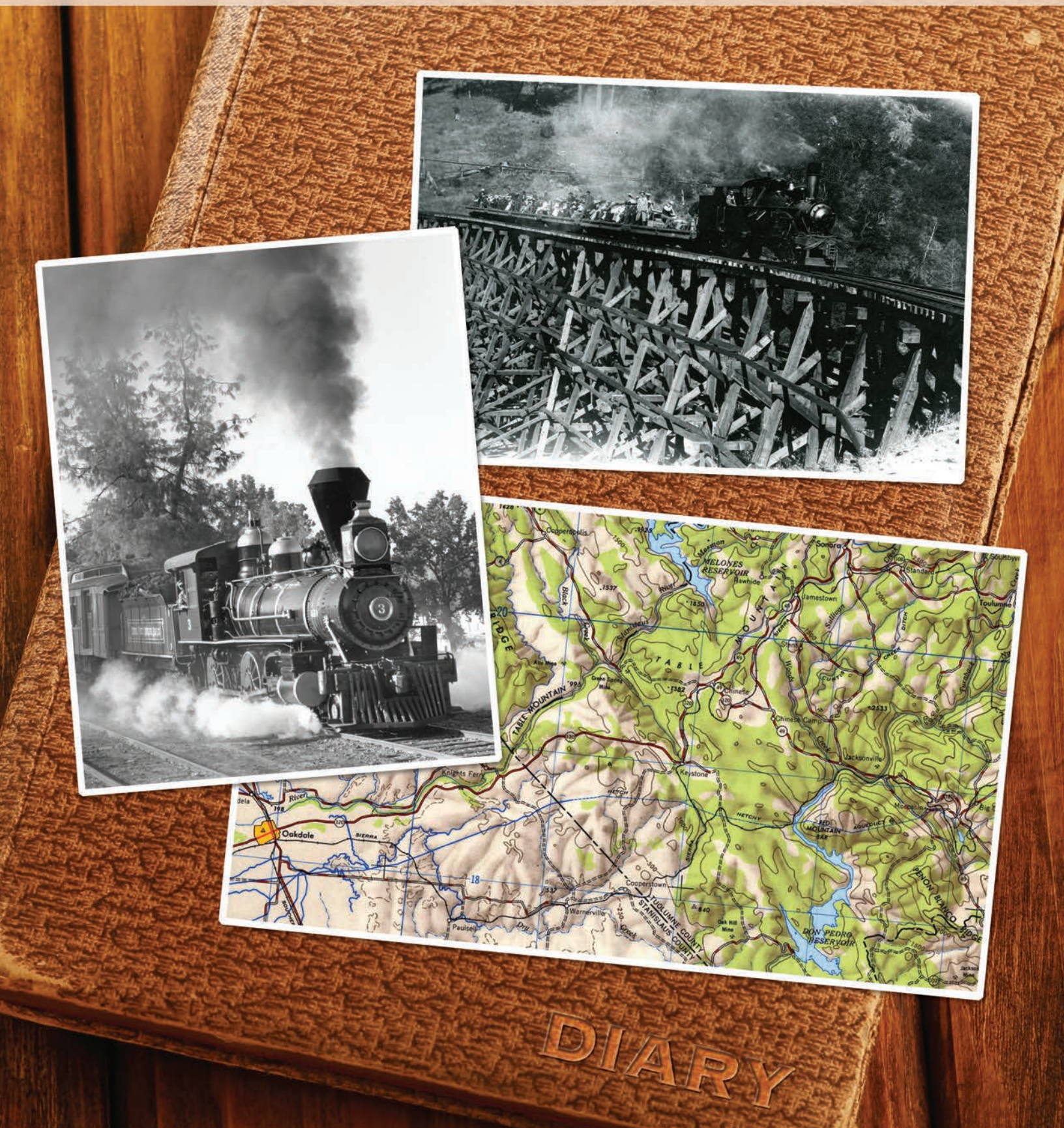
Name: _____

The Sierra Railway and the Transformation of California

Grade 4
Student Workbook



Railtown 1897 State Historic Park

4th Grade Unit Plan: The Sierra Railway and the Transformation of California

Author:

Helen de la Maza, Educational Consultant

Project Manager:

Jennifer Rigby, Director, The Acorn Group

Graphic Design:

Jim Cokas, Creative Director, Jim Cokas Design

Debora Brown, Graphic Designer

Cover images:
Train Trestle photo courtesy of Tuolumne County Historical Society
Railtown No. 3: steam photo courtesy of California State Railroad Museum
Map courtesy of the U.S. Geological Survey
Diary image ultramarinfoto, iStock

This publication can be made available in alternate formats. For information call:
(800) 777-0369 (within US), (916) 653-6995 (outside the US), 711, TTY relay service,
www.parks.ca.gov

Questions about this instructional unit should be directed to:
Railtown 1897 State Historic Park, 18115 5th Ave, Jamestown, CA 95327

Lesson 1: Rise of the Sierra Railway

April 15, 1897

Dear Diary:

This is the first page of our brand new diary. Our father gave it to us so we can write our thoughts in it. We like to cut out newspaper articles. Now that we have this diary, we'll keep interesting articles in it. Since you are new to us, diary, we're going to tell you who we are. I am Ruth. My brother, Peter, is my twin. We are 9 years old. We live with our father, John, and mother, Adelaide. We just moved to Oakdale. We're a couple miles from the center of town. Our father bought land that has orange trees on it. We also have two cows.

