Family edition

Landslide Lab: Why Did the Hill Let Go?

Ages 11-14 · about 45 minutes, in one sitting

Your child rains on a forested hillside in Landslide Lab, watches the water rise inside the soil, and finds out why one part of the hill slides when the rest holds. Then they change the hill and see what happens.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/landslidelab?lesson=why-did-the-hill-let-go&ref=fam-landslidelab-1. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/landslidelab?lesson=why-did-the-hill-let-go&ref=fam-landslidelab-1. A short guide opens over the app. A forested hill rises above a road and a row of houses, seen from the valley floor. The side cut in the corner is a slice through the hill.

1. **The ordinary storm.** Press `Rain`. The blue layer in the side cut rises from the rock up. The hill holds: at its weakest place the grip is 1.38 times the pull.
2. **The colors.** After the first storm the hill takes colors: green holds easily, yellow barely holds, red would slide. `Stability` turns them off and on.
3. **The big storm.** Pick `Big storm` and press `Rain`. The hollow turns yellow: 1.04.
4. **Clear the hollow.** Press `Clear the trees on the hollow`, then `Rain`. Four slides run. The biggest falls 170 m, runs 350 m, crosses the road and reaches a house.
5. **Cut the road.** Press `Undo`, then `Cut the road deeper`, and `Rain`. The steep bank above the road slumps onto it in short slides, and the hollow holds.

> The moment that lands is the hollow. Children expect the steepest place to slide. The hollow slides because it is the wettest, and the colors show it before anything moves.

The ideas, in plain words

A slope holds while the grip of its soil is bigger than the pull of its weight down the slope. The grip comes from grains rubbing on each other, a little stickiness, and roots. The pull grows as the slope gets steeper. The ratio of grip to pull is the factor of safety: above 1 it holds, below 1 it slides.

Rain that soaks in drains downhill through the soil and gathers in hollows. Water filling the spaces between the grains pushes them apart, so they press on each other less and grip less. That is why a hollow full of water slides

before a steeper, drier slope beside it. Roots tie the soil together and to the rock; after logging they rot over a few years and that grip is gone. A road cut takes away the soil at the bottom of a slope that held up the soil above it.

Common mistakes: thinking the water makes the soil slippery like oil; thinking only the steepest slopes slide; and thinking trees hold a hill up like a wall. The app is a model of a made-up hill and mountain. It is not a tool for judging a real slope.

Do it together

1. Open mytekdev.com/try/landslidelab?lesson=why-did-the-hill-let-go&ref=fam-landslidelab-1 together. A short guide opens over the app. Press `Rain` and watch the side cut in the corner.

   > **You'll know it worked when:** The blue layer rises in the soil, and the hill holds.

2. Pick `Big storm` and press `Rain`. Ask: why is the hollow yellow when the same rain fell everywhere?

   > **If you get stuck:** Water that soaks in drains downhill through the soil and gathers in the hollow.
   >
   > **You'll know it worked when:** The hollow turns yellow, barely holding.

3. Press `Clear the trees on the hollow`, then `Rain`.

   > **You'll know it worked when:** The hollow slides across the road. The card says how far it fell and ran.

4. Press `Undo`, then `Cut the road deeper`, and `Rain` again. Ask: what did each change take away from the slope?

   > **If you get stuck:** Clearing took the roots; cutting took the soil holding up the slope from below.
   >
   > **You'll know it worked when:** The bank above the road slumps, and the hollow holds.

Talk about it

Ask these while you work together. A child who has understood it can answer them without help:

- Point to the water in the side cut. Where did it come from?
- Why is the hollow yellow when the slope beside it is green?
- Which arrow got smaller in the big storm, the pull or the grip?
- What did clearing the trees take away?
- What did cutting the road take away?

> The third question is the real test: the water changes the grip, not the pull. A child who says so has the idea.

For younger and older kids

Younger: For a younger child, pick Grades 2 to 5 in the level menu and stop after the cleared hollow slides.

Older: For a teenager, pick High school and read the grip and the pull in kilopascals in the side cut.

Keep going

- Switch the level to high school and read the grip and the pull in kilopascals in the side cut.
- Find the smallest change to the hill that makes the ordinary storm bring it down.
- Plant trees on the cleared hollow and run the big storm: explain why the young trees do not hold it yet.

Bring it into other subjects

- Math: the biggest slide moved 39,184 cubic meters of soil. A dump truck carries about 10. How many trucks is that, and how long would it take to clear the road at one truck every ten minutes?
- Social studies: read a news report of a landslide that closed a road after heavy rain, and find the trigger and the human changes it names.
- English: write the county's warning to the people in the houses below the hollow, in five sentences.
- Engineering: sketch one way to protect the road from the cut bank, and say what it would change in the balance.

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Landslide Lab: Why Did the Hill Let Go?
SUBJECTS	Earth science
TIME	45 minutes
WHAT WE DID	Modeled rain soaking into a forested hillside, found why the hollow came closest to sliding, and compared how clearing trees and cutting a road changed the slope.
SKILLS PRACTICED	Slope stability; Water in soil; Human effects on landslides

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/landslidelab?lesson=why-did-the-hill-let-go

Essential question: The same rain falls on the whole hill. Why does one part of it slide?

Warm-up: Which part of a forested hill slides first in heavy rain, and why? _____

1. **Vocabulary.** Landslide, hollow, water table, grip, pull: write each in your own words.

2. **The storm table.** For each run: what you changed _____; the storm _____; held or slid _____; how far the biggest slide ran _____; did it reach a house? ____. One run on each line.

1. The hollow is not the steepest place on the hill. Why did it come closest to sliding?

2. Clearing the trees and cutting the road both made slides. What did each change take away from the slope?

Quick check

Name: _____

1. Water in the soil makes a slope weaker because it (A) makes the soil slippery like oil (B) pushes the grains apart, so they grip less (C) makes the soil lighter

2. After the trees on a slope are logged, the slope is weakest (A) the same day (B) a few years later, when the roots have rotted (C) never, because the stumps stay

3. The same storm falls on a whole hill and only the hollow slides. Explain why.

Answers

QUESTION	ANSWER	WHY
1	B	Water between the grains pushes them apart, so they press on each other less. It does not oil them.
2	B	Roots keep their grip for a while after the trees are cut, then rot. The app takes that time as passed.
3	Water gathers in the hollow	Rain soaks in and drains downhill through the soil into the hollow, so it fills with water first and grips least. Naming the water alone is half.

If your state or umbrella school asks, this lesson covers NGSS MS-ESS3-2, NGSS MS-ESS2-2.

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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