5 WILDLIFE CROSSING DESIGN CHALLENGE

ESTIMATED TOTAL TIME
100 minutes

- **Grades 6–8 Life Science**
- **Engineering and Geography Connections**

In this activity, students use the engineering design process to develop wildlife crossings that reduce the limitations animals face in fragmented landscapes. First, students analyze the capabilities of selected animal species and predict challenges in moving across fragmented landscapes. Then students design a wildlife crossing, such as a bridge or pathway, to connect habitat areas. Finally, students present their work, provide feedback to others, and revise their designs.

KEY TERMS

- **biodiversity**
- **constraint**
- **criteria**
- **fragmented landscape**
- **wildlife corridor**
- **wildlife crossing**

See the glossary on page 44 for definitions.

BACKGROUND

Across the world, human development has led to the fragmentation of many wilderness areas. Highways, towns, and cities make it difficult for wild animals to safely travel between habitat areas. Networks of protected lands that provide routes from one area of habitat to another—known as **wildlife corridors**—are one solution to this problem. The Florida Wildlife Corridor is an example of a statewide corridor. It is made up of 18 million acres of land that animals can use to travel across the state.

Within wildlife corridors, there are often human-made structures called **wildlife crossings**. They can include highway overpasses or underpasses, tunnels, viaducts, and canopy bridges. These crossings help animals safely travel across a specific barrier, such as a highway, as they move from one habitat area in a corridor to the next.

Wildlife corridors and crossings help to maintain and enhance **biodiversity** by increasing the space animals have to travel and to use as territories. By providing continuous pathways between **fragmented landscapes**, corridors and crossings offer animals the opportunity to access food and water, suitable habitats, and safe migration routes, ultimately supporting the overall population health of many species. Landscape connectivity can also help animals avoid potentially dangerous interactions with humans, as well as decrease genetic isolation by enabling animals to find mates from other areas.

WILDLIFE CROSSING DESIGN CHALLENGE

OBJECTIVES

Students will:

- analyze the capabilities and habits of a wild animal;
- predict challenges the species may face when moving across a human-dominated landscape; and
- design a model of a wildlife crossing or pathway to assist the animal in avoiding a human-made obstruction or threat.

PREPARATION

Gather and/or print materials:

- Video: Tis the season as Christmas Island crabs mass to cross bridge (1:14)
- Handout: Animal Profile Cards (1 per small group)
- Handout: Wildlife Crossing Design Challenge (1 per small group)
- Slide: Engineering Design Process graphic
- Blank paper
- Craft materials for model-building (e.g., popsicle sticks, cardboard, tin foil)
- Sticky notes

Set up technology:

Ideally, the video and graphic will be displayed for the whole class to view.

Additional preparation:

- Read this blog post for more background information about land development and habitat loss.
- Review the engineering design process.
- Print Animal Profile Cards, or use a similar format to create your own cards for local species of interest.
- Preview the Wildlife Crossing Design Challenge handout and make modifications based on time and the needs of your students.

STANDARDS

This activity addresses the following:

NGSS: MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing human impacts on the environment.

NGSS: MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Florida NGSS: SC8.N.1.6: Understand that scientific investigations involve the collection of relevant empirical evidence, using logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations, and models to make sense of the collected evidence.

PART 1: 50 MIN

10 MIN **INTRODUCE THE TASK**

1. Have students close their eyes and imagine being a pedestrian or bicyclist in a busy city. Then ask: *What would you need to cross a busy intersection? To cross a busy highway?* Discuss students' ideas on how they think roads and highways impact many communities in the United States. Ask: *What structures allow humans to cross a highway safely?* Have volunteers share their ideas. Then explain that highways are human-made pathways that help people travel within a state or even across the United States. Although they are beneficial, they can also divide communities and make it difficult for pedestrians to cross. To help people safely cross highways, communities often build safe ways for people to cross. They often do the same to support wildlife.
2. Introduce the concept with a video of how people designed a safe pathway for the Christmas crab. Preview the following questions to keep in mind as students view the video "Tis the season as Christmas Island crabs mass to cross bridge":
   - What strategies are used to assist the crabs' migration?
   - What are the pros and cons of each strategy?
3. Watch the video (1:14) and discuss as a class what students learned. Explain that their challenge will be to design a crossing or pathway to help a particular species avoid human-made barriers and the dangers they often present.

