

Designing a Wolverine Live Trap

The first and crucial step to animal conservation, which includes protection and restoration, is gathering data or more information about the key species we are trying to help. Researchers go out into the field to observe animals in their habitat and to gather data about their behaviors, diets, and other pertinent information that will help solve the conservation problem at hand. Due to the elusive nature of wolverines and their wide habitat range, there has been limited research available. There is no doubt that wolverine populations were pushed out of their historical range in the early to mid-1900s, but we need to know more about how they are doing today. In other words, how is this impacting populations of other animals and resources within the region?

As mentioned in the video [Wolverines!](#), there are many ways field scientists collect wolverine data to better understand their behaviors and needs. Through methods like tracking, observing dens, and analyzing fecal matter, scientists are able to learn more about their typical behaviors and adaptations that help them to survive in their environment. Another important method is live trapping and collaring. Live trapping allows scientists to collect data such as weight, sex, height and length while allowing blood samples to be taken for DNA analysis. It also gives scientists the opportunity to collar wolverines so that they can track the movement of these individuals throughout the region. All these methods are made possible and accessible through the use of technology. Therefore, engineering is another valuable asset to data collection.

In this activity, students will engage in the engineering process and design a wolverine trap that will help scientists safely obtain and collar wolverines out in the field. Since typically wolverines live in remote, harsh conditions and are powerful creatures, it is important to consider durability when designing the live trap and be prepared to deal with unexpected challenges.

Objectives:

Students will be able to:

- Plan and design a model trap to hold a mini model of an individual wolverine safely.
 - Identify and investigate the problem and imagine a solution.
- Address unexpected challenges and revise their designs.
- Communicate to peers and improve their designs.

Materials:

- Design Journal
 - [PDF version](#)
 - [Editable version](#)



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Process:

1. To begin the activity, students will watch the [Designing a Wolverine Live Trap](#) video introducing wolverine conservation and data collection.
2. After watching the video, tell students they are part of the WCS wolverines team and are in charge of engineering or building technology to help field researchers collect data. They were assigned to create a mini model of a trap to safely hold an individual wolverine so that the field researchers can obtain a blood sample, measure, weigh and collar it.
3. Do an informal assessment of students' prior knowledge about technology and engineering by having them participate in a group brainstorm using the following prompts:
 - What is technology? What are some examples?
 - What is engineering? In other words, what does it mean to "engineer" something?

Once finished, students will do a gallery walk and review each other's brainstorming results. Next, have a class discussion about what the students noticed - similarities, differences, patterns, wonderings or insights. As a class, establish working definitions for "technology" and "engineering." Then provide the following definitions:

- Technology - is anything humans create to solve a problem.
- Engineering - is using creativity and knowledge of math and science to design technology that solves problems.

Teacher Note: For in-person learning, consider having students create a brainstorm web on chart paper or chalkboard and then have a class discussion. For remote learning, use an interactive online whiteboard (e.g., Zoom whiteboard feature, Jamboard, and Mentimeter) conducive for collaborative work that will show students' responses in real time.

4. Reiterate that students will primarily be focused on the design aspect of the engineering process for this activity. To help guide them, provide the [Design Journal](#) and inform students that they will be complete parts of the journal throughout this activity. Remind students that after finishing a section (Parts I-V) in their journal, they should wait for further instructions from the teacher before moving on.

Review the following vocabulary and answer any questions for clarifications:

- Design Process - steps engineers take to create technologies that solve problems. In other words, it is a problem-solving process.
- Criteria - things that your design needs to do.
- Constraints - ways that your design is limited.

Refer students to **PART I** (p.1) of the Design Journal and review the challenge details. Then students will work on their designs (30-45 minutes).