San Francisco Call
January 15, 1896

ORANGE BLOSSOM COLONY.
OAKDALE, STANISLAUS CO., CAL.

Beautiful young orange groves in tracts of 5 acres and upward, lying along the Stanislaus River, two and a half miles from Oakdale, the principal station of the Southern Pacific Railroad on the line between Stockton and Merced. The Stanislaus and San Joaquin Irrigation Company's canal runs directly through the colony and the property has a perpetual water right.

We are prepared to sell portions of the property either unimproved or already planted to Washington Navels, Mediterranean Sweets and Maltese Bloods.

Prices for land, including a perpetual water right and planted to orange trees, $175 per acre. Unimproved land with fully paid up water rights, $70 per acre.

For particular maps and catalogues, address
EASTON, ELDRIDGE & CO.,
638 Market Street. San Francisco, Cal.
Or F. T. KNEWING, our representative.
Oakdale, Cal.

California Digital Newspaper Collection, Center for Bibliographic Studies and Research, University of California, Riverside, http://cdnc.ucr.edu.

Father found this newspaper advertisement for land with orange trees. Now we have a new home!

When we moved here from Stockton we traveled on the Southern Pacific Railroad. We love riding trains and learning about them. In today's paper we found out details about the new track we saw being built at the train depot in town. It's not another branch of the Southern Pacific. It's a new company called The Sierra Railway of California. The engine runs on coal.

When coal is burned, energy is transferred, or moved, to different parts of the locomotive, or engine. Eventually the energy is transferred to the wheels. They turn, and in the process, make the train move. As the coal burns, it heats the water in the boiler and creates steam. The steam is released under pressure through the cylinders. When this happens, it makes the familiar "choo-choo" sound.

This is what the map of California looks like. We live in this part of the state.

Map courtesy of Aminie Elsberry, California Secretary of State

San Francisco Call
April 15, 1897

RAILROAD INTO THE SIERRAS

Tracks Already Laid in the Mother Lode Country.

Benefit to a Great Mining Section Oakdale and Coulterville the Termini.

Construction work on a new railroad in the "mother lode" counties of the Sierras has actually begun, and within the next few months a standard-gauge railroad 124 miles long will be in operation from Oakdale, Stanislaus County, to Coulterville, Mariposa County.

Some time ago W. Bullock conceived the project. Rights of way were secured and other preliminaries were arranged, but for some reason the enterprise was not matured.

Meanwhile others, including Prince Poniatowski, became interested in the idea of opening direct rail communication into this district, and the result was that Bullock transferred his rights of way and other privileges to the new parties, who incorporated and organized under the title of the Sierra Railway Company of California.

Without flourish of trumpets those back of the new company began work about ten days ago, and to-day two miles of track have been laid and more than five miles of the new road have been graded. The construction work is in charge of the Ericsson Bros., who have instructions to push it with the utmost rapidity. The proposed line will pass through Jamestown, Angels and probably Sonora. At the latter point there are some differences over right of way, and should these not be arranged to the satisfaction of the projectors the line will be built around the town. For most of the remaining portion of the road the right of way is virtually secured. At no point will there be more than a 2 per cent grade, and this will be for a short distance only.

Two great objects it is claimed will be accomplished by the building of this road. It will give ready and direct access to the mining country, which has hitherto been reached only by a circuitous and inconvenient route, and will, among other important things, permit of timber being brought into the mining camps at a comparatively low cost.

California Digital Newspaper Collection, Center for Bibliographic Studies and Research, University of California, Riverside, http://cdnc.ucr.edu.

We clipped a newspaper article that says, "the proposed line will pass through Jamestown, Angels Camp and probably Sonora." Our grandparents live in Jamestown.

When the road is finished we'll be able to travel to see them by train instead of stagecoach. Horses are slower than trains. The trip will be much faster. We've also never been to Angels Camp or Sonora. Maybe someday we'll travel there.

Our father told us train owners have to get permission to lay track across other people's land. This permission is called right-of-way. Sometimes the railroad company has to pay to go through land. Sometimes the landowners give permission for free.

Since the late 1880s this area has had a second gold rush. Many people are migrating here. Migration means that people move from one place to another. There are many mines near Jamestown. People call them hard rock mines because they contain hard rock in which gold, copper, and other ore are found. Maybe that's why the owners of the new train want the line to go to Jamestown and Angels Camp. The train can transport the minerals extracted, or taken out, from the mines. There's

We found a newspaper clipping that tells more about the new railroad.

also a big mine right outside Jamestown. It's called Harvard Mine. This is where our grandfather works.

Sonora is in the foothills of mountains called the Sierra Nevada. Mr. Bullock is one of the directors of the Sierra Railway. We've heard he wants to use his train to transport timber, or trees, from the foothills to a lumber mill. The train would bring the lumber here to Oakdale in the valley. Then people could buy it and use it to build houses and barns. Maybe the train road will go even further so it's closer to the forest?

