 2-3 people. 1 night in Winnipeg each way.
Meals en route	\$ 200	Estimate.
Total (estimate)	\$ 1,246	

V. THINGS TO BRING

CLOTHING

1. Fall coat
2. Sun/camping hat and winter hat
3. Raincoat and rain pants
4. Heavy sweater or polar fleece sweatshirt
5. Long-sleeved shirts
6. T-shirts
7. Pants (at least one pair of quick-dry field pants recommended)
8. Underwear
9. Mitts/gloves (waterproof)
10. Hiking boots (optional, as many people wear rubber boots the whole time outside)
11. Rubber boots (calf) – essential!
12. Running shoes (recommended to keep these dry for wear around the CNSC)
13. Socks (bring lots; thick/thin; bring long ones that your pants will tuck into for wearing rubber boots)
14. Bug jacket or hat and mosquito netting – essential!

LINENS

1. Face cloth
2. Towel, if desired (they supply small ones)

Tips – Get comfortable rubber boots that fit you well. We will be spending a lot of time in rubber boots. Also, I recommended avoiding the mesh-only insect jackets. Those leave too many vulnerable spots for this environment. I'd recommend the type of bug jacket that is mainly closed material, with mesh only in the face area and under the arms. A camping hat is helpful for keeping the bug netting of the jacket off your face. (Hopefully we will also have some very windy days to enjoy the lovely Hudson Bay views without a bug jacket, but you want to be prepared.)

OTHER

1. Day pack
2. Sunglasses
3. Water bottle
4. Insect repellent
5. Spare glasses, if needed

6. Field notebook (hard cover strongly recommended)
7. Pencils (or write-in-the rain pen) and pencil sharpener
8. Binoculars*
9. GPS*
10. Laptop**
11. Digital camera or smart phone with camera**

* Useful but optional.

** It would be best to have your own camera device, but you could share with another person if you don't have your own. There are a few computers at the CNSC that you can use if you don't have your own laptop.

PERSONAL

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Hair brush 2. Shampoo, conditioner 3. Shaving kit 4. Soap 5. Toothbrush, paste, floss 6. Sunscreen, moisturizer, lip balm 7. After-bite or other insect bite treatment 8. Antihistamines, aspirin or Tylenol 9. Band-aids and polysporin (or other antibiotic cream) in case of minor scratches 10. Ample supply of any other medications you require | <p>You will have access to a washing machine/dryer at the CNSC (\$5/load)</p> |
|---|---|

THINGS NOT TO BRING

1. You will not need a sleeping bag as sheets, pillowcases, blankets, etc. are provided by the CNSC.
2. You can't use a tent because of bears.
3. Pack everything you need, but try to stick to one large pack plus your day pack, as the rooms are shared and cozy. Also, be sure to check on luggage restrictions on flights, as Calm Air limits are lower than for other airlines.

VI. THINGS TO DO (Soon!)

1. Fill out your application form for the course. Please return application form, deposit, and course waiver form to Connie Davison, Room 2484, Science Complex, no later than Friday, January 27th, 2017. You will be informed about acceptance by the end of the semester. A waiting list position may be created if demand exceeds positions.
2. Upon acceptance, make your travel plans and commence background reading. Be sure to remember to prepare your first presentation in advance of arriving in Churchill.
3. Once you make your travel plans, notify course instructor by email (sadamowi@uoguelph.ca) of your expected mode of travel, anticipated time of arrival, and flight numbers (if applicable).

VII. BACKGROUND READING

It is critical that you do some background reading to broaden your understanding of Arctic environments before the course. The following book provides the best low-cost introduction to the Arctic. It can be ordered from any bookseller (e.g. www.amazon.ca) for about \$20.00.

E.C. Pielou. 1994. A Naturalists Guide to the Arctic. University of Chicago Press, Chicago.

I would also highly recommend the following book, which contains a wealth of information about the Churchill region specifically.

As of December, 2016, this excellent work was available for a very affordable price (\$22) through:

<http://www.mcnallyrobinson.com/9780986937101/lorraine-brandson/churchill-hudson-bay>

L.E. Brandson. Churchill Hudson Bay: A Guide to Natural and Cultural Heritage. Churchill Eskimo Museum, Churchill, Manitoba.

You may also wish to purchase regional-specific guidebooks for taxonomic groups that are especially of interest to you. Several resources (such as plant identification books) will be available to be shared during the course.

Other Information

1. There is a large amount of information on Arctic life and environments at the following website:

www.polarlife.ca

2. You can learn more about DNA barcoding at the following websites:

www.barcodinglife.org; <http://www.ccdb.ca/>; <https://biodiversity.uoguelph.ca/>

3. Student research. You can read about a previous group project conducted by the instructors and students of the Arctic Ecology 2012 course that has been published.

