

<b>Course Title:</b>	<b>Field Methods in Ecological and Environmental Genomics</b>
<b>Instructor(s):</b>	Robert I. Colautti ( <a href="mailto:robert.colautti@queensu.ca">robert.colautti@queensu.ca</a> ; 613-533-2353)
<b>Dates:</b>	Monday, May 29 to Saturday, June 10
<b>Location:</b>	Queen's University Biological Station (QUBS), 280 Queens University Road, Elgin, ON 613-359-5629
<b>Cost:</b>	<p>\$1,250 for accommodations, meals, and lab/field expenses                  (\$350 non-refundable deposit to your home university                  + \$900 cash balance due on arrival)</p> <p><b>Includes</b> field trips, DNA sequencing + wet lab work, boats, wi-fi, full room + board  <b>Excludes:</b> Students must bring appropriate field clothing and arrange transportation to/from QUBS</p>
<b>Prerequisites:</b>	<p>Senior-level university courses in biology or environmental science. Additional courses in ecology, genetics and statistics are recommended.</p> <p><b>Mandatory:</b> (1) Basic laptop with battery lasting 3+ hr while using wi-fi. (2) field clothing appropriate for a variety of weather conditions from cold rain to hot sun (rain pants, sunscreen, bug spray, etc). (3) Refillable water containers with at least 2L.</p>
<b>Enrolment:</b>	12 (3 reserved for Queen's Students)
<b>Course Description (brief):</b>	<p>Genetic diversity is a critical component of global biodiversity and an important consideration for sustaining natural systems that are robust to anthropogenic disturbance. In this introductory-level field course, you will learn a variety of methods for data collection, biotic surveys, and experimental approaches for assessing biodiversity in natural systems. Based at the scenic Queen's University Biological Station (QUBS), you will learn how to combine field methods with genetic techniques to inform management priorities and address fundamental issues in ecology and conservation science.</p> <p>Daily activities involve hands-on experience with experimental design, field sampling, data collection, and basic laboratory methods for ecological and environmental genomics. Evening lectures and tutorials will introduce you to a variety of classic, modern, and emerging methods in molecular genetics and bioinformatics. A final project will emphasize training in the methods of reproducible science and informed management.</p>
<b>Evaluation:</b>	<p>Field &amp; Lab Notes (25%)                  Presentation (25%)                  Final Group Project (30%)                  Peer Evaluation on Group Project (20%)</p>