Our grandpa wrote us a letter when he first moved to Jamestown. He said he thinks we'll like the town because nearby there are many pretty hills, the Stanislaus River, and creeks. The Sierra Railway road will have to travel through these areas. We think it will be a pretty view.

Sometimes we go to the train depot at Oakdale to watch people coming from San Francisco via Stockton. They travel from here to Yosemite and to other towns on stagecoach. Maybe the Sierra Railway will make their trip faster and more fun.

Our mother is calling us for dinner.

We'll write soon,

Ruth and Peter

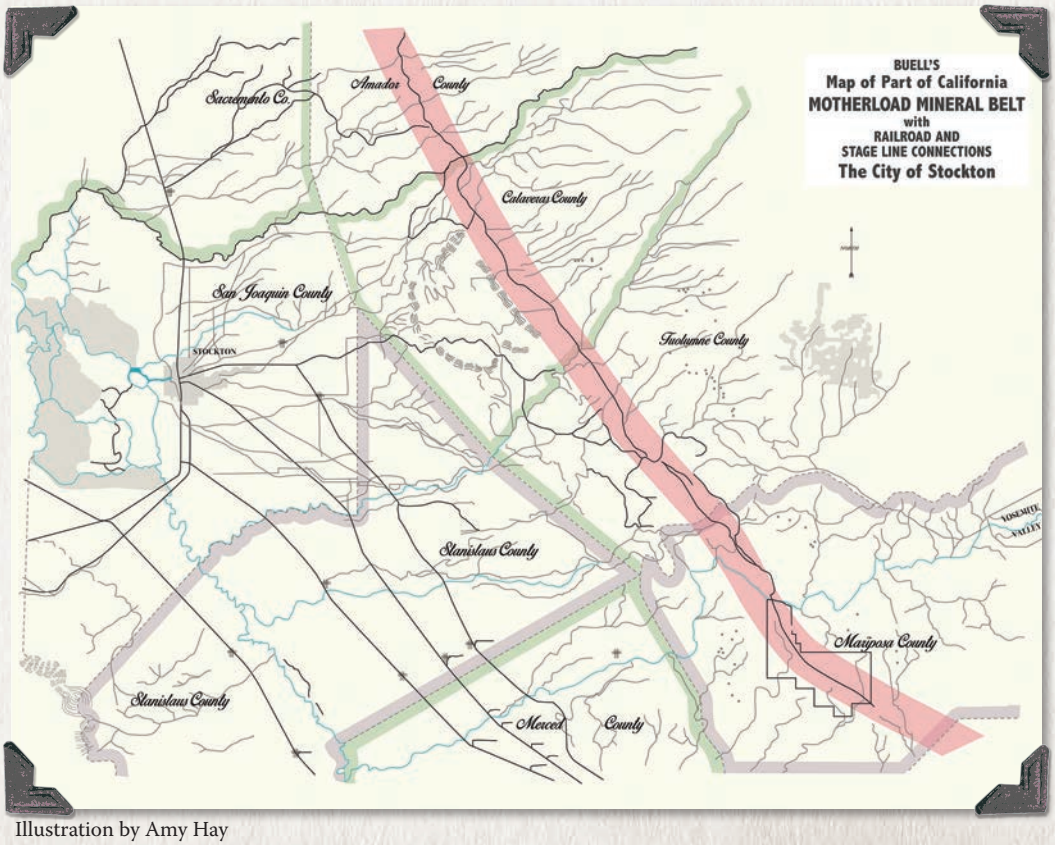


Illustration by Amy Hay

What I've Learned about The Rise of the Sierra Railway

In the spaces below, answer the three questions.

1. Use Ruth and Peter's diary to explain three events related to the Sierra Railway.

a. _____

_____

_____

_____

_____

b. _____

_____

_____

_____

_____

c. _____

_____

_____

_____

_____

2. Define the word migration.

_____

_____

_____

_____

3. Describe how the Sierra Railway steam locomotives were powered (you may refer to the text).

_____

_____

_____

_____

_____

_____

_____

_____

Laying Track: Part 1

April 17, 1897

Dear Diary:

