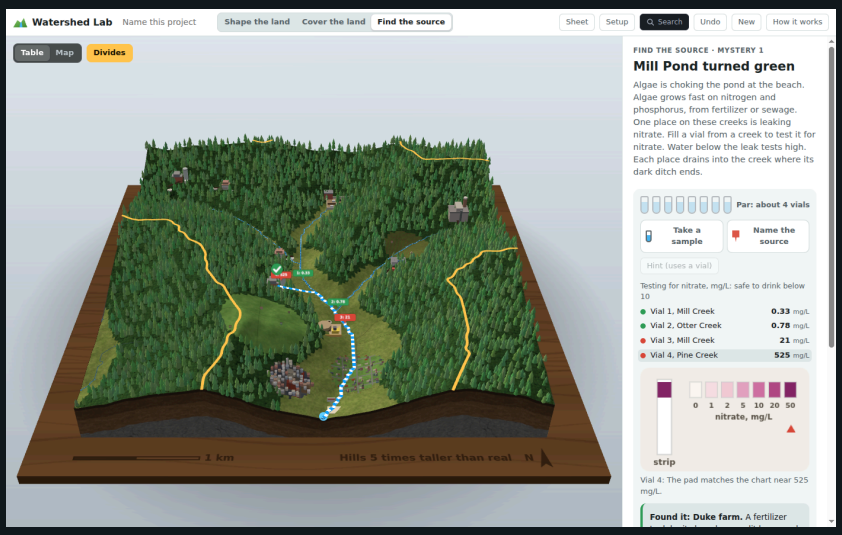
mytekDev

Watershed Lab: Find the Source

Grades 6-8 · 45 minutes

Earth science



Slides, rubric and answer key | **Print and go** | **No student accounts** | **Chromebook friendly**

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a vial log
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school environmental science
- Standards: NGSS

Watershed Lab: Find the Source

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Something is wrong with the water at the beach: germs, algae, an oil sheen or mud. One place upstream is to blame. Students fill up to eight vials of creek water, read each on a test kit, and use one rule, water below a leak tests high and water above it tests clean, to work upstream to the source and name it.

At a glance

ESSENTIAL QUESTION

Something upstream is fouling the beach. How can a few tests of the water find it?

OBJECTIVES

Students will be able to:

- read water quality tests and compare each reading with the line where it becomes a problem
- explain why water below a leak tests high and water above it tests clean
- plan where to sample so each test rules out as much as possible
- name a pollution source and support it with the readings that prove it

VOCABULARY

Sample, Upstream, Confluence, Point source, E. coli

STANDARDS

MS-ESS3-3

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/watershedlab?lesson=find-the-source&ref=tpt-watershedlab-3 once on a student computer: it opens on a mystery in Find the source. Solve one yourself, about ten minutes: read the story, press Hint, click the blue flag, read the kit, keep going upstream, then Name the source and click the place. Press Next mystery and solve one without hints.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: how would you find which place upstream is making swimmers sick? Write every plan on the board.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app with the starter open. Read the story aloud. Take one vial at the creek mouth and one far up a branch, and read each kit. Show The rule and The lines on the tests. > **It's working when:** Ask: the mouth is high and the branch is clean. What do we know now? The leak is between them, on another branch, or below the clean spot.	Watch, and fill in the vocabulary on the worksheet.
12 to 22	**Guided practice (We do)** The first vials together	Students open the link or scan the QR code. A short guide walks them through a hint and the first vial at the blue flag. Each student then takes the next vial on their own idea, and says why there. > **Watch for:** Students who test right next to every place. A vial just above a confluence clears a whole branch at once.	Start the vial log: where, the reading, clean or high.
22 to 38	**Independent practice (You do)** Solve it	Students solve their mystery, then press Next mystery and solve another without hints. Walk the room with the What to look for questions. > **If they ask:** "You named the farm. Which two vials, together, show it is the farm and not the house just upstream?" Proof	Log every vial and name the source; write which vial proved it.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Two students show the pair of vials that proved their source. Compare vial counts: who beat par, and how? Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/watershedlab?lesson=find-the-source&ref=tpt-watershedlab-3. A short guide opens over the app, on a mystery: a new valley with six to eight places on its creeks, one of them leaking.

1. **The story.** The card names what is wrong at the beach and what to test for: E. coli, nitrate, mud or oil.
2. **A vial.** With `Take a sample` picked, click the creek. A numbered pin shows the reading, and the kit below the list shows the test: spots on an E. coli dish, a nitrate strip, a turbidity tube, an oil tray.
3. **A hint.** `Hint` costs a vial and puts a blue flag where one vial rules out about half the places still possible.

4. **Name it.** Pick `Name the source` and click the place. Right: the app shows the leak's path to the beach and how many vials it took. Wrong: it says which vial rules that place out.

> The moment that lands is the first clean vial above a confluence: a whole branch is cleared at once, and students see the strategy.

