NATIONAL SOCIO-ENVIRONMENTAL SYNTHESIS CENTER



Zebra mussels are small, freshwater mussels that are native to Eurasia. These invasive mollusks are rapidly spreading throughout freshwater bodies in the United States, including the Great Lakes.

Lesson – Debate: Interdisciplinary Perspectives on Non-Native Species, Part 2

By Margaret A. Palmer & Heidi Scott, SESYNC | October 28, 2022

Overview:

This is the second lesson in a two-part series. Learners should complete Debate: Interdisciplinary Perspectives on Non-Native Species, Part 1 *before proceeding with this lesson.*

Ecologists traditionally have defined non-native species as those that have not evolved in or historically lived in a geographic region. Only a small subset of these species is also invasive, but when they are, they can outcompete native species and cause extinctions or extirpations, as well as detrimental changes in ecosystem-level processes, such as nutrient cycles and hydrology. For this reason, many ecologists have emphasized the need to control non-native species and have promoted growth in the field of invasion biology. (Invasion biology is the study of when and why non-native species become invasive and the best practices for limiting their spread or removing them.) Some scholars, including those from diverse fields, have raised concerns that the growth of invasion biology has bolstered the assumption that all non-natives are bad (invasive), and thus there is a need to control and/or eradicate them. These scholars argue that this assumption is problematic because many non-native species are quite valuable from a human-centered perspective and non-native assemblages are inevitable, given the pace of global change. Such arguments often come up in the contexts of ecosystem restoration and the concept of "novel ecosystems"—both are the explicit focus of lessons

that could be tied to this one.

This lesson is structured as a formal debate between camps concerned over the need to control non-native species vs. those focused on their value. Two teams will argue their points, and a science advisory board (SAB) will evaluate the outcome seeking some common ground. The SAB will also lead a discussion on the topic that incorporates even broader perspectives from individuals with diverse disciplinary and sector backgrounds who seek to study and solve socio-environmental problem.

Assumed Prior Knowledge:

Most suitable for undergraduate and graduate learners. Higher-level learners may be better suited to serve on the SAB that evaluates the outcome of the debate.

Learning Objectives:

- Gain detailed knowledge about the hot-button issue of non-native and invasive species.
- Research and articulate the two perspectives and argue for a particular position.
- Anticipate and address counterarguments to learners' assigned positions.
- Explore deeper issues of how values, as well as disciplinary and sector perspectives, influence thinking and stances on the importance and potential management of non-native species.

Key Terms and Concepts:

non-native species; invasive species; extinction vs. extirpation; hybridization; invasion meltdown; invasion debt; lag effect; novel ecosystems; intrinsic and instrumental value; structural heterogeneity/ complexity; species diversity vs. richness

Teaching Assignments:

This debate is intended to span two class sessions (about 50–75 min. each). The first session was covered in Lesson 1. The second session is covered here in Lesson 2.

Session 2: Debate Day (50–75 min.)

The actual debate varies in length (30–40 min.) depending on the total time allocated for the class session (50–75 min.). In advance of the session, the instructor should prepare the debate stage with two long tables open toward the audience and SAB.

1. **(5 min.)** Once participants arrive, review the debate rules and structure. Allow debate groups to briefly consult and to bring up their visuals and oral debate materials.

2. **(30–40 min.)** Conduct the debate. The instructor should keep time and order over the proceedings as outlined in the previous session.

3. **(15 min.)** In the remainder of class, invite the SAB to:

    - Present comments on each team's debate performance
    - Lead a discussion related to the core themes and the questions they developed prior to the session

- Remark on the roles of history, climate change, and philosophies of restoration that further enrich the class's understanding of this complex issue
- Articulate the potentials of a middle ground and show how it features ideas from both sides.

4. **Optional Extension:** Continue the conversation by requiring debaters and the SAB to post reflections using the class's online discussion board. Learners might consider what went well and what could be improved in the debate itself, or they may extend the concepts by musing on additional case scenarios relevant to the issues discussed.

Background Information for the Instructor:

1. **Can Invasive Species Ever Be Good?**

   - For decades, biologists have warned of the consequences of introducing alien organisms into new ecosystems, but some researchers' studies have suggested that certain alien species may actually help ecosystems. This article explores both sides of the debate among invasion scientists and the push for greater data acquisition about non-native species' positive and negative impacts to inform management decisions.
   - Elbein, A. (2022, October 2). Can Invasive Species Ever Be Good? *The Atlantic*. https://www.theatlantic.com/science/archive/2022/10/invasive-species-help-ecosystem-wildlife/671626/

2. **Fruit quantity of invasive shrubs predicts the abundance of common native avian frugivores in central Pennsylvania**

   - Biological invasions threaten global biodiversity, but they can also create positive ecological relationships and services, which can sometimes result in challenges for conservation efforts. For example, non-native plants can form mutualisms with native, fruit-eating—and consequently, seed-dispersing—birds. This article looks at such a relationship between honeysuckle plants and bird communities in central Pennsylvania.
   - Gleditsch, J.M., & Carlo, T.A. Fruit quantity of invasive shrubs predicts the abundance of common native avian frugivores in central Pennsylvania. *Diversity and Distributions, 17*(2), 244-253. https://doi.org/10.1111/j.1472-4642.2010.00733.x

3. **Invasion Biology: Specific Problems and Possible Solutions**

   - Though biological invasions are one of the major global causes of biodiversity loss, the field of invasion biology faces regular criticism and faces a lack of progress. To address these issues, this article's authors outline 24 specificities and problems of this discipline. They categorize those items into four groups: understanding, alerting, supporting, and implementing the issues associated with invasive alien species; they then offer solutions to tackle these problems and advance the field.
   - Courchamp, F., Fournier, A., & Bellard, C. (2017). Invasion Biology: Specific Problems and Possible Solutions. *Trends in Ecology and Evolution, 32*(1), 13-22. https://doi.org/10.1016/j.tree.2016.11.001

Related SESYNC Content:

- Palmer, M.A., & Scott, H. (2022, October 28). *Lesson – Debate: Interdisciplinary Perspectives on*

Non-Native Species, Part 1. SESYNC. https://www.sesync.org/resources/debate-interdisciplinary-perspectives-non-native-species-part-1

- Palmer M.A., & Scott, H. (2022, October 21). *Lesson – Novel Ecosystems and Natural Resource Management: For Whom? Part 1*. SESYNC. https://www.sesync.org/resources/novel-ecosystems-and-natural-resource-management-whom-part-1
- Palmer M.A., & Scott, H. (2022, October 21). *Lesson – Novel Ecosystems and Natural Resource Management: For Whom? Part 2*. SESYNC. https://www.sesync.org/resources/novel-ecosystems-and-natural-resource-management-whom-part-2

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