NATIONAL SOCIO-ENVIRONMENTAL SYNTHESIS CENTER



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Lesson – Novel Ecosystems and Natural Resource Management: For Whom? Part 1

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Overview:

This is the first lesson in a two-part series on novel ecosystems. The second is available here: Novel Ecosystems and Natural Resource Management: For Whom? Part 2. *It is recommended to complete these lessons in order, as they build upon concepts.*

The fields of restoration ecology and conservation have undergone dramatic changes over the last 50 years. For both, there is wide recognition that humans have always modified nature, in some cases intentionally to meet their needs, and in other cases unintentionally in ways that degrade the environment and negatively impact people. It is within this broad context that the concept of novel ecosystems has emerged. Novel ecosystems are combinations of species, associated with humans' influence on nature, that differ from those that existed historically at that site; these species also tend to "self-organize" (i.e., not require human maintenance).

Novel ecosystems have become a topic of great debate. Given the pace of global change—including an increase in the movement of materials and people, rapid changes in land use, and a changing climate—some argue that novel ecosystems will be the norm and that we must embrace the concept. Others argue that accepting novel ecosystems as inevitable phenomena may divert our attention from

protecting and restoring nature; some also argue that the science underpinning novel ecosystems is flawed. In this lesson, participants consider disciplinary and sector perspectives on decision making related to managing ecosystems that have been or are about to experience dramatic changes due to human activities.

Assumed Prior Knowledge:

Appropriate for all levels from undergraduates to advanced learners.

Learning Objectives:

- Explore the concept of novel ecosystems from a scientific, management, ethical, and personal perspective.
- Explore the challenges and nuances associated with natural resource management decisions.
- Design, articulate, and revise a specific management plan based on the agenda of a stakeholder group.
- Consider who is included in management decisions and processes that may open doors to those who are typically left out.

Key Terms and Concepts:

novel ecosystem; ecological threshold; resilience; self-organize; evolutionary rescue; precautionary principle; hybrid vs. historic ecological ecosystem

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

(5 min.) Open the lesson by asking participants to spend 5 min. freewriting in response to the following questions: Should the concept of novel ecosystems be fundamental to decisions that natural resource managers make? Why or why not? What is your personal view on the concept of novel ecosystems? Which of the arguments most closely resonated with your own feelings about the environment?

Teaching Assignments:

Managing a Public Natural Resource (One, 75-min. class)

This debate is spread across two class sessions: the first requires 75 min., and the second (Lesson 2) requires 50 min. Both class sessions require work on the part of participants prior to meeting.

1. **Prior to Class:** Participants should come to the session having already read the highlighted sections of the Murcia et al. (2014) and Hobbs et al. (2009) articles found below.

   Murcia_et_al_2014_Highlighted.pdf

   Hobbs_et_al_2009_Highlighted.pdf

   For this session, the instructor will need magic markers or crayons and large (poster-size), sticky-board paper (e.g., like 25" x 30" sheets), or if they prefer, they can use Google Docs or discussion

boards on the course website. This session ends with a homework assignment that will be picked up on in the next session. The lesson uses a specific place (Golden, Colorado) that is associated with a management-planning process; however, we have fictionalized some of the issues to facilitate learning.

2. **(5 min.)** Participants will work in teams to develop a management plan of a region in which novel ecosystems could expand, and citizens' views differ on what—if anything—should be done to prevent this. One team will argue for conservation above all other goals, another for what they call pragmatic restoration, and a third for expanding public access. After dividing the participants into three teams, describe the following scenario, using the associated PowerPoint photos as desired.

Novel_Ecosystems_Case_Study_Lesson_Slides_Accessible.pptx

Scenario: Your team's task is to develop a plan for managing public space near the city of Golden, Colorado, which is just 7 miles west of Denver. Some of the open space parcels are home to native grasses, shrubs, and trees, while invasive grasses dominate other parcels. Wildlife includes many native species, but sometimes natural predators like black bears and mountain lions do not hold some of those native species (e.g., elk) in check. Left unchecked, species' populations spike, leading to over-browsing, which reduces plant density and diversity that is important to other wildlife. Concurrently, the region faces the risks of increased urbanization, development pressures, neglect, and unauthorized uses. Therefore, while the area may already be classified as a home to novel ecosystems, the future could expand the number of novel ecosystems greatly, i.e., with more non-native species and more populations going unchecked by other ecosystem components. Assume that opinions differ on the direction in which the management plan should go:

- **"Conservationists"** argue for protecting much of the land from future human disturbance (i.e., closing off fragile areas entirely) and removing all non-native species. This group has little-to-zero tolerance of novel ecosystems and favors the idea of pristine wilderness.
- **"Pragmatic restorationists"** argue that investing in the restoration of degraded parcels is urgent; this work may involve removing invasive species but also using some non-native (non-invasive) species to stabilize degraded habitats. This group believes novel ecosystems are OK if there is absolutely no other option.
- A **"citizen-access group"** argues that their taxes pay for the open space and that they want even more access (e.g., more public amenities on the land including roads, education centers, unrestricted areas, and even increased hunting seasons). They believe novel ecosystems provide amenities such as reduced maintenance of vegetation because the non-native species that dominate them are tolerant to human activities.

