NATIONAL SOCIO-ENVIRONMENTAL SYNTHESIS CENTER



The yellow plant known commonly as the strawflower or curry plant is native to Europe but often grows beside the pink highway ice plant, which is an invasive species.

Lesson – Debate: Interdisciplinary Perspectives on Non-Native Species, Part 1

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Overview:

This is the first lesson in a two-part series. The second lesson can be found here: Debate: Interdisciplinary Perspectives on Non-Native Species, Part 2.

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 problems.

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

The "Hook" (suggestions for quickly engaging students):

(3 min.) Ask learners to consider two familiar, non-native species that have naturalized across many American ecosystems: dandelions and white clover. Have them list at least two virtues and two liabilities of having these species so abundantly represented in disturbed areas.

Teaching Assignments:

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

Session 1: Team Assignments and Debate Preparation (50–75 min.)

The amount of time the instructor should spend on each of the parts of this session varies depending on the total time allocated to the session (i.e., 50 min. or 75 min.)

1. **Prior to the First Session:** Learners should carefully read two articles: Simberloff (2015) and Schlaepfer (2011). They should pay special attention to the way researchers present the non-native and invasive perspectives, including bias, emotion, and subjectivity that may affect the tone and understanding of the underlying science. They should note specific examples that may help them articulate their position. Learners do not yet know which side they are on for the debate.

Simberloff_2015_Highlighted.pdf

Schlaepfer_et_al_2011_Highlighted.pdf

2. **(10–15 min.)** Begin the session by posing questions and reviewing concepts in the PowerPoint presentation:

   Non-Native_Species_1_Lesson_Slides_Accessible.pptx

3. **(5 min.)** Divide the class into three groups: the debate team **Control**; the debate team **Embrace**; and the **Science Advisory Board (SAB)**, which will be the debate audience and jury.

   Note to Instructor: You may decide whether to assign learners randomly or ask them their preferences. If you ask for preferences, there may be more difficulty in fairly assigning final teams, but learners may be happier with their debate position. If the class has a mix of student levels, you may find it wise to distribute more advanced learners among the teams, and/or stack the SAB with more expertise. You might also invite professional colleagues and postdocs to participate in the SAB. Suggested times for each activity are listed in parentheses.

4. **(5 min.)** Instructor reviews the classic debate structure that they will employ in the next session. This structure results in a total of ~30–40 min. debate time depending on class time:

   - **Opening Arguments:** The first speaker on the Control team will present arguments in support of their position; then, the first speaker on the Embrace team presents their arguments (each gets 3–5 min.). Next, the second speaker on the Control team presents further supporting arguments, identifies areas of conflict, and answers questions that may have been raised by the Embrace speaker; then vice versa (second Embrace speaker presents) (each gets 3–5 min). Total time for this part is 12–20 min.
   - **Prepare Rebuttals:** Teams have 5 min. to prepare rebuttals.
   - **Delivery of Rebuttals:** The Control team begins, attempting to defend their arguments and to defeat the opposing arguments without adding new information; the Embrace team's rebuttal then follows (each team gets 2–4 min.); the total time for this part is 4–8 min.
   - **Closing Statements:** Each team gets a second rebuttal for closing statements with the Embrace team having the last opportunity to speak followed by the Control team; each has 4–8 min. There cannot be interruptions. Speakers must wait their turns. The instructor may need to enforce the rules. Total time for this part is 8–16 mins.

5. **(30 min.)** Teams meet separately to prepare their arguments.

   - Groups should assign debate positions (speaker order, leading arguments vs. rebuttal roles, etc.) and begin detailed planning of their rhetoric based on the above readings. They may conduct additional research and prepare visuals to support them in the debate.
   - If the SAB includes learners in the class, have that group meet separately to study issues related to the debate that extend beyond the articles pre-assigned to the full group. Shackleton et al. 2022 discusses the many dimensions of the debate after surveying practitioners and scholars. The SAB readers may wish to only skim the details of how the survey was implemented and statistically analyzed and instead focus on results related to how disciplinary perspectives influenced survey responses. The SAB should become familiar

with the core themes related to values, management, impacts, and the terminology, as well as thought/discussion questions to pose to the entire group in the next session.

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; and then, they 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

References:

- Education and Early Childhood Learning. (n.d.) *Social Studies Teacher Notes 13: Conducting a Debate*. Province of Manitoba. https://www.edu.gov.mb.ca/k12/cur/socstud/frame_found_sr2/tns/tn-13.pdf

- Schlaepfer, M.A., Sax, D.F. & Olden, J.D. (2011). The potential conservation value of non-native species. *Conservation Biology, 25*(3), 421-657. https://doi.org/10.1111%2Fj.1523-1739.2010.01646.x

- Shackleton, R.T. et al. (2022). Consensus and controversy in the discipline of invasion science.

Conservation Biology, 36(5). https://doi.org/10.1111%2Fcobi.13931

- Simberloff, D. (2015). Non-native species and novel ecosystems. *F1000 Prime Reports, 7(*47). https://doi.org/10.12703/P7-47

Related SESYNC Content:

- Palmer, M.A., & Scott, H. (2022, October 28). *Lesson – Debate: Interdisciplinary Perspectives on Non-Native Species, Part 2*. SESYNC. https://www.sesync.org/resources/debate-interdisciplinary-perspectives-non-native-species-part-2
- 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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