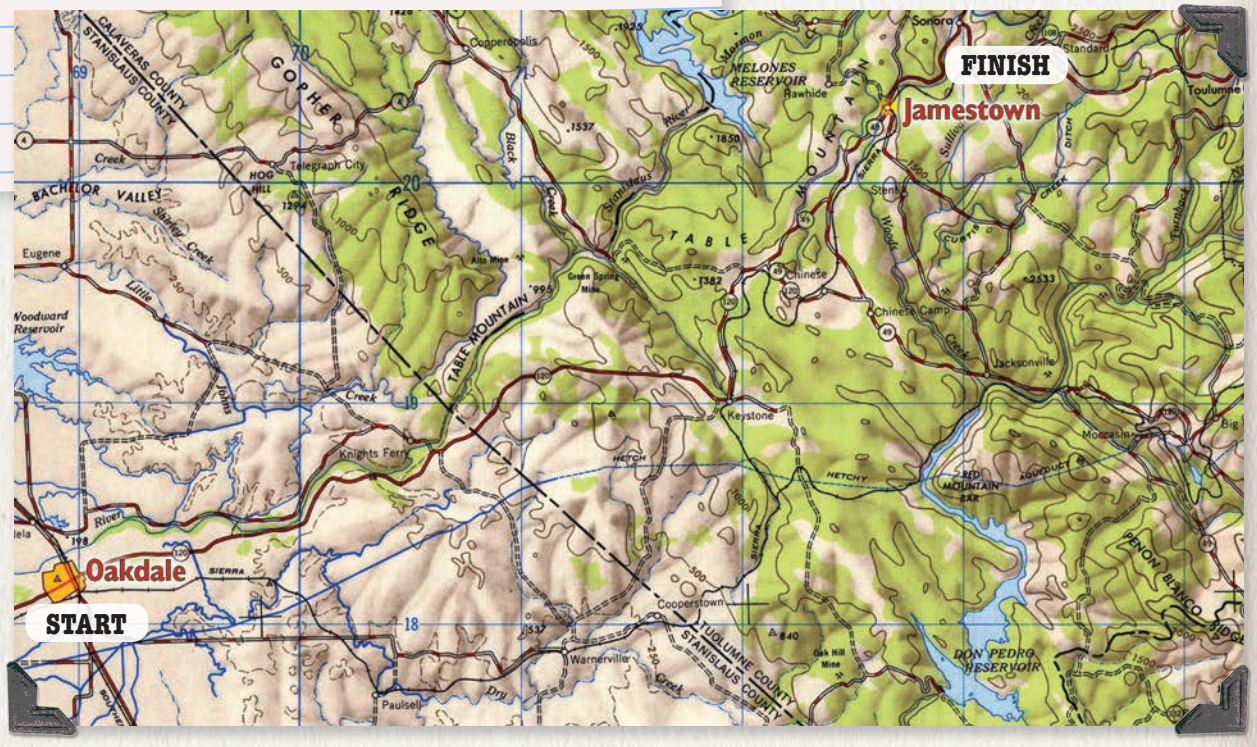
Today is Saturday and our father has time to help us with our Sierra Railway exploration. Mother is washing our clothing and said she'd join us later. Yesterday after school we watched the men laying track for the Sierra Railway. For the first 26 miles the land is flat. Laying track won't be too hard there. But beyond that, to Jamestown, the terrain, or ground, is hilly. The track will have to cross creeks, canyons, and hills.

We have asked father to show us maps of the area between Oakdale and Jamestown. We will predict where the track will be laid.

We're going to think about the solutions the engineers will use to deal with the terrain.

We'll write soon,
Ruth and Peter

Trains can't go straight up very steep hills or canyons. They also can't make very tight turns. And they certainly can't go through a river! And of course, the people and items being transported need to have a safe journey!

