

Syllabus - Invasive species seminar course, BIOL509
Winter 2025

Land acknowledgement

The territory that Queen's University occupies is included in the Dish with One Spoon Wampum Belt Covenant, an agreement between the Iroquois Confederacy and the Confederacy of the Ojibwe and Allied Nations to peaceably share and care for the resources around the Great Lakes. The Kingston Indigenous community continues to reflect the area's Anishinaabek and Haudenosaunee roots, as well as Métis and First Peoples from other Nations residing here.

Historically, Indigenous communities were rarely consulted on conservation issues, nor were their priorities and values considered. As a white settler of European descent and a university professor, I recognize that I have had a privileged role in science and to some extent, conservation. In this class, I will strive to incorporate published papers with viewpoints by Indigenous researchers and rights-holders, in an effort to diversify the voices that are heard.

Equity, Diversity, and Inclusion

Queen's University recognizes that the values of equity and diversity are vital to and in harmony with its educational mission and standards of excellence. It acknowledges that direct, indirect, and systemic discrimination exists within our institutional structures, policies, and practices and in our community. These take many forms and work to differentially advantage and disadvantage persons across social identities such as race, ethnicity, disability, gender identity, sexual orientation, faith, and socioeconomic status, among other examples.

In this class I will work to promote an anti-discriminatory, anti-racist and accountable environment where everyone feels welcome.

Every member of this class is asked to show respect for every other member.

Learning outcomes

On successful completion of the course, students will be able to:

1. Identify the various stages of a species moving from a native to invasive species
2. Discuss the costs and benefits of the establishment of invasive species
3. Use published tools to evaluate the costs and benefits of non-native species
4. Understand prominent theories associated with invasion ecology and identify their associations and importance
5. Describe key invasive species threats in Ontario lakes and other water bodies
6. Identify effective management strategies for reducing the harm of invasive species
7. Discuss some Indigenous perspectives and how they can be used to inform invasive species management

Grades:

- Participation/discussion: 20
- Theory presentation (individual): 20
- Species presentation (individual): 20
- Management presentation (group): 20
- Lake association website (group): 20

Discussion – 80 minutes

There will be **7 class discussions** based on papers that you have read before coming to class. Everyone is expected to contribute. Contributions can take different forms but should all be related to the topic of the paper. You can ask for clarification of ideas, you can respectfully disagree with comments made by classmates (critique ideas not people), you can prompt the discussion with questions, and you can give your opinion of the ideas being discussed. You can bring in other sources of information/evidence from other papers, presentations, reliable websites to support your opinions and ideas.

When you read the paper, answer the following questions to support your contributions to the discussion. Submit your answers to OnQ before the discussion starts. I will incorporate your answers and discussion comments into your grade.

1. What is the main idea of the paper?
2. What evidence do they use to support their ideas? What are the strengths and weaknesses of this evidence?
3. Are there alternative ideas/evidence that aren't in agreement with those suggested by the paper?
4. How can these ideas be applied to the issue of invasive species?
5. What are your thoughts about the ideas that the authors present? Do you agree? Do you think we need more information/research?

Invasion theory presentation – 15-20 minutes

Read the assigned paper related to the invasive species theory. In your presentation, define the theory, present the background information necessary to understand it (including where it fits in the Invasion Pathway Framework proposed by Blackburn et al. 2011), and present a study in freshwater (e.g., lakes, rivers, wetlands) that supports the theory.

The slide deck for class presentations is due (uploaded to OnQ) one class before you give the assignment. For example, if you are scheduled to give your presentation on a Tuesday, you should upload your presentation the Friday before.

Rubric: Background context for the theory (5); Clear articulation of the theory (5); Recent freshwater example (5); presentation aesthetics (3); presentation delivery (2)

Species presentation and information sheet – 15-20 minutes

Use a combination of reliable websites (e.g., government) and primary literature to conduct research on the assigned species. In your presentation, describe the species, including life history attributes, feeding ecology, native distribution and habitat, distribution in Canada (and

in particular Ontario). Do we know how it arrived in Canada and how it spreads? Why is it a threat in Ontario? Are there existing management strategies to deal with it? What are the gaps in knowledge? Use this information to produce a single-page information sheet that includes citations).

The slide deck for class presentations is due (uploaded to OnQ) one class before you give the assignment. For example, if you are scheduled to give your presentation on a Tuesday, you should upload your presentation the Friday before.

