Gray Vireos:
Using Science to Protect a Threatened Species

Overview: In this one-hour lesson, students play the role of scientists working for the New Mexico Department of Game and Fish. They work through four steps with the goal of conserving the Gray Vireo (a Species of Greatest Conservation Need) in New Mexico: (1) using a model to count Gray Vireos in two habitats, (2) learning what scientists already know about the species, (3) choosing a limited number of strategies to include in a Gray Vireo Recovery Plan, and (4) comparing their plan to other recovery plans.

Grade Level: 3rd – 5th

Phenomenon: The Gray Vireo is a "Species of Greatest Conservation Need" in New Mexico. How can we conserve the species using scientific ideas, but with a limited amount of time and money?

Next Generation Science Standards

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, evaluating, and communicating information Analyzing and interpreting data Engaging in argument from evidence	ESS3.C: Human impacts on Earth systems (major effects of humans and how individuals and communities are doing things to help protect Earth's environments)	Systems and system models Patterns

Common Core State Standards

ELA-LITERACY.RI. 3.4, 4.4, and.5.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3, 4, or 5 topic or subject area.

ELA-LITERACY.SL.3.1, 4.1, and 5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3, 4, or 5 topics and texts, building on others' ideas and expressing their own clearly.

Time
60 minutes

Materials
- Student worksheets
- Slide deck
- Gray Vireo Natural History page (one per pair of students)
- 20 habitat mats (10 of Habitat 1 and 10 of Habitat 2)
- 10 three-inch straws
- 10 packs of Recovery Plan Strategies (10 strategies)

Preparation
1. Prepare slide deck to be ready to show to students.
2. Prepare habitat mats to hand out to groups of students (each group gets one Habitat 1 mat, one Habitat 2 mat, and one straw).
3. Hand out the worksheets at the start of the lesson.

Procedures

1. Introduction (5 minutes)

A. Slide 1: Introduce students to the lesson. They are going to play the role of scientists working for the New Mexico Department of Game and Fish. Their job is to gather information and make a plan to conserve the Gray Vireo in New Mexico.

B. Slide 2: Show students a photo of the Gray Vireo and its distribution map. Gray Vireos migrate to New Mexico in the spring during their mating season. Click forward to play the calls of the Gray Vireo.

C. Slide 3: Conservation of the Gray Vireo
- The Gray Vireo was listed as threatened by the NM Department of Game and Fish in 1983 (source: Gray Vireo Recovery Plan, 2007).
- It is also on the list of Species of Greatest Conservation Need.
- The NM Department of Game and Fish is required to develop recovery plans for all threatened and endangered species.
- There are four steps scientists use to protect species. We will model these steps today.

2. Step 1: Count the Gray Vireos (15 minutes)

A. Explain that the first thing we need to do is count the number of Gray Vireos in two different areas.

B. Slide 4: As scientists, we can count birds using **transect lines**. We walk along a straight line in Gray Vireo habitat and count the number of birds we see or hear. Explain the full procedure listed on the slide.

C. Slide 5: We are using a model today to represent Gray Vireo counts along transects. We are going to pretend that we have ten groups of scientists, and each group will monitor Gray Vireo populations in two locations, one in Habitat 1 and one in Habitat 2. We will combine

our information when we return from doing our surveys. Show students the model ecosystems and briefly explain how to do the counts (click forward for the animation).

- Find the **Step 1: Count the Gray Vireos** section on your worksheet.
- Each mat represents a habitat where you are searching for Gray Vireos.
- Note the group number printed at the top of the mat and show students where to record this on the worksheet in question 1. Click forward to show an example.
- Have one student stand up and look down at the tray.
- Pick up the straw. Line up the middle of the straw with the transect line in the Habitat 1 tray.
- One student moves the straw along the transect line, keeping the middle of the straw over the blue line.
- Count the number of Gray Vireos under the straw, on both sides of the line. Use the key to determine the species you detect. Remember, you are only counting Gray Vireos today.
- In the model, you can only see or hear Gray Vireos that are under the straw. Note that there are other Gray Vireos in some of the habitats, but we can't see them or hear them because they are too far away.
- Record the number of Gray Vireos on the Habitat 1 line on your worksheet.
- Repeat steps above for Habitat 2 tray and record this number on the Habitat 2 line on your worksheet.
- Have students look at the habitat mats and answer question 4 on their worksheets.