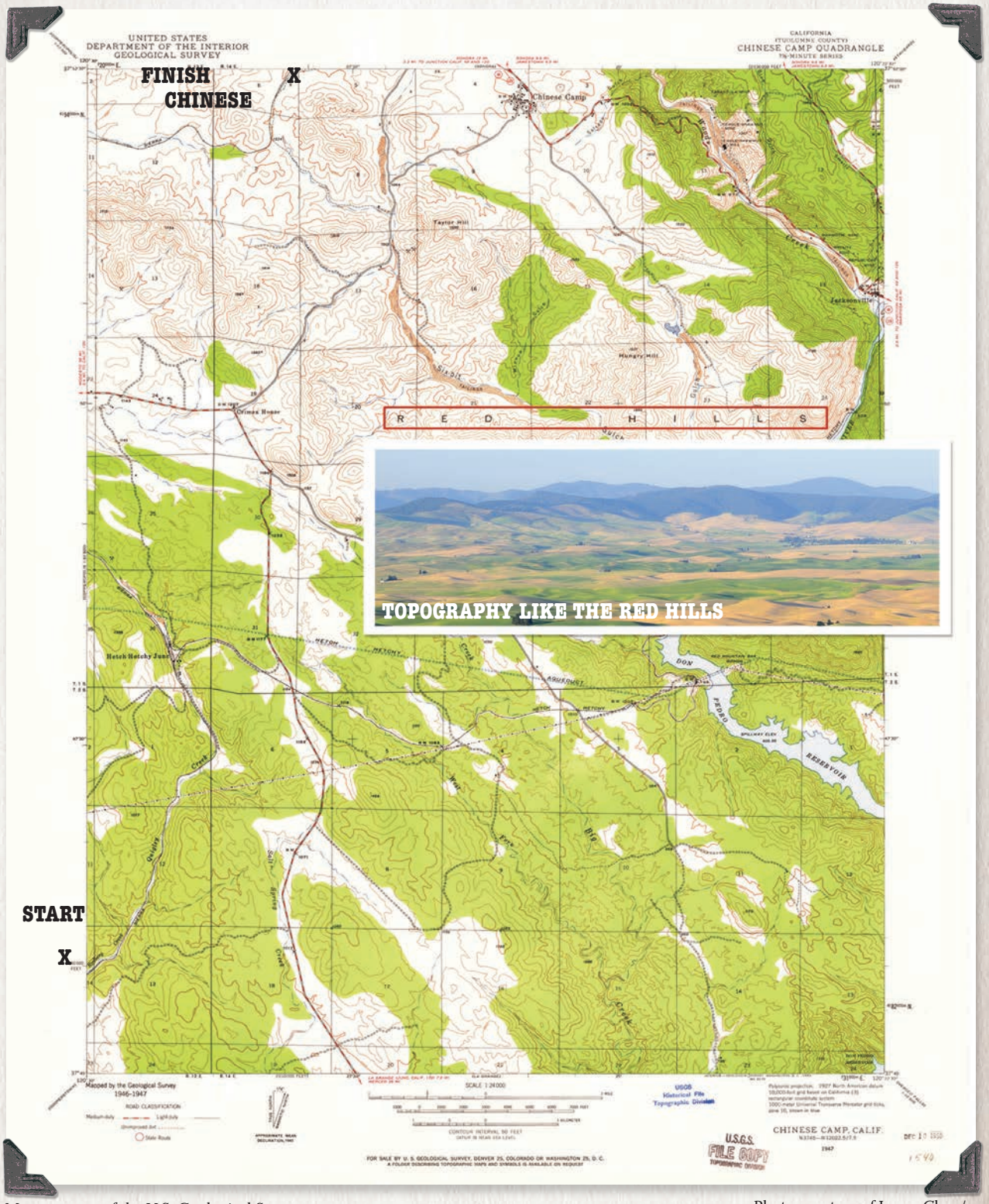


Map courtesy of the U.S. Geological Survey

Oakdale to Jamestown Topographic Maps: Engineering Challenge

Map courtesy of the U.S. Geological Survey

OAKDALE TO JAMESTOWN
(middle part)

