**Subject area/course**: Science/Biology or Environmental Science

**Grade level/band**: 9-12

**Task source**: Educational Policy Improvement Center (EPIC)

**Restoring the Balance**

**TEACHER'S GUIDE**

1. **Task overview**:

In this task, students will explore the ways in which humans seek to restore balance within an ecosystem after a disturbance disrupts the pre-existing balance of a population or populations of species endemic to the habitat. Students will research a solution that was used/is going to be used to restore the balance of a plant or animal species after a particular disruption, provide a background that includes any unintended consequences of the solution, and then argue either for or against the proposed solution, supporting their view with evidence from a variety of sources.

1. **Aligned standards:**
2. **Common Core State Standards**

[CCSS.ELA-Literacy.RST.11-12.2](http://www.corestandards.org/ELA-Literacy/RST/11-12/2/) Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

[CCSS.ELA-Literacy.RST.11-12.8](http://www.corestandards.org/ELA-Literacy/RST/11-12/8/) Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

[CCSS.ELA-Literacy.WHST.11-12.1](http://www.corestandards.org/ELA-Literacy/WHST/11-12/1/) Write arguments focused on discipline-specific content.

[CCSS.ELA-Literacy.WHST.11-12.4](http://www.corestandards.org/ELA-Literacy/WHST/11-12/4/) Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

[CCSS.ELA-Literacy.WHST.11-12.9](http://www.corestandards.org/ELA-Literacy/WHST/11-12/9/) Draw evidence from informational texts to support analysis, reflection, and research.

1. **Critical abilities**

Research: Conduct sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, and demonstrate understanding of the subject under investigation. Gather relevant information from multiple authoritative print and digital sources, use advanced searches effectively, and assess the strengths and limitations of each source in terms of the specific task, purpose, and audience.

Analysis of Information: Integrate and synthesize multiple sources of information (e.g., texts, experiments, simulations) presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to address a question, make informed decisions, understand a process, phenomenon, or concept, and solve problems while evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Communication in Many Forms: Use oral and written communication skills to learn, evaluate, and express ideas for a range of tasks, purposes, and audiences. Develop and strengthen writing as needed by planning, revising, editing, and rewriting while considering the audience.

Use of Technology (May or may not be applicable depending on student presentation media choice): Present information, findings, and supporting evidence, making strategic use of digital media and visual displays to enhance understanding. Use technology, including the Internet, to research, produce, publish, and update individual or shared products in response to ongoing feedback, including new arguments or information.

1. **Next Generation Science Standards**

[HS-LS2.C 2-6](http://www.nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics): Ecosystem Dynamics, Functioning, and Resilience: A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. Moreover, anthropogenic changes (induced by human activity) in the environment – including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change – can disrupt an ecosystem and threaten the survival of some species.

[HS-LS4.D](http://www.nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics): Biodiversity and Humans: Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

1. **Time/schedule requirements:**

This task requires a total of four class periods of work: one class period to introduce the task and have students begin their research, an additional class period toward the end of the two week research window for a peer review/edit session, and a third and fourth class period for planning and presentations of the final products (e.g., discussion panels, poster/multimedia presentations). Students should have two weeks to research and complete their final product, which can be done for homework or during class time as the teacher chooses.

1. **Materials/resources:**

* Ensure student access to Internet for research purposes
* Consider using an introductory story to raise interest in the concept of restoring the balance
  + Example: Killing One Owl Species to Save Another

http://klcc.org/post/killing-one-owl-species-save-another

1. **Prior knowledge:**

* Students should have background knowledge of ecosystems and how different kinds of natural and man-made disturbances can upset the balance within an ecosystem.
* Students should be able to search the Internet for appropriate sources.

1. **Connection to curriculum:**

This task gives students the opportunity to research and build their own argument about a timely and controversial topic in ecology. In addition, success in college and careers requires students to gather information from a variety of sources and evaluate solutions presented from competing viewpoints. This task gives students practice in using reading strategies to interpret scientific material. The task would fit into a biology class after a unit on ecology/ecosystems or in a class on environmental issues.

1. **Teacher instructions:**

* Engage the students with the podcast “Killing One Owl Species to Save Another” found here: http://klcc.org/post/killing-one-owl-species-save-another

NOTE: teachers could substitute another podcast/video/article about a species that is more relevant to their location.

* Have students give examples of natural and man-made disturbances that might disrupt the equilibrium in an ecosystem.
* Referring back to the podcast, start a discussion about how restoring the balance does not always lead to the projected results and may even cause further damage, as well as any tangential ethical considerations.
* Review the concept of ecosystem equilibrium.
* Working in small groups, have students brainstorm and use the Internet or other resources to find interesting examples of the ways in which attempts to restore ecosystem balance leads to unintended consequences. Have each group come up with a local/regional example (if possible) and share the results with the class as a whole.
* Hand out the task and have students work to choose a topic that interests them. Explain that their final paper will include a discussion of the disruption to the ecosystem, what the consequences were, at least one proposed solution to the disruption, and the pros and cons of the solution. Their paper should also include a section where the students argue for or against the proposed solution and provide a solid rationale for their argument.
* For the final product, all learners will benefit from a class period that includes peer-editing and teacher feedback for their papers and presentation formats before final submission.

1. **Student support:**

The following suggestions are examples of scaffolding that can be used to meet the diverse student needs within the classroom.

* Provide class time for research on their topic.
* Confer with individual students who require additional support with the writing process. Provide specific suggestions for drafting, editing, and revision.
* Provide students with the rubric to be used to score their final product.
* Provide exemplars/examples of the final product.
* Provide definitions to vocabulary ahead of time.
* Provide written guidelines for revision and/or editing.
* If applicable, allow small group work on the final presentation. Students can combine similar topics or create debate panels if they have opposing viewpoints.
* Some students will have good research skills, but some will need guidance in the determination of appropriate sources and where to look for them. It is important to spend class time in review of what constitutes an appropriate source in advance of their independent work.

1. **Extensions or variations:**

* Students could present the results of their research to the class via an oral or multimedia presentation. This project would lend itself well to poster presentations with a gallery walk and Q&A session afterwards. The use of technology for the presentation would also work well.
* If there is a particularly interesting and/or controversial topic, a debate could be organized where students choose sides on the topic and defend their views.

1. **Scoring instructions:**

This task can be scored using the SCALE Scientific Literacy Rubric, Grades 11-12.