Smith MA, Boyd A, Bringloe T, Britton-Foster C, Cahill H, Desnoyers K, Duitshaeffer N, Gibson D, James S, Jeong Y, Kelly D, Levene E, Lyttle H, Masse T, Pare K, Paris K, Russell C, Scott E, Silva D, Sparkes M, Valkova K, Adamowicz SJ. 2016. The northward distribution of ants forty years later: re-visiting Gregg's 1972 collections in Churchill, Manitoba, Canada. *The Canadian Entomologist*. 148: 307-315.
(doi:10.4039/tce.2015.53)

VIII. CODE OF CONDUCT

All participants are required to adhere to field and laboratory safety protocols. Training will be provided at the beginning of the course. Key components of the field safety training include staying in the group (don't wander away from the group!) and alerting others and retreating to the vehicle when a polar bear is spotted. No food or drink is permitted in laboratory spaces. Students are welcome to ask questions and raise any safety concerns they may have.

Participants in this course agree to treat all others with respect, including other course participants, other guests of the CNSC, CNSC staff, Churchill town citizens, etc. Harassment will not be permitted. The course welcomes all individuals with a suitable academic background.

Some elements of the course involve providing feedback to one another and peer review. The purpose of this is to help one another to improve understanding of concepts and to improve the research products produced (e.g. oral presentations, formulation of hypotheses, research design, etc.). Also, providing feedback to others facilitates concentration and one's own learning. Critiques should be delivered respectfully. Focus your comments on the arguments and the materials presented, not the person. As well, unexpected challenges commonly arise during field work. It is important to work through such challenges in a mutually respectful fashion, even if expressing frustration at a situation.

The CNSC hosts many different groups for educational and research purposes, ranging from school groups to senior citizen science groups. Please be considerate of others and do not make excessive noise at any time, and be especially quiet at night. While socializing in the CNSC is permitted, and there are designated spaces for this, it is strongly advised to avoid drinking games and excessive alcohol consumption. This can be dangerous. Also, while the field course is great fun, it is best to remember that this is an academic/professional setting. Also, it is forbidden to provide alcoholic beverages to underage people.

Before posting photos or videos to social media, ask permission from any other individuals that appear in your images. Please do feel free to share your own stories about your field experiences as well as photos of the landscapes, organisms you are studying, and photos of yourself in the field.

IX. GRADING

As a fourth-year course, expectations are high for performance in Arctic Ecology. There is no bell curve used, and all students have the opportunity to perform well. Grades follow the standard definitions at the University of Guelph:

- **80 - 100 (A) Excellent.** An outstanding performance in which the student demonstrates a superior grasp of the subject matter, and an ability to go beyond the given material in a critical and constructive manner. The student demonstrates a high degree of creative and/or logical thinking, a superior ability to organize, to analyze, and to integrate ideas, and a thorough familiarity with the appropriate literature and techniques.
- **70 - 79 (B) Good.** A more than adequate performance in which the student demonstrates a thorough grasp of the subject matter, and an ability to organize and examine the material in a critical and constructive manner. The student demonstrates a good understanding of the relevant issues and a familiarity with the appropriate literature and techniques.
- **60 - 69 (C) Acceptable.** An adequate performance in which the student demonstrates a generally adequate grasp of the subject matter and a moderate ability to examine the material in a critical and constructive manner. The student displays an adequate understanding of the relevant issues, and a general familiarity with the appropriate literature and techniques.
- **50 - 59 (D) Minimally Acceptable.** A barely adequate performance in which the student demonstrates a familiarity with the subject matter, but whose attempts to examine the material in a critical and constructive manner are only partially successful. The student displays some understanding of the relevant issues, and some familiarity with the appropriate literature and techniques.
- **0 - 49 (F) Fail.** An inadequate performance.

For further information on grading, please see:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/2015-2016/c08/c08-grds-proc.shtml>

Late assignments are issued a penalty of 10% per each additional 24 hr period starting after the due date/time,

including weekends.

X. UNIVERSITY AND COURSE POLICIES

E-mail Communication

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students. Students from other universities are also required to provide an email address and to check this regularly.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. [See the undergraduate calendar for information on regulations and procedures for Academic Consideration.](#)

Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40th class day. To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar: Undergraduate Calendar - Dropping Courses

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

[The Academic Misconduct Policy is detailed in the Undergraduate Calendar.](#)

(Notes about Arctic Ecology: The type of academic misconduct that is most likely to occur in Arctic Ecology is the plagiarism of published works. We will discuss how to reference published works in the course. It remains the

students' responsibility to seek clarification if you are uncertain of how to reference the works of others and to avoid plagiarism.)

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

Use of Animals

The University is committed to principles of conducting research and teaching in accord with the highest ethical standards. Given that the use of animals in research and teaching is a critical aspect of the work of the University of Guelph, the Department of Integrative Biology is committed to minimizing the use, pain, and suffering of animals used for teaching and to ensuring that animals which are used will receive care and treatment that meets or exceeds the standards outlined by provincial guidelines and statutes, and by the Guidelines of the Canadian Council on Animal Care. For more information

http://www.uoguelph.ca/research/assets/acs/docs/university_animal_care_policy_and_procedures.pdf

Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program.

<http://www.bsc.uoguelph.ca/index.shtml> or <https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

- There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.

<http://www.learningcommons.uoguelph.ca/>

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>

- Student Health Services is located on campus and is available to provide medical attention.

<https://www.uoguelph.ca/studenthealthservices/clinic>

- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.

<http://www.uoguelph.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

- The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see:

<https://www.uoguelph.ca/csd/>