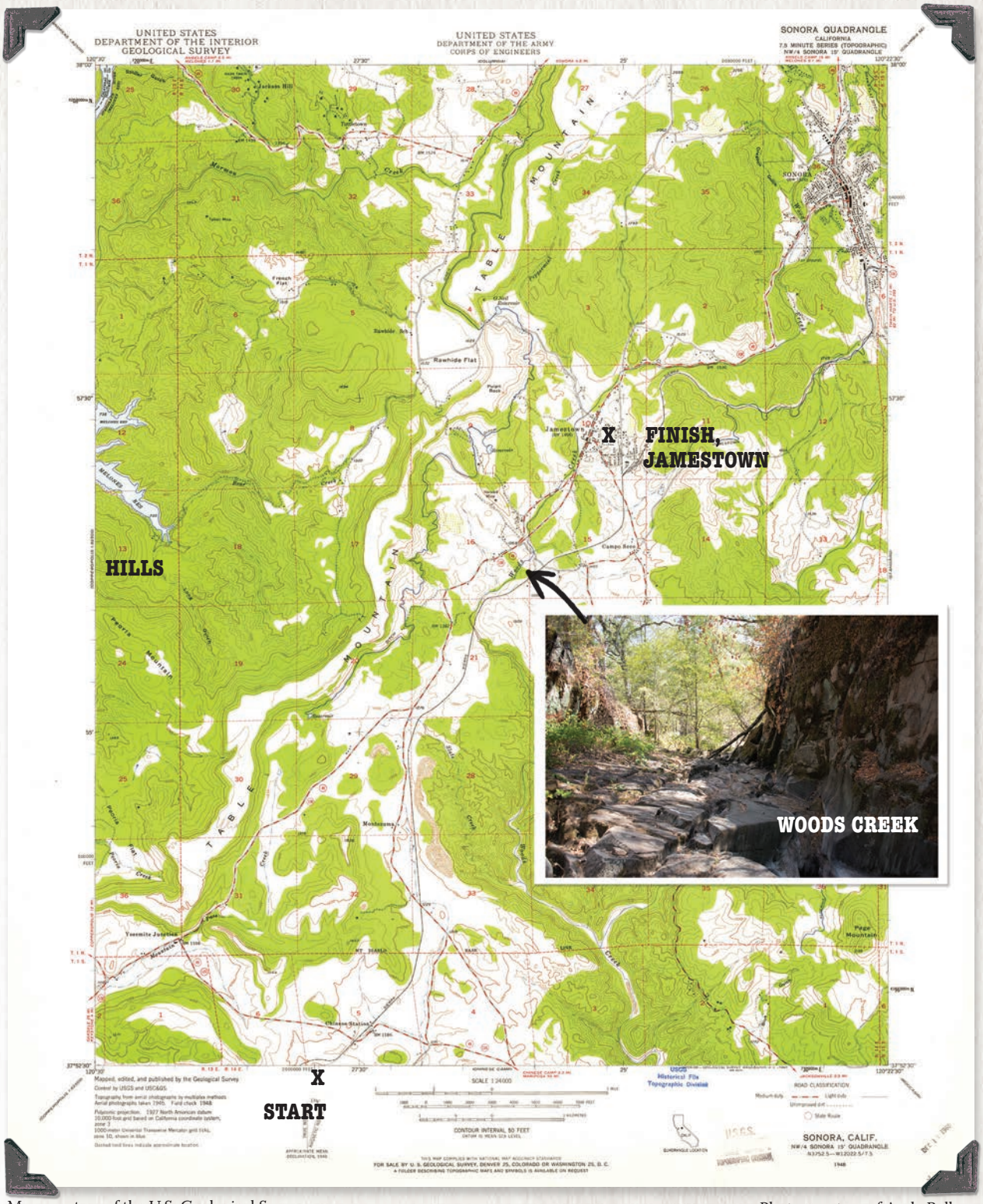


Map courtesy of the U.S. Geological Survey

CHINESE CAMP **1:24,000** **1947**

Photo courtesy of James Chen/ Shutterstock

OAKDALE TO JAMESTOWN
(final leg)



Map courtesy of the U.S. Geological Survey

SONORA 1:24,000
1948

Photo courtesy of Andy Bell, Center for Watershed Sciences, UC Davis

Laying Track: Part 2

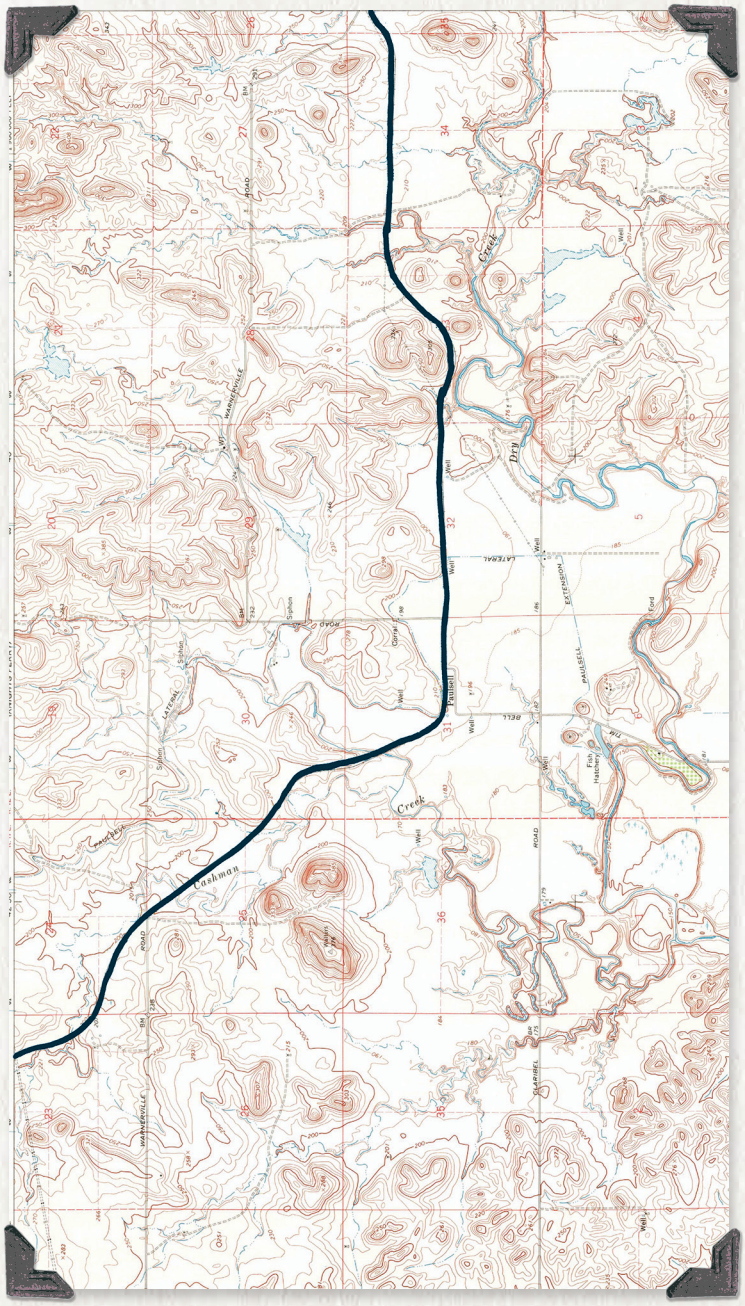
November 10, 1897

Dear Diary:

The first train traveled from Oakdale to Jamestown today! The route has been completed. Bridges had to be built over Dry Creek Canyon and Woods Creek. The Red Hills area around Don Pedro was difficult to build.