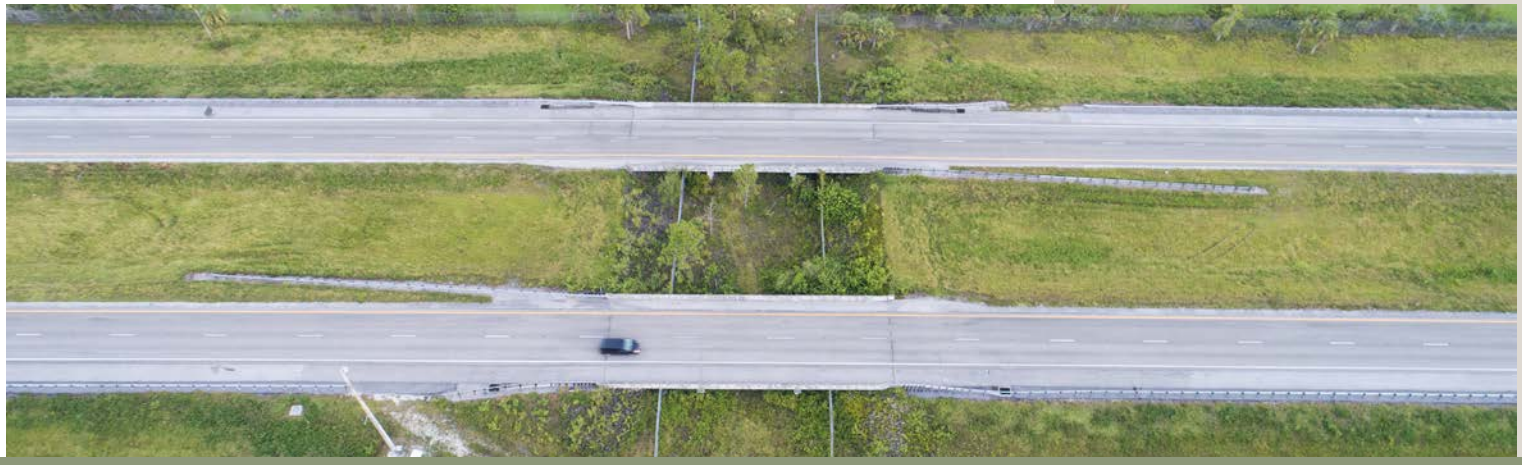
40 MIN **DESIGN CHALLENGE**

4. Divide the class into small groups of 2–4 students and assign an Animal Profile Card to each group.
5. Distribute the Wildlife Crossing Design Challenge handout and read aloud the quote and challenge description in Step 1. As you read, have students circle any keywords or phrases that catch their attention.
6. Next, project for the class the Engineering Design Process graphic and expand on each step.
   - **Ask:** Define the problem. What needs to be solved? Explain to students that they may need to conduct some **Research** to understand the problem fully.
   - **Imagine:** Brainstorm potential solutions.
   - **Plan:** Decide how the solution will work. For example, draw a prototype and label its components.
   - **Create:** Build a model of the solution.
   - **Test:** Explain to students that, typically, the next step would be to test the designs. In this case, because they are models, the next step will be to present them to peers for feedback instead.
   - **Improve:** Revise the design based on peer feedback. Repeat the cycle as needed.
7. Return to the Wildlife Crossing Design Challenge handout and review the "Criteria" and "Constraints" sections. Remind students of the following definitions:
   - **Criteria:** Rules or directions that must be followed; requirements that must be met
   - **Constraints:** Restrictions or limitations
   - **Optional:** If students need more context or find developing ideas challenging, show this video (2:54) about wildlife bridges for inspiration.
8. Provide students with ample time to complete Steps 2–4 in the handout (approximately 40 minutes total). Inform students that they will present the model and the answers to the questions from the Wildlife Crossing Design Challenge handout to their peers.

TIP: Manage the time for each step, and monitor and support each group throughout the process as needed. But do not provide too much guidance. This is a critical thinking activity that requires students to use their imaginations. Allow students to be as creative as they can be within the time. Steer students away from ideas that do not factor in the given constraints.

MORE TO EXPLORE

REVISE THE 3-D MODEL
In class or at home, give students the opportunity to continue the engineering design process by improving their model. Consider contacting an engineering firm or university department that could provide an expert to speak to students about their work and provide feedback on students' designs and/or models.



PART 2: 50 MIN

25 MIN **GROUP PRESENTATIONS**

1. Have students regroup in their small groups, set up their models, and prepare for their presentations. Explain the process:
   - Distribute sticky notes to each student (2 sticky notes x the number of groups presenting).
   - Provide each small group with 3 minutes to present their model and answers from Step 4 in the handout.
   - After each presentation, allow time for the other students to ask questions about the design and the rationale used.
   - Give 1 silent minute for students to provide feedback on a sticky note (2 per presentation):
     - ► one good thing (glow)
     - ► one question or critique (grow)
   - Have one student collect the sticky notes from the class and give them to the group who presented.

15 MIN **DISCUSS AS A GROUP AND REVISE BASED ON FEEDBACK**

2. Have students revisit their Wildlife Crossing Design Challenge handout to complete Step 5. Ask each group to read the feedback on their sticky notes and write a summary of the feedback they received on the handout.
3. Have small groups determine what revisions are needed to their prototype and why. Have them record ideas on the Wildlife Crossing Design Challenge handout and revise their labeled drawing to reflect their agreed-upon ideas.
4. Ask each group to share changes they decided to make and why in a whole class discussion.

10 MIN **REFLECT**

5. Have students reflect verbally or in writing (on blank paper) using the following reflection prompts:
   - Could any design created by the class help more than one species of wild animal? If so, which other animals might also benefit from that design?
   - You may have noticed some designs can be used for multiple species. Which design should local or state governments invest in to get the most impact and why? (e.g., cost-effective; serves the most organisms)
   - How can humans design structures to coexist with wildlife?
   - Why are animal crossings needed?

MORE TO EXPLORE

CONDUCT A DEBATE
Have students debate for and against building wildlife crossings and wildlife corridors. Students can then discuss arguments that could be used to persuade policy makers to support wildlife crossing projects.