Family edition

Watershed Lab: Forest or Parking Lot?

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

Your child rains the same storm on a forest valley and then on the same valley with a town built on it, in Watershed Lab, and finds out why the creek below the town rises higher.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/watershedlab?lesson=forest-or-parking-lot&ref=fam-watershedlab-2. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/watershedlab?lesson=forest-or-parking-lot&ref=fam-watershedlab-2. A short guide opens over the app, on Millbrook Valley with Cover the land open.

1. **The forest.** Press `Rain` with the Big storm. The card says 93% soaked in and 7% ran off, and the gauge peaks about two hours after the heaviest rain.
2. **The town.** Pick `Town` and drag across the valley above the creek. `Rain` again: more runs off and the peak is higher. The card compares the two storms.
3. **The parking lot.** Pick `Parking lot` and paint a patch. Almost all the rain on it runs off.
4. **The soil.** Change `Soil under it all` from Loam to Clay and rain: more runs off from every cover.

> The moment that lands is the second gauge. Children expect a difference; the size of it surprises them.

The ideas, in plain words

How much of a storm runs off depends on the ground. Engineers give each kind of land cover and soil a curve number: near 100 the ground holds almost nothing, lower numbers hold more. A forest on loam soaks in most of an ordinary storm. Roofs and pavement let almost nothing in, so nearly all the rain on them runs off, and fast, through gutters and storm drains.

More runoff, arriving sooner, means a higher peak at the creek mouth: more flooding downstream and more scouring of the creek banks. Soil matters too: sand takes water in quickly; clay's tiny spaces let it in slowly. The valley is a model with numbers of the right size, not a real place. The runoff uses the curve numbers engineers use, and the storms are real ones for central Iowa.

Common mistakes: thinking pavement makes rain disappear; thinking the forest stops all runoff (on clay or in the hundred year storm, a third can run off even a forest); and changing the storm and the cover at once.

Do it together

1. Open mytekdev.com/try/watershedlab?lesson=forest-or-parking-lot&ref=fam-watershedlab-2 together. A short guide opens over the app. Press `Rain` and read the card when the storm ends.

   > **You'll know it worked when:** About 7 of every 100 drops ran off the forest.

2. Pick `Town` and drag across the valley above the creek to build a town.

   > **You'll know it worked when:** Roofs and streets appear where the trees were.

3. Press `Rain` again with the same storm. Ask: what changed on the gauge?

   > **If you get stuck:** Compare the tan curve and the number at the top with the first storm.
   >
   > **You'll know it worked when:** More ran off, and the creek rose higher.

4. Change the soil to `Clay` and rain once more. Ask: why did the soil matter?

   > **If you get stuck:** Clay has only tiny spaces between its grains, so water squeezes in slowly.
   >
   > **You'll know it worked when:** Even more ran off.

Talk about it

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

- What did you keep the same between the two storms?
- Why did more water run off the town?
- Where does the rain on a roof go?
- Why did the creek peak higher, and not only later?
- Why did clay make a difference under the forest too?

> The first question is the real test of the method: a child who names the storm and the soil as what stayed the same can run a fair test.

For younger and older kids

Younger: For a younger child, open Setup and pick grades 2 to 5, and stop after the town.

Older: For a teenager, pick high school in Setup and read the curve numbers on the cards.

Keep going

- Pick the Once in a hundred years storm: does the forest still hold most of it? Explain.
- Find the smallest town that doubles the peak.
- Turn half the town into houses and lawns, and compare the peak.

Bring it into other subjects

- Math: a parking lot of one acre gets 3.04 inches of rain. How many gallons is that? (One inch on an acre is about 27,000 gallons.)
- Civics: find your town's stormwater rules for new buildings, and what they ask a builder to do with the rain.
- Engineering: design a rain garden for the school's parking lot and say where the water goes.
- English: write a letter to the town council about the mall on the forest, using two numbers from your storm table.

For your records

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

LESSON	Watershed Lab: Forest or Parking Lot?
SUBJECTS	Earth science
TIME	45 minutes
WHAT WE DID	Compared runoff and the creek's peak from the same storm on a forest valley and on the valley with a town, and tested how the soil changes it.
SKILLS PRACTICED	Runoff and land use; Reading a storm graph; Fair tests

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/watershedlab?lesson=forest-or-parking-lot

Essential question: The same storm falls on a forest and on a town. Why does the creek below the town rise higher?

Warm-up: Where does more rain reach the creek, a forest or a parking lot, and why? _____

1. **Vocabulary.** Land cover, impervious surface, runoff, peak flow, fair test: write each in your own words.

2. **The storm table.** For each run: the cover _____; the soil ____; the storm _____; ran off ____%; the peak _____. One run on each line.

1. How did the town change the creek in the same storm? Use two numbers from your table.

2. Why does more rain run off a town than a forest?

Quick check

Name: _____

1. More rain runs off a parking lot than a forest because (A) parking lots are flatter (B) water cannot soak into pavement (C) more rain falls on parking lots

2. To test what a town does to the creek, you should (A) change the town and the storm together (B) keep the storm the same and change only the land (C) use the biggest storm

3. A forest above a creek is cut down for a town. Predict what happens to the creek in the next big storm, and explain.

Answers

QUESTION	ANSWER	WHY
1	B	Roofs and pavement let almost no water in, so nearly all of it runs off.
2	B	Changing one thing at a time is a fair test.
3	It rises higher, and sooner	More of the rain runs off roofs and streets instead of soaking in, so more reaches the creek at once. A prediction without the reason is half.

If your state or umbrella school asks, this lesson covers NGSS MS-ESS3-3.

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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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