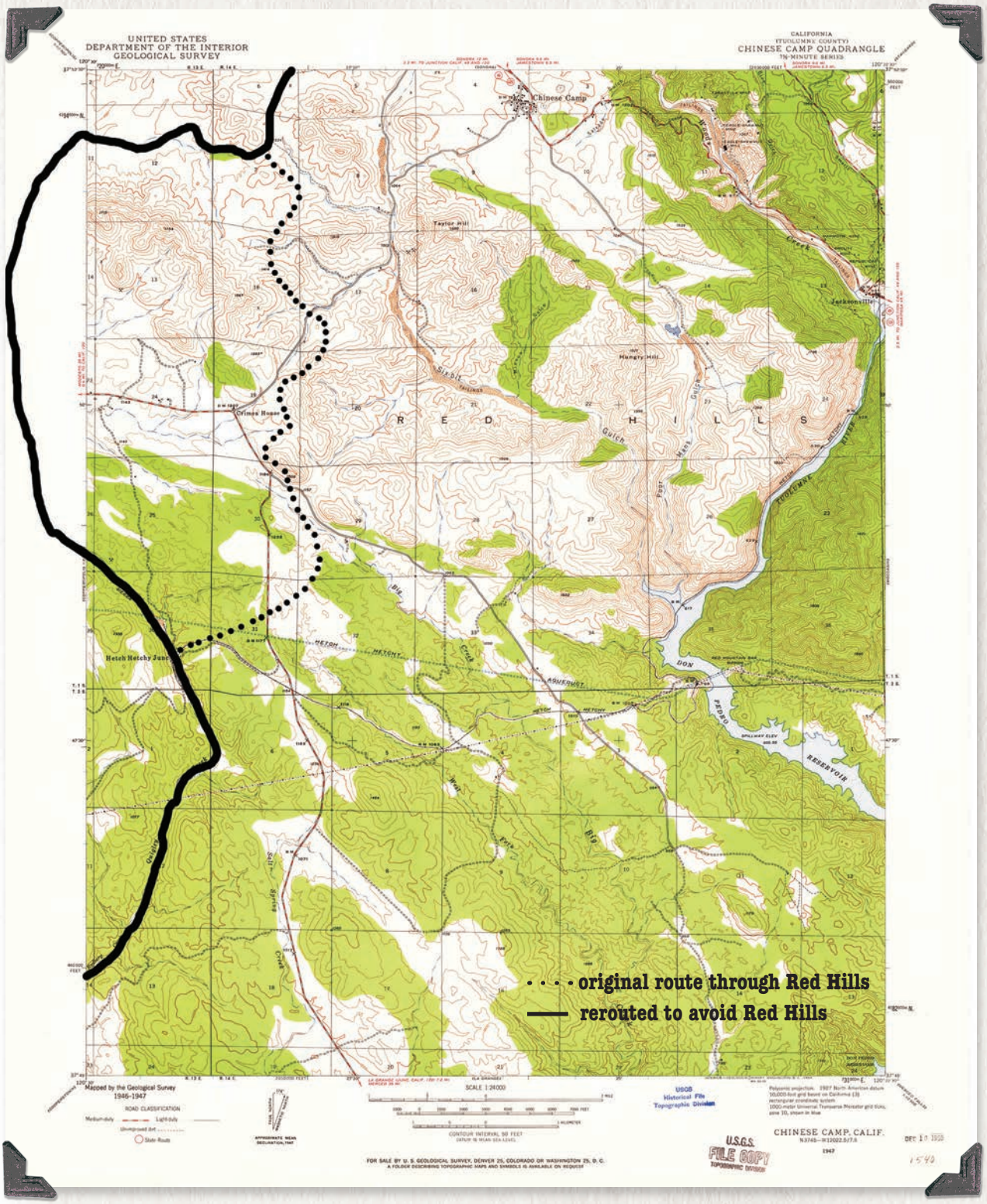
Here are pictures of the route the engineers decided on.

OAKDALE TO JAMESTOWN
(near first section)



Map courtesy of the U.S. Geological Survey

OAKDALE TO JAMESTOWN
(middle part)



Map courtesy of the U.S. Geological Survey

OAKDALE TO JAMESTOWN
(final leg)

WOODS CREEK TRESTLE

Map courtesy of the U.S. Geological Survey

Photo courtesy of Tuolumne County Historical Society

We also learned other ways engineers deal with difficult terrain.

Sometimes in mountain areas, or for transporting timber, engineers use narrow gauge track. This means the distance between the two rails that make up the track is less than it is for a standard gauge track. The standard gauge is 4 feet, 8½ inches. Even the cars and locomotives used on a narrow gauge railway are smaller. Less material is used in their construction. Narrow gauge tracks are less expensive to build.

