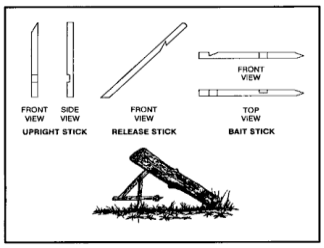
{FM5.1; FM5.2; FM5.3; Forces & Simple Machines }



Deadfall Trap Physics

Deadfall traps are a traditional way to kill large animals, like Bears, in Saskatchewan. They are also a very effective way to catch animals that move quickly over fallen logs, including pine marten. This traditional technology was widely used in Northern Saskatchewan, and this method was learned by Barry Linklater from his uncle Gordon Linklater, an elder in Pelican Narrows who grew up following a traditional lifestyle on a trap line. The deadfall trap is a 'quick, humane kill' only when it is designed just right. Bait is positioned so that an animal that comes and takes it will destabilize the trap, and be crushed or trapped.

Along with teaching Barry how to build and use a deadfall trap, his uncle shared teachings about how to choose a trap for your purposes and how to use them with respect. 'Only take what's needed, don't' be greedy or take more than you need.' The trap consists of 3 sticks notched together in a particular way to form the trigger apparatus, and a heavy log or board which falls on the animal, delivering a blow referred to as an 'impact force'. Oral history suggests that as a rule of thumb, the weight of the board should be three times the weight of the animal to be caught. To kill a bear, the 'board' would be a large, heavy log. To trap a smaller animal the 'board' could be a much lighter. In this activity, you will explore the relationship between the weight of the board and the 'impact force' which a deadfall trap can deliver.

RELATED MEDIA: Video and ppt. by ITEP student Barry Linklater – 'Deadfall Trap Physics';
Senior Physics Lesson *(Grade 12 Conservation of Energy Lab, with worksheet & assessment guidelines)*

Materials (needed for each group of 2-3 students)

- Graph paper
- Pencils
- Deadfall trap trigger system (3 small sticks with particular notches; see video)
- 3 Boards the same size, with different weight (suggested: Styrofoam, cedar or pine, maple or oak)
- A scale to measure the weight of each board
- Play-dough
- Meter stick or measuring tape
- String
- Tape

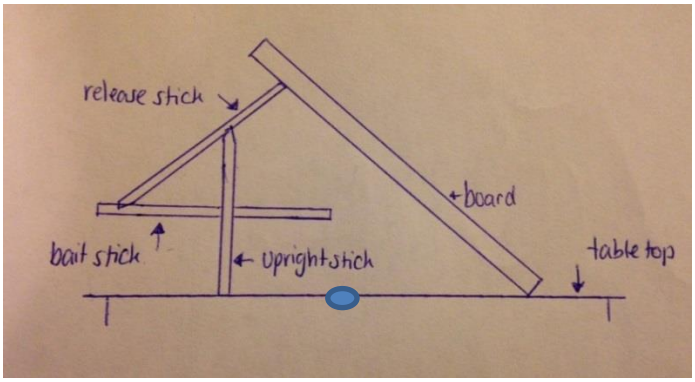
Activity part 1: 'Gravity and balance' (10 min)

- After watching the video 'Deadfall Trap Physics' discuss how gravity stabilizes structures
- Gravitational stabilization is used in architecture, civic planning, and has many other uses
- On your graph paper, draw a deadfall trap to scale and use arrows to show what forces are pulling on, and stabilizing the deadfall trap

{FM5.1; FM5.2; FM5.3; Forces & Simple Machines }

- How does each force respond when the release / bait stick is moved?

Set up:



Activity part 2: 'A Deadfall Trap' (20 min)

- Can you build a Deadfall Trap?
- Depending on your group, you may want to let them figure it out for themselves, or provide step-by-step directions. Depending again on the abilities of your class, and time limits, you can have them notch wooden dowels to create the sticks, or can prepare these in advance. Your students may have an easier time if they are working on carpet or rubber mats to provide some stability to the end of the upright stick and board.
- Barry shares that a deadfall trap must be 3 times the weight of the animal being crushed in order to make a clean, humane kill. A bear weights 300-400 lbs. and a deadfall trap must be 3 x the weight of the animal being killed. How heavy would it have to be? Building one in the woods is definitely a job requiring teamwork. How might trappers have lifted the Deadfall log?

Activity part 3: 'Weight' and impact force (30 min)

- It is not only the weight, or mass, of the board that is related to the impact force that kills the animal in a Deadfall trap. It is also the force of gravity pulling on that mass. This creates a force called the 'impact force' that translates moving, or kinetic, energy into a measurable physical change in the impact being crushed. In the language of physics, this change is called 'work'. In this activity, you will measure the work performed on a 'trapped object' by Deadfall logs of varying weight
- Use the scale to determine the weight of each of the three boards and record these values in your table (be sure to note the unit of measurement, lbs. or grams). Example data table:

Board	Weight	Play-dough diameter	Play-dough Height	final height	Change in Height	Notes
Light 1						
Light 2						
Medium 1						
Medium 2						
Heavy 1						
Heavy 2						

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Activity continued…

- Tie the string around the free end of the bait stick
- Set up the deadfall trap as shown above using one of the boards, and mark the blue spot on the table with a small piece of tape
- Shape a piece of play-dough into a cylinder about 4 cm in diameter and 10 cm in length, measure it's exact height and record this in your data table
- Place the play-dough cylinder on the tape beneath the trap (be careful!)
- Trip the bait stick by pulling the string
- Carefully retrieve the play dough and measure its new 'squashed' height, record this in the data table
- Repeat a second trial
- Repeat steps 3-7 using the other two boards, do two trials each
- Now you have a dataset!
- Use your graph paper to compare the weight of the board to the change in the height of your play-dough cylinder
- What does your data tell you about how to use a Deadfall trap?

As a Class Discuss: *What other ways could you adjust a Deadfall trap to increase the impact force?*

As a Class Discuss: *How would a Deadfall trap compare to a leg-hold trap in terms of effectiveness, humanness, and environmental footprint?*