

STREAM SCIENCE

5th Grade NGSS Correlations:

- [ETS1.A](#): Defining and Delimiting Engineering Problems
 - [3-5-ETS1-1](#)
- [ETS1.B](#): Developing Possible Solutions
 - [3-5-ETS1-2](#)
 - [3-5-ETS1-3](#)
- [ETS1.C](#): Optimizing the Design Solution
 - [3-5-ETS1-3](#)

Pre-trip Information/Activities:

- [Why do Rivers Curve? Video](#)
- [Bodies of Water: River NewsELA Article](#)
- [Rivers Crossword and Word Search](#)

Objectives:

- Understand how the force of moving water changes landforms
- Model the creation of a stream and observe how it affects/is affected by the landscape
- Demonstrate human impacts on streams/rivers

Materials:

- Empty stream bins
- Mixed substrate (ground walnut shells and sand)
- 2 small empty trash cans or buckets per stream bin
- 1 turkey baster per stream bin
- Assorted “building materials” (sticks, legos, rocks, etc.) for each group

Background:

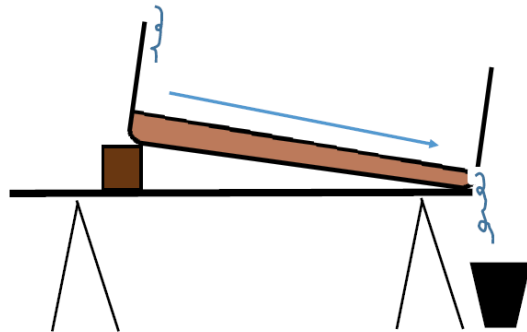
Which way does water flow? Have you ever seen water flowing uphill? Rivers and streams are formed by **precipitation** (water in the form of rain, snow, or hail) falling on high areas of lands (such as mountains) and flowing downhill. As water moves to the lowest available point, these droplets come together and form small channels of water. These channels join one another to create a stream, and streams join other streams to form a river, all the while flowing downhill. Eventually the rivers reach a valley or other relatively flat area of land, at which point they wind

their way across the land until they reach the ocean. The path that a river takes largely depends on the landscape it meets along the way.

Flowing water, like that in a river, is very powerful, and it carries a lot of energy. This energy allows water to **erode** (gradually wear away at or break apart) the soil, rock, and land that it flows over. Flowing water moves in a corkscrew or swirl motion, which carves away at the edges of the stream, eventually causing bends to form (called **meanders**, meaning winding course). The water picks up the small particles of soil or rock it has eroded and carries it downriver. When the water goes around a bend it slows down and loses energy, causing the small particles of dirt or rock to drop (or **deposit**) and become a part of the river bank (the side of a river) or river bed (the bottom of a river) in this new area. Over time these bends can grow and change, and occasionally disappear altogether. By definition, rivers are constantly changing, and are able to change the landscape they interact with.

Activity:

- Prior to the beginning of the activity, set up the stream bins with ~1 ½-2” of mixed substrate each. Elevate one end of stream bin with the block, and line up the opposite end (end with hole drilled into it) with the edge of the table. Place the empty trash can/bucket below the hole to catch the water as it exits the table. (See diagram below).



- Break students into 5 groups and assign each group a stream bin.
- Explain that in order to simulate the precipitation on the highest points of their landscape they will take turns using a turkey baster to drop water on the designated spot (the X marked on the bin). They can model different types of flow (a light sprinkle vs. a heavy rainstorm) by letting out more or less water at a time.
- **First run through** the students will be modeling the flow of water over an undisturbed landscape and observing the way the water interacts with it.
 - Do not have students make any changes to the initial set up, and have them each take a turn making it “rain” using the full turkey baster.
 - Have students observe what happened.

- Reset each station (or have students smooth over the formed river using their hands).
- **Second run through** you're going to have the students add some mountains/hills/valleys to their landscapes (use their hands to form mounds and pits in the sand).
 - Have students take turns making it "rain" using the full turkey baster.
 - Reset each station (or have students smooth over the formed river and landscape using their hands).
- **Third run through** have students add landscape again, and this time have them use legos to "build" cities, farms, etc. where they think they would go on the landscape.
 - Have students take turns making it "rain" using the full turkey baster.
 - Reset each station (or have students smooth over the formed river and landscape using their hands).
- **Fourth run through** have students add landscape, cities, farms, etc. Now have them build a dam and reservoir where they think they would go.
 - Have students take turns making it "rain" using the full turkey baster.
 - Reset each station (or have students smooth over the formed river and landscape using their hands).
- Let students keep playing with their stream bins and making changes for the duration of the time.

Discussion:

- What was different when you let the water out slowly vs. quickly (with more force?)
- How would the river formation change if you let the water flow for several hours?
- How did the formation of the river change when you added mountains and valleys to the landscape?
- What happened when you started adding human-made structures to the landscape? Were they ever consumed by the river?
- Do you think real rivers form in the same way as the models we just used? Why or why not?