5. After 30 minutes have passed, cue students to complete the check-in section of **PART II** (p. 3) in the Design Journal. Regroup and have students share their responses. Reiterate that asking questions is part of figuring out the solution and thus informs the design plan.
6. Tell students that things don't always go as planned and so we must approach unexpected challenges with an open, creative mind. Although engineers carefully plan and design in detail, they often face new challenges along the way and so revise accordingly, sometimes multiple times. Therefore, the best solution is the one that has persevered, endured failures, and been improved. Reiterate that this is a very important and necessary step in the design process.

Keeping that in mind, each group will receive a unique curveball scenario (refer to the Design Journal, **Part III**, for more details) and will return to their designs to make appropriate revisions.

Refer students to **PART III** (p. 3) of their Design Journal. In a different color, they will make revisions to their design on p. 2.

Teacher Note: If applicable, this is a good opportunity to talk about failure in science and reiterate that making mistakes is normal. It is important to see mistakes as opportunities for improvement rather than dead ends.

7. After groups have made their revisions, they will present their designs in small breakout groups. Before doing so, be sure to establish group agreements or ground rules and norm feedback language that is conducive to a collaborative, respectful, and nonjudgmental learning environment. To promote accountability, have students create their own group agreements and brainstorm ways to remind themselves and one another. Then focus on or highlight a few to set the tone. Do this moving forward whenever students share their work with one another.

Students will be presenting in small breakout groups. The times included are suggestions so feel free to adjust as you see fit. Refer students to **PART IV** (p. 4) of their Design Journal.

In breakout groups (2 presenters)

- Step 1: Group A presents.
- Step 2: Group B gives feedback.
- Step 3: Switch! Group B presents and repeat Steps #1-2.

8. Direct students to **PART V** (p. 4) of the Design Journal for a final reflection and debrief of the challenge. Provide students with an opportunity to share their responses.

Teacher Note: Feel free to get creative with how students share. For example, have them stand in two lines facing one another so that each person is paired with another. For each reflection prompt, have students share with a different person. You can do this by having one line shift down so that students have a new partner. (You can also do this by having students stand in concentric circles instead of lines.) This way, it makes sharing more interactive and engaging for for students while strengthening classroom community.

10. To close this learning experience, have students think about their journey throughout the design challenge. They will select a picture that best represents their feelings/thoughts in response to the following prompt: How are you feeling now about your design challenge experience?

In small breakout groups, students will share their experiences. Next, regroup as a whole class and ask for volunteers to share any common themes or interesting topics they discussed while in their small breakout groups.

Remind students that a strong conservation team includes diverse members, i.e., individuals who bring specific and unique expertise, skills, and experiences into the approach, planning, and execution of conservation research and efforts. Without technology, field researchers would find obtaining wolverine data in the wild a much more difficult task. Thus, learning how to assess and solve engineering problems involved in building a durable wolverine live trap is a valuable and essential skill to have to successfully conduct research of wolverines' behaviors and movement throughout their natural habitat.

Extension Activities:

- Additional Ideas for the Design Challenge
 - To make it more challenging, consider limiting the amount of each item included in the materials list. For example, 2 plastic cups, 24 inches of tape, or 2 pieces of paper (8.5 x 11 inches).
 - If you would like to add a math component to the challenge, consider assigning prices to each item and provide students with an overall materials budget that they can spend. Furthermore, to include a physics component, consider adding the criterion: Model must be able to have some kind of trigger to automatically close the trap.
- Engineering and Testing Models
 - If you would like your students to take their design to the next level, have them engineer their designs using the listed materials. If students do not have access to the listed materials, consider having them build with materials they have at home. Then, as a class, think of ways to test the model's durability, windproofing and waterproofing, by simulating extreme weather conditions.
 - To add another challenge, have students brainstorm materials they would actually use to build a life-size wolverine live trap.

References:

Engineering is Elementary (EiE) Team developed by the Museum of Science, Boston (2014, 2016).
It's in the Bag: Engineering Bioinspired Gear. Engineering Everywhere. eiestore.com/bioinspired-gear-unit.html.

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