D. Slide 6: Leave this slide up while students are doing the count. Remind students to complete #1-4 on their worksheets. We will do the Class Monitoring Table together when everyone is done.

E. Slide 7: After all groups are done with their counts, collect each group's data and record it on a Class Data Table. Have students fill out the Class Data Table on their worksheets.

F. Why do students think there were more Gray Vireos in one of the habitats? Do they notice anything that is different about the two systems? We need to do some research to figure out why there are different numbers of Gray Vireos in these habitats.

3. Step 2: Learn What Scientists Already Know about Gray Vireos (10 minutes)

A. Slide 8: Now that we know about the number of Gray Vireos in different habitats, we need to collect more information on the species' needs so we can make a recovery plan. Gray Vireos are found mostly in woodlands with juniper trees and oak trees.

B. Hand out the Natural History of the Gray Vireo pages.

C. Slide 9: Explain that students will answer questions #5 - #8 on their worksheet using the information on the Gray Vireo Natural History page. **Give students approximately 8 minutes to work and then go over their answers.** Ask students to identify where they found the information for each question.

D. Slide 10: Explain Cowbird parasitism and show the photos.

- Brown-headed Cowbirds are nest parasites.
- They lay their eggs in other birds' nests.
- The other birds feed and raise the Cowbird chick, leaving less food for their own chicks.

4. **Step 3: Create a Gray Vireo Recovery Plan** (15 minutes)
   A. Slide 11: Now that we know about the natural history of the Gray Vireo and have counted how many there are in different parts of southern New Mexico, we are now ready to create a Gray Vireo Recovery Plan. The goal is to make sure that gray vireos survive in New Mexico.
      - There are many possible **strategies**.
      - But you and other scientists don't have the time and money to do them all. This is called a **constraint**.
      - Your job is to choose strategies that you think will work best.
   B. Slide 12: There are at least 10 different strategies that might go into the plan.
      - Briefly explain each strategy and show students that they have a card for each one. They can use the cards to sort into piles of the ones they want in their recovery plan and the ones they will skip.
      - The point values are roughly scaled to match the time and money it would take to implement each strategy.
      - You have 50 points for all of your recovery efforts. You can choose the group of strategies you think would be most effective, as long as your total number of points does not exceed 50.
   C. Hand out the strategy cards.
   D. Slide 13: Ask students to work with their group to choose the strategies for the plan.
      - Use the cards to plan which strategies will go in your plan. Remember, there is a limit on how much time and money you can spend. You can use 50 points.
      - Once you have chosen the strategies, fill out the table on your worksheet. Show the Sample Recovery Plan to illustrate how to mark their choices and add up their points on their worksheets.
      - **Give students 8 minutes** to discuss and decide on their strategies and fill out worksheet question 9. Tell them that the points expire at the end of the time, so they need to work efficiently to come up with their plan.

5. **Step 4: Compare Your Recovery Plan with Others** (10 minutes)
   A. Slide 14: Have students share their recovery plans briefly.
      - One option is to go through each strategy and ask how many groups included that strategy in their plan.
   B. Slide 15: Reveal that the "Sample Recovery Plan" is actually the plan developed by the New Mexico Game and Fish. Ask students to compare their plan to this plan.
   C. Slide 16: Ask students to fill out questions 10 and 11 on their worksheet.
      - Click forward to show how to mark an X to the left of strategy found in both the students' recovery plan and the New Mexico Department of Game and Fish Recovery Plan.
      - After they have chosen one strategy, they will explain why they think this strategy was in both plans.
   D. Slide 17: Show this slide while students work on questions 10 and 11 on their worksheets.
   E. Slide 18: How would we know if our plan worked? What would we look for after one year, five years, ten years? Click forward to reveal that a successful plan would meet our goal of making sure Gray Vireos continue to survive in New Mexico. Thank students for their hard work on behalf of the Gray Vireo!