## An Average Day – What to Expect

(a) Daily timeline	An average workday begins with a catered breakfast (7:00-8:00) followed by half- to full-day guided learning activities in field or laboratory settings. Each day includes a catered picnic lunch break (12:00-13:00) in the field, and dinner (18:00-19:00) served in the main lodge. Two-hour evening tutorials (19:30-21:30) cover a variety of topics, including introduction to programming for data science, introduction to genome sequencing technologies, journal article discussions, and student presentations.
(b) Work habitat & Physical exertion	Light hiking around QUBS property can include terrain around marshes, lakes and rivers, with potential for slippery rocks and muddy conditions in a variety of cool to hot weather conditions. Tick and mosquito-borne diseases (e.g. Lyme, West Nile) are potential hazards that can be mitigated with proper clothing and repellents. Outdoor activities may occur in a variety of weather conditions including cold rain or summer heat. Everything required for a day in the field (e.g. clothing, snacks, water, toiletries) must be packed and carried. Meals are provided but dry, odourless snacks are also recommended to maintain energy between meals. Bathrooms are available in the morning and evening but during the day students must make use of the surrounding vegetation. Students must be prepared to spend long days in the field (up to 9 hours).
(c) Common activities	<ul style="list-style-type: none"> <li>• Boat/canoe travel across open water – risk of sea sickness, drowning, finger/hand injuries from sampling equipment and docking procedures. Life jackets will be provided and must be worn.</li> <li>• Hiking around QUBS hiking trails – risk of tick or mosquito bites and potential for disease (e.g. Lyme, West Nile); risk of injury from thorns, sprained ankle, old wire fences, poison ivy exposure, blisters from poor footwear, heat exhaustion, hypothermia. Students should bring proper clothing (e.g. light material, long sleeve, full pants, not shorts), proper footwear and strong repellents that are effective against arachnids. Tick gaiters or long socks to tuck in pants are highly recommended to mitigate risks of tick bites and Lyme disease.</li> <li>• Lab work – risk of exposure to toxic chemicals. Disposable gloves and other safety equipment will be provided. Food and drink are prohibited in the wet lab.</li> </ul>
(d) Weather, dehydration, & biting insects	<ul style="list-style-type: none"> <li>• Temperatures can vary considerably from excessively hot (&gt;30°C) to cold and wet (&lt; 10°C). Students should bring appropriate field clothing and dress in ‘layers’ that can be adjusted to ambient temperatures. Bring containers for up to 2L of water, and a variety of field clothing appropriate for variable weather conditions.</li> <li>• Regardless of temperature, strong sun and high UV are likely. Students should bring a large sun hat and high SPF sun blocking cream to mitigate these effects.</li> </ul>
(e) Toxic/poisonous, wildlife/ plants	<ul style="list-style-type: none"> <li>• Ticks and mosquitoes in this area can carry a variety of pathogens including West Nile virus and the bacteria that cause Lyme disease. These risks can be mitigated by wearing a wide-brimmed hat, pants (not shorts) and long-sleeved shirt, sprayed with a strong acaricide or insecticide that is also effective against ticks and mites.</li> <li>• Hiking trails may have poison ivy, which can be mitigated by avoiding direct contact with skin (e.g. wearing long pants, long sleeves and washing clothes after field use).</li> <li>• Black bears are also a potential risk during day hikes. To mitigate this risk, bring a loud whistle or other noise maker and avoid bringing any food with a strong smell into the field.</li> <li>• Other injuries (e.g. sprained ankle, broken limb) are possible so students should take care when hiking. There are few time constraints so students should hike at a pace they are comfortable with and students should stay together with their groups in case somebody is injured.</li> </ul>
(f) Sleeping, washroom & laundry facilities	<ul style="list-style-type: none"> <li>• Sleeping accommodations at QUBS include a bed with mattress. It is recommended that students bring their own sleeping bag and pillow to ensure a good night’s rest. Shared rooms may be located within a single co-ed lodging building, depending on space availability.</li> <li>• Field clothes should be washed or stored in plastic bags to prevent introduction of ticks into the sleeping quarters. Paid laundry is available on-site. Showers, sinks and flush toilets are available but may require a short walk to the main lodge (&lt;100m). Students are responsible to keep the rooms clean to avoid attracting vermin.</li> </ul>
(g) Meal plans & food allergies	Full meals are provided. Options for dietary restrictions (e.g. vegan, vegetarian, allergies) can be accommodated, but must be communicated to the course coordinator prior to arrival.
(h) Non-academic responsibilities	Students may be asked to help with dishes and sweeping/cleanup after communal meals
(i) Degree of isolation	QUBS is large and isolated, occupying >3,400 hectare. The main lodge is fully serviced with electricity, plumbing and wi-fi/internet but no cell phone signal is available for much of the property. Students should always stick together with their assigned groups, and stay within site of the designated hiking paths at all times. The closest hospitals are more than an hours’ drive, so any serious injuries can quickly become life-threatening.
(j) Alcohol & drugs	QUBS is part of Queen’s University and activities are therefore subject to all rules and regulations relevant to Queen’s campus. Smoking of any kind is prohibited on campus. Alcohol is not strictly prohibited but is restricted to personal accommodation spaces. Due to the increased isolation and dangers associated with work at QUBS, students must be sober for all activities and always behave responsibly; failure to do so will result in immediate expulsion from the course.

(k) Vaccinations/ Insurances	No additional vaccinations or insurance are needed for Ontario residents with OHIP coverage. Students are reminded to bring their Health Cards in the unlikely event that hospital treatment is needed.
(l) Social Situations	<p>This is a two-week, intensive field course. During this time students will be engaged in full-day activities, living in close quarters with other students in the course and likely additional students from other courses or students working at QUBS for the summer. A few social activities are planned in order to bond and generate lasting friendships.</p> <p>In order to do this, it is important that we all follow Queen's <a href="#">Code of Conduct</a>, which is based on the simple premise of mutual respect. There is a zero-tolerance policy for harassment or violence towards any student or staff at QUBS. Any violations of this policy should be immediately reported to the course instructor or QUBS staff.</p>
(m) Final comments	<p>This is an intensive field course that teaches fundamental skills in field methods, laboratory techniques, sequencing technologies, and computational methods relevant to biodiversity research in ecology and environmental science. Despite the demanding schedule, past students have given the course high ratings, particularly the hands-on coding tutorials to manage and analyze biological data. The course is designed such that all requirements can be completed within the course timeline.</p>