Post-trip:

- Have students research the major rivers of California and draw and label them on a [blank map](#) of the state. ([WS.7](#))
- Read the 'I am the San Joaquin Story' (see below) to students, then have them write a story as either a drop of water traveling along a river system or as the river itself. ([WS.3](#), [WS.4](#))
- Have students illustrate the stream formation they observed on a story board or 6 panel comic template.

- Have students research an important river in the world and create a poster or presentation highlighting where that river starts, any important cities it passes on its journey, if it played an important part in history, etc. ([WS.2](#), [WS.4](#))

I am the San Joaquin (Story)

I am the San Joaquin River.

My story begins hundreds of millions of years ago, when dinosaurs roamed the Earth and the Sierra Nevada Mountains were formed. Two tectonic plates (huge broken pieces of Earth's crust that move below the surface) collided, and one plate started to go underneath the other. It pushed the land above upward, and created the mountains. High in these mountains, snow and rain fell, and I began my journey.

I started as a trickle of water, letting gravity pull me downhill. As I flowed, more water began to join me, and I became a stream. As I passed by other streams, we would join together. Soon I swelled into a large, rushing river.

My journey took me down steep hills, and as I passed over the land the force and power of my movement began eroding the rocks beneath me. I was so strong that bits of land and rock began breaking down, and I would carry them with me in my current.

Eventually, I reached the bottom of the steep mountains. I began to slow as I reached first the foothills, then the flat land below. For a while I headed straight out to the west, directly to the ocean. But then, the movement of tectonic plates caused the coastal mountain ranges to grow, and I had to find a new path. I headed north, wandering along the valley floor. Along the way, other rivers joined me, and I grew even larger. Eventually I met another mighty river that would be called the Sacramento, and together we headed west through an opening in the mountains and joined the sea.

This was long ago, and for many years only the plants and animals kept me company. I gave them water so they could grow big and strong. Each spring, I would flood the flat land of the valley to create wetlands and lakes and marshes. New birds would come visit, singing me their songs. Elk and deer would come drink from me, splashing in my deep pools to bathe. Fish and other aquatic animals swam in me. For a long time, it was very peaceful.

Then, nearly 8,000 years ago, man arrived. There were several tribes of Native Americans, but the Yokut and Miwok were the ones that settled along my banks in this area. They, too, would drink my water and splash in my deep pools to bathe. They used spears made of sharpened sticks and nets made of woven plants to catch the large salmon that swam along my length, and hunted the deer and elk that lived nearby. We lived together for many years.

Not too long ago (maybe 200-300 years) other humans began to arrive. They spoke different languages, and one of them called me 'San Joaquin.' It became my name. These men, too, would hunt animals along my banks and catch the fish that were swimming by. Some of them

hunted just for the beavers that used sticks and mud to build their homes in my shallow branches. As more of them came, they brought herds of cattle that would come to me to drink.

When one of the men found gold among the rocks and sand in my riverbed, many more came along. They used riverboats to traverse my many miles. They built towns nearby, and started using my water to irrigate their crops. They would build small canals to reroute the water away from me. The more canals they built, the smaller I became.

As more people came, the towns and cities grew. They wanted electricity to power their homes, so they built dams along me up in the foothills of the mountains. My water pooled up behind these dams, and spun large turbines that produced energy as it passed through.

Eventually, they build a large dam in Friant, and my water created a large lake behind it. Much of that water was diverted to large canals that led to places very far away. They needed it to irrigate the many farms that were built along the valley's floor. The water was used to grow the crops they needed to survive, but it meant I could no longer flow freely. During the long, hot summers, I began to dry up in some places. My water could no longer flow continuously into the ocean year round.

The salmon that once swam up me each spring could no longer complete their journey. I could no longer flood the flat lands and create the lakes and marshes that provided temporary homes for the birds that would migrate through. In some places I became a muddy trickle of water, in others my water would seep underground to continue on its journey.

The cities and towns continued to grow larger, but over time I saw less and less of the people who lived in them. People built houses along my banks, and drove cars on the bridges that crossed me, but many less people came to visit. Many of those that did visit would come to the man-made lakes that pooled behind the dams, rather than the places where I flowed free.

In many ways, this is how things still are for me. I still begin with the snow and rain high in the Sierra Nevada Mountains. I still flow wildly down the steep slopes, dropping over waterfalls and eroding the rock beneath me, beginning my long journey north towards the ocean. The birds and mammals and fish and amphibians still use me to bathe and drink and swim. The dams that were built to hold my water and create electricity still exist, and the canals redirect my water to farms throughout the Central Valley. Most importantly, I still go dry for nearly 60 miles.

Recently, though, things have begun to change. In the past 20 or so years, more people have begun to visit me again. They kayak along my smooth waters, swim in deep pools, and fish from my banks. Groups of students come to see me, and learn from my experiences. The dams release water more frequently and the salmon are being reintroduced.

Things will never go back to the way they were millions of years ago. More changes will be made, I will be used for agriculture and energy and many other things. The humans and plants and animals and I will live together for a long time to come. But I am hopeful that one day I will not dry up anywhere along my path, and that I will flow continuously from my headwaters in the high Sierras to the ocean many miles away. I am hopeful that the salmon will return, and the birds will continue to use my water to rest and drink. I am hopeful for the future.

I am the San Joaquin River.