Rubric: Description of species (5); Native distribution and habitat (5); Canadian/Ontario distribution (3); Arrival and spread (2); Management (2); Knowledge gaps (3)

Management presentation (group) and discussion – 1hr 20 minutes

For a given management issue/strategy, provide relevant background information so the class will understand the problem. Give specific examples from the scientific literature. What are the effective strategies? Is there evidence that they have been successful? What are the problems/challenges associated with this strategy? Are we lacking information/research to make it more effective? If yes, what should be done?

Assign a key paper that illustrates the management issue for the class to discuss. Guide the class discussion through prompts and questions.

The slide deck for class presentations is due (uploaded to OnQ) one class before you give the assignment. For example, if you are scheduled to give your presentation on a Tuesday, you should upload your presentation the Friday before. The paper that you assign for the class to read should be uploaded along with the slide deck, or before.

Rubric: Explanation of the management issue (5); examples where it has been effective (5); Challenges (3); Ways forward (2); paper discussion (5)

Invasive species website for Devil Lake Association

Create an informative and educational website for the Devil Lake Association (<https://devillake.org/home-3/>). They have a strong interest in conservation and recognize that invasive species are a critical problem to deal with, but they need some guidance. A few of the members are biologists (fish biologists), many have a university degree (but not in biology), and the rest are permanent or seasonal residents that want to learn how to best protect the lake. At the end of this course, you will have a strong foundation in aquatic invasive species theory and management. As biologists with some expertise, it is important to share your knowledge and insights with the public so they are motivated to protect the environment, so they understand why it is important, and what the most effective strategies are to ensure that local ecosystems maintain their biodiversity, ecosystem functions, and the services they provide.

Some topics that you might want to consider for the website are:

What is an invasive species?

Why should we be concerned about invasive species?

What are some of the current threats to Devil Lake?

What can they do to prevent the arrival and spread of invasive species?

For this project, you will draw on material from class, as well as information from the literature. You will be working as a team, so you will likely want to organise into small sub-groups with assigned tasks and then come together at the end to create the final product. You will likely use photos and figures in the website – so should make sure that their copyright allows for use on educational material. Make sure you credit all sources (photos and information).

Rubric: General information about invasive species (5); information about particular invasive species that are threats to Devil Lake (5); management strategies that individuals or the Association can use (5); aesthetics, readability, grammar, spelling (5)

Course Schedule

Week 1: (Shelley)

- Invasion overview
- Stages of invasion
- Citation politics discussion; group work

Week 2:

- Discussion** about cost/benefits of invasions
- Discussion:** Indigenous perspectives on invasive species

Week 3:

- Theories – Propagule
 - Propagule/colonization pressure
 - Tens Rule
 - Invasion meltdown
- Theories – Traits
 - Plasticity
 - Adaption
 - Habitat filtering
 - Novel Weapons
- Theories – Biotic Interactions
 - Biotic resistance

Week 4:

- Theories – Biotic Interactions
 - Enemy release & Evolution of increased competitive ability
 - Enemy reduction & Enemy Inversion
 - Enemy of my enemy
 - Ecological naivety
- Theories – Resource availability
 - Increased resource availability
 - Disturbance
 - Opportunity windows
 - Environmental heterogeneity

Week 5:

- Discussion** – putting theories together (read paper)
- Friday class cancelled

Week 6:

- Zebra and quagga mussels
- Spiny water flea
- Hemimysis anomola (bloody red shrimp)

Marbled Crayfish
Sea Lamprey
Tench
Round Goby
Goldfish

Week 7: READING WEEK

Week 8:

Hydrilla
Water soldier
Starry Stonewort
Eurasian milfoil
Yellow Floating-heart
Water chestnut
Curly-leaf pondweed
European Frog-bit

Week 9:

Impactful or benign – how to assess them? **Discussion** of papers using examples from class

Management – two-eyed seeing – Sea Lamprey example - **discussion**

Week 10:

Live organism trade – problem and management

Website – **discussion**

Week 11:

Arrival – prevention – transatlantic and Great Lakes ballast regulation

Overland spread – how?

Control (decontamination – what has been done, what is effective?)

Week 12:

Physical removal

Chemical and biological control

Week 13:

Discussion – Robichaud et al. framework for management

Final Website discussion

Name/Pronoun

If, for whatever reason, you wish to change how your name appears in onQ and/or on class lists, please follow these steps. You may also use this process to add your pronouns to the appearance of your name.

1. Log into SOLUS.
2. Click on Personal Information tab.
3. Click on the Names tab
4. Click on the Add New Name tab
5. Choose Preferred from the Name Type drop down menu
6. Enter the name you would like to appear in onQ and/or on class lists.
7. Click Save.

Please allow 24 to 48 hours for your name to be registered within the system. If you have further questions or concerns, please contact ITS at Queen's University.