Background for the teacher

Water quality staff find pollution sources the way the mystery does: sample above and below each place where streams join, and follow the branch that tests high. Water carries what leaks into it downstream only, so a clean sample clears everything upstream of it. Choosing spots that split the remaining places in half is the fastest plan, the same idea as a binary search.

The tests: E. coli is counted as purple spots on a dish of 1 mL, times 100 for a reading per 100 mL; above 235 per 100 mL a beach posts a swimming advisory. Nitrate is read against a color chart; above 10 mg/L it is not safe to drink, especially for babies. Mud is read with a turbidity tube; a clear creek reads under 10 NTU. Oil shows as a sheen.

Simplifications to know: E. coli is an indicator, and other germs that come with it cause most illness; a beach lab tests 100 mL, not 1; a sheen shows oil is there, not how much. Common mistakes: testing next to every place, and thinking a high reading far downstream points at the nearest place. 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.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- Your vial was clean. What does that rule out?
- Why test just above where two creeks join?
- Which two vials prove the source?
- Is that reading over the line? What is the line for?
- Why might a reading at the beach be lower than one right below the leak?

> The third question is the real test: a source is proved by a clean vial just above it and a high one just below.

Cross-curricular extensions

- Math: eight places, and each vial clears about half. How many vials should it take at best? Compare with your count.
- Computer science: write the plan as steps a robot could follow, and test it on the next mystery.
- Health: read your state's beach monitoring page and find what reading closes or posts a beach.

- English: write the report to the county: the problem, the evidence, the source, in five sentences.

Vocabulary

Sample	A small amount of water taken to be tested.
Upstream	Toward where a creek comes from. Water flows from upstream to downstream.
Confluence	The place where two creeks join.
Point source	Pollution that enters at one place, like a pipe or a leaking tank.
E. coli	Bacteria that live in the guts of people and animals. In a creek they are a sign of sewage or manure.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the screen as you say each word: the yellow line, the creeks and the gauge carry the meaning.
- Pair each learner with a partner; the pins on the table turn green for clean and red for high.
- Accept the vial log as clean or high, without sentences.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one clicking and one keeping the log.
- Zoom the browser to 125%; the vial list and the kit stay readable.
- Allow hints for every vial, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "The leak is above vial ___ and below vial ___."
- A check-in after the guide: every student can say whether their first vial was clean or high.
- Allow the Hint button for the whole first mystery.

STUDENTS READY FOR MORE

- Solve a mystery in par or fewer without hints, and explain the plan.
- Explain why testing above a confluence rules out about half the places, the same idea as guessing a number by halves.
- Write the beach sign the county should post, with the reading.

Adapting for other grades

Younger students: In grades 4 and 5, open Setup and pick grades 2 to 5: readings are in words and pictures and the sheet asks the simpler questions. Do the guide together and stop there; skip the third rubric row; total 8, and 6 meets the objectives. At that level the kits read in words: a lot, some, very little.

Older students: In high school, pick high school in Setup. Students solve two mysteries without hints and explain, with the readings, why a mud mystery on a dry day points to a building site or cattle in the creek.

Student worksheet

Name: _____ Date: _____

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

Essential question: Something upstream is fouling the beach. How can a few tests of the water find it?

Warm-up: How would you find which place upstream is making swimmers sick? _____

1. **Vocabulary.** Sample, upstream, confluence, point source, E. coli: write each in your own words.

2. **The vial log.** For each vial: where _____; the reading and its unit _____; clean or high ____; why you tested there _____. One vial on each line.

1. Which place did you name, and which two vials prove it?

2. Why does a clean vial rule out everything upstream of it?

Watershed Lab: Find the Source

Exit ticket

Name: _____

1. A vial just below a farm is clean. The leak is (A) at the farm (B) not at the farm or anywhere above that vial (C) at the beach

2. The best place for a vial is often (A) right at the beach (B) just above where two creeks join (C) next to the biggest building

3. A vial reads 2,800 E. coli per 100 mL. The line is 235. What does that tell you, and what would you do next?

Watershed Lab: Find the Source

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	Water carries a leak downstream only, so a clean vial clears everything above it.
2	B	One vial there tells you which branch the leak is on.
3	The leak is upstream of that vial	It is far over the swimming line, so the source is above it; test farther up, above the next place or confluence. Naming only that it is high is half.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
The vial log	Every vial logged with where, the reading with its unit, and clean or high, with a reason for each spot.	Every vial logged with where, the reading and clean or high.	Some vials logged.	No log.
The rule	Explains that water carries a leak downstream only, so a clean vial clears everything above it.	Explains that water below the leak tests high.	Says the high readings are near the source, with no rule.	No explanation.
The proof	Names the source and the two vials that bracket it, one clean above and one high below.	Names the source and one vial that shows it.	Names the source with no vials.	No source named.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-ESS3-3: students carry out a method for monitoring a human impact on water and find its source.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-ESS3-3**	6-8	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Students monitor a creek by sampling, read water quality tests against their limits, and trace a pollution source.

Checked November 2026 against: NGSS MS-ESS3-3, Earth and Human Activity.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/watershed-lab/lessons/find-the-source/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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