## **Station 3: Sound Trap Alert**

**NGSS: MS-PS2-3 & MS-PS3-2** – Investigate forces and energy in circuits  
**Goal**: Build a buzzer-based alarm triggered by pressure!

### Materials:

 1 Buzzer

 1 Battery + holder

 2 foil squares or strips

 Sponge or soft cardboard piece

 Tape

 Jungle-themed “leaf” cover paper (or green paper)

### **Student Directions:**

**Step 1: Build the Pressure Plate**

* Place the **sponge** between the two **foil pieces** like a sandwich.
* Tape it so the foil is on the top and bottom—**not touching each other** unless pressed.

**Step 2: Connect the Circuit**

* Connect one foil piece to the **positive side** of the battery holder.
* Connect the other foil piece to **one terminal of the buzzer**.
* Complete the circuit by connecting the buzzer’s other terminal back to the battery's negative side.
* Test it! Push gently on the sponge—**does the buzzer sound?**

**Step 3: Disguise It Like a Jungle Pro**

* Place jungle “leaf” paper over your pressure plate.
* Try placing it under a path or entry point.
* Now **test it** by stepping, tapping, or pressing your trap.

**Test & Record:**

| **Test Action** | **What You Did** | **What Happened?** |
| --- | --- | --- |
| Light Press | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Firm Step | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Jump On It | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Cover with Leaves | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Reflection Questions:**

* **How does the circuit close and send energy to the buzzer?**  
  → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **What type of force activates the trap?**  
  → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **How could you make your trap more sensitive or louder?**  
  → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Bonus Challenge:**

Can you add a **second buzzer** or a **blinking light** to your trap? Defend your jungle base with style and science!

Would you like a printable worksheet version of this next?

**Test & Record:**

* What happens when pressure is applied?
* How sensitive is your trap?

**Reflection:**  
→ How does the circuit close and send energy to the buzzer?  
→ What type of force causes this?

📍 **Station 3: Sound Trap Alert**  
**NGSS: MS-PS2-3 & MS-PS3-2** – Investigate forces and energy transfer in circuits

### ✅ **ITEEA STEL Standards – Middle School**

**STEL 1B** – Technological systems help meet individual and community needs.  
→ Students design a pressure-sensitive sound trap system to alert or protect—a direct application of technology for safety.

**STEL 2B** – Design decisions consider performance, safety, and usability.  
→ The activity challenges students to make the alarm more sensitive and louder while keeping it reliable and safe to use.

**STEL 3B** – The interaction of system parts influences function.  
→ The buzzer, pressure plate, foil conductors, and battery work together in a simple closed-loop system.

**STEL 4B** – Understanding inputs, processes, and outputs helps students model systems.  
→ Students explore how the input force (step/pressure) completes the circuit (process) and activates the buzzer (output).

**STEL 5B** – Design involves creativity, testing, and iteration.  
→ Students improve their trap’s design through experimentation with placement, pressure sensitivity, and output sound.

**STEL 7B** – Design involves problem-solving with constraints.  
→ Students explore how to build an effective trap using limited materials while enhancing reliability and responsiveness.

**STEL 8B** – The materials used affect a system’s efficiency and outcome.  
→ Choices in sponge density, foil connection, and tape placement directly affect the trap’s performance.

### ✅ **Common Core Math Standards – Middle School**

**CCSS.MATH.CONTENT.6.SP.B.4–5** – Display and summarize numerical data in context.  
→ Students organize test data on the trap’s performance under different forces (light press, jump, etc.) and analyze patterns.

**CCSS.MATH.CONTENT.7.RP.A.2** – Analyze proportional relationships.  
→ As students compare force (pressure applied) and resulting buzzer behavior (volume, sensitivity), they consider proportionality.

**CCSS.MATH.PRACTICE.MP2** – Reason abstractly and quantitatively.  
→ Students evaluate how varying amounts of pressure correlate with circuit activation and sound output.

**CCSS.MATH.PRACTICE.MP4** – Model with mathematics.  
→ Students model circuit behavior with variables such as pressure force, foil contact area, and circuit closure time.

**CCSS.MATH.PRACTICE.MP5** – Use appropriate tools strategically.  
→ Strategic use of materials (tape, foil, sponge) to design a functioning, efficient pressure circuit.

**CCSS.MATH.PRACTICE.MP7** – Look for and make use of structure.  
→ Students understand how circuit design structure affects flow of energy and system response.

### ✅ Summary

The **Sound Trap Alert** activity supports NGSS physical science standards on **forces and energy transfer**, while fostering hands-on engineering design via **ITEEA STEL**. It also integrates **math standards** through **data collection, modeling, and systems thinking**, helping students build a functional, responsive alert system with real-world safety applications.