2. **(35 min.)** Divide the participants into three management-planning groups and task each team with:

- Developing a set of at least five recommendations that align with their group's "stance"
- Articulating the logic underlying them (e.g., as opposed to other alternatives).

Their logic should be grounded in both **quantitative** and **qualitative** evidence that they find through scholarly searches. The evidence could include data, ethical or philosophical arguments, experiential narratives, etc. We provide a linked document with a number of suggested references relevant to the site and the issues, but there are many other sources the teams can seek out on their own.

Potential_Sources_for_Team_Research.pdf

Using large, poster-size, sticky-board paper, each group should outline their recommendations and provide bullets for the underlying logic; on a separate sticky poster, they should provide their responses (as bullets) to each of the questions below. Groups will be explaining their plans, logic, and question responses to all the participants after the teamwork.

- Was the concept of novel ecosystems useful in developing their plan? Did they draw upon the essays by Murcia or Hobbs?
- What other sources informed their plan? (Provide a list.)

3. **(27 min.)** Have all the participants reassemble as a group and put their sticky sheets on the wall in front of the group. Then ask each group to have one person take ~3–5 min. to explain their plan and then ~5 min. for the whole group to respond to the questions from the other groups in the room. Encourage participants from the other groups to pose challenging questions or comments. Everyone should take notes as they will need these for the homework. The instructor may wish to take a photo of the poster-sized sticky sheets to share electronically with participants after the session.

4. **(5 min.)** Have the groups split up again to agree on times to meet outside of class and prior to the next session. In this meeting, the members of each group should revise their plan based on what they heard during the session *and* any new resources they consider. They should come to the next session with at least two new resources they used to further advance their plan. Note, they are free to change their plan in any way that they want, i.e., they are not bound to their original assignment. They should summarize their revised plan in a document or a PowerPoint that can be shared electronically with all participants in the next session.

Background Information for the Instructor:

1. **Origin of the Concept of Novel Ecosystems**

   - This essay reviews basic ideas on the existence and value of novel ecosystems. It discusses the evolution of the concept and presents a framework relying heavily on human agency as a foundational attribute of novelty. It also discusses what constitutes a novel ecosystem from the perspective of the authors and provides examples.
   - Mascaro, J., Harris, J.A., Lach, L. et al. (2013). Origins of the Novel Ecosystems Concept. In R.J. Hobbs, E.S. Higgs, C.M. Hall (Eds.), *Novel Ecosystems: Intervening in the New Ecological World Order*. https://doi.org/10.1002/9781118354186.ch5

2. **What's wrong with novel ecosystems, really?**

   - This article discusses the various scientific controversies around novel ecosystems, particularly problems with criteria associated with irreversible thresholds, non-native species, and the hybrid state. The authors also try to integrate novel ecosystems with other ecological perspectives and argue that novel ecosystems are a useful concept.
   - Miller, J.R., & Bestelmeyer, B.T. (2016). What's wrong with novel ecosystems, really? *Restoration Ecology, 24*(5), 577-582. https://doi.org/10.1111/rec.12378

3. **A simplified approach to stakeholder engagement in natural resource management: The Five-Feature Framework**

- This article discusses the importance of stakeholder engagement and presents what they consider the five key elements of engagement. Their framework outlines the steps that are needed for effective engagement and apply it to a case study. This is meant to be a very practical paper to grow collaborative decision-making, including with citizens.

- Talley, J.L., Schneider, J., & Lindquist, E. (2016). A simplified approach to stakeholder engagement in natural resource management: the Five-Feature Framework. *Ecology and Society, 21*(4):38. https://doi.org/10.5751/ES-08830-210438

References:

- Hobbs, R.J., Higgs, E. & Harris, J.A. (2009). Novel ecosystems: Implications for conservation and restoration. *Trends in Ecology & Evolution, 24*(11), 599-605. https://doi.org/10.1016/j.tree.2009.05.012

- Murcia, C., Aronson, J., Kattan, G.H. et al. (2014). A critique of the 'novel ecosystem' concept. *Trends in Ecology & Evolution, 29*(10), 548-553. https://doi.org/10.1016/j.tree.2014.07.006

Related SESYNC Content:

- Palmer, M.A., & Scott, H. (2022, October 28). L*esson – 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 28). L*esson – 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 2. SESYNC. https://www.sesync.org/resources/novel-ecosystems-and-natural-resource-management-whom-part-2

- Scott H. (2022, October 3). L*esson – Exploring Novel Ecosystems: Field Trip to an Urban Forest Patch*. SESYNC. https://www.sesync.org/resources/exploring-novel-ecosystems-field-trip-urban-forest-patch

- Scott, H. (2022, October 3). *Lesson – Socio-Environmental Services & Management of a Novel Ecosystem Lesson: Urban Forest Patch Case Study*. SESYNC. https://www.sesync.org/resources/socio-environmental-services-management-novel-ecosystem-urban-forest-patch-case-study

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