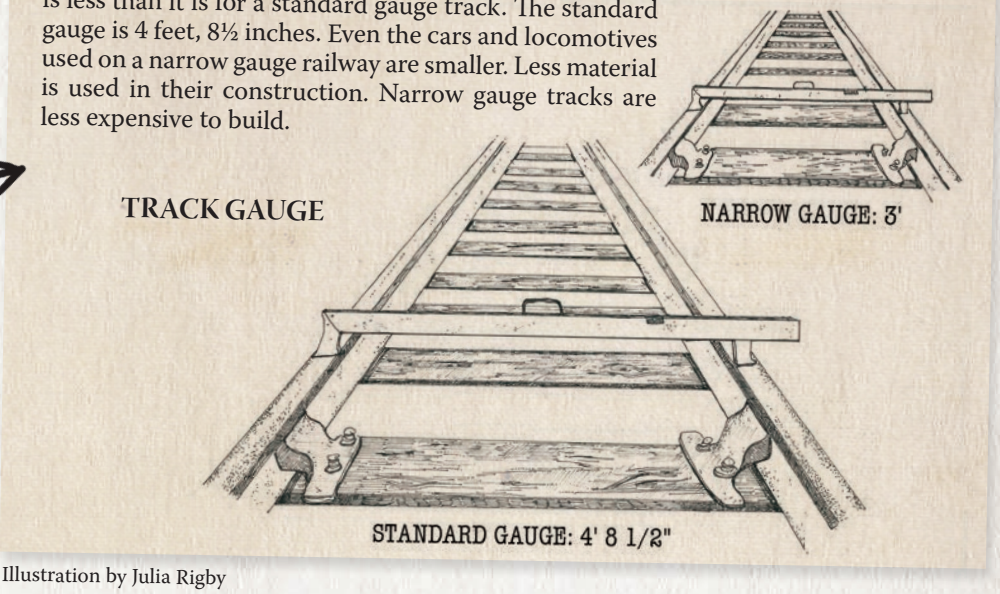


Illustration by Julia Rigby

Sometimes trains need to go in the opposite direction. But trains can't make a tight u-turn! Train cars are long and not flexible. We learned about four engineering solutions for this problem.

Photo courtesy of Helen de la Maza

One option is a turntable like this one. The locomotive is unhitched from its cars and placed on the turntable. The turntable turns the locomotive to face the other direction.

We found three more ways to turn a train around.

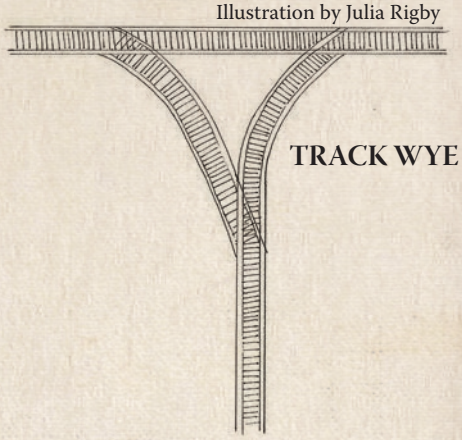
Siding tracks built next to mainlines are common. Locomotives and train cars can be moved to the siding tracks so they are out of the way of the main line and so car order can be switched.

One option is to build a wye next to the mainline. The locomotive is unhitched from its cars. The locomotive backs up on the wye, and then pulls forward to the other side of the cars. It's then on the front of the train and ready to go once the cars are hitched again.

Another option is to use run around siding that is built next to the mainline. The run around siding allows a locomotive to be at the front of the train again, but the locomotive is still facing the way it came, so it looks like the train is going backwards! The locomotive pushes, instead of pulls, its cars.

Another option is a balloon loop. This takes up a lot of space because the entire train needs to be able to make a large u-turn by following the large balloon-shaped loop.

Illustration by Julia Rigby



TRACK WYE

RUN AROUND SIDING

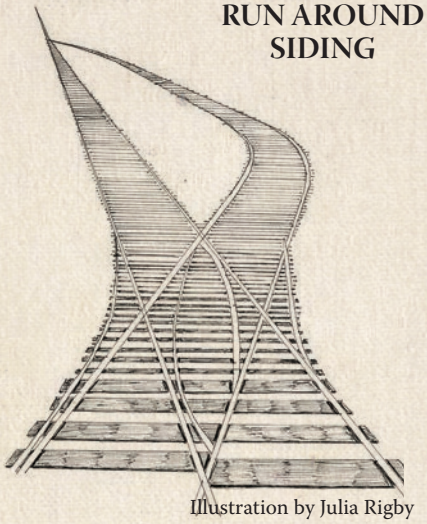


Illustration by Julia Rigby

BALLOON LOOP

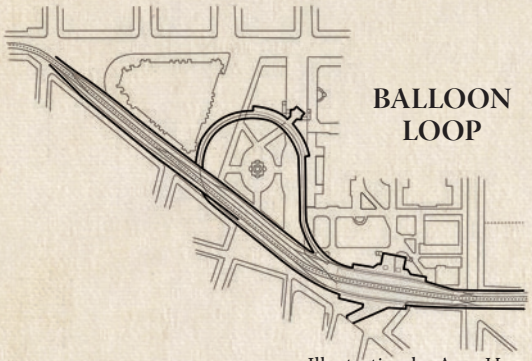


Illustration by Amy Hay

On steep hills or mountains, other engineering solutions are used.

A train cannot go straight up a steep grade, or slope. Instead, it needs to climb higher bit by bit. Going all the way around and around the hill would take a long time. A shorter route is to build switchbacks, or ramps, on one side of the hill.

The train goes forward up one of the switchbacks, and then goes backward up the next. Each time it travels on a switchback, it's climbing.

Photo courtesy of Tuolumne County Historical Society

Sometimes a tunnel has to be built through a hill.

Photo courtesy of West Valley Museum, Oviatt Library Digital Collections, California State University, Northridge

Other times part of a hill is blasted with dynamite to create a level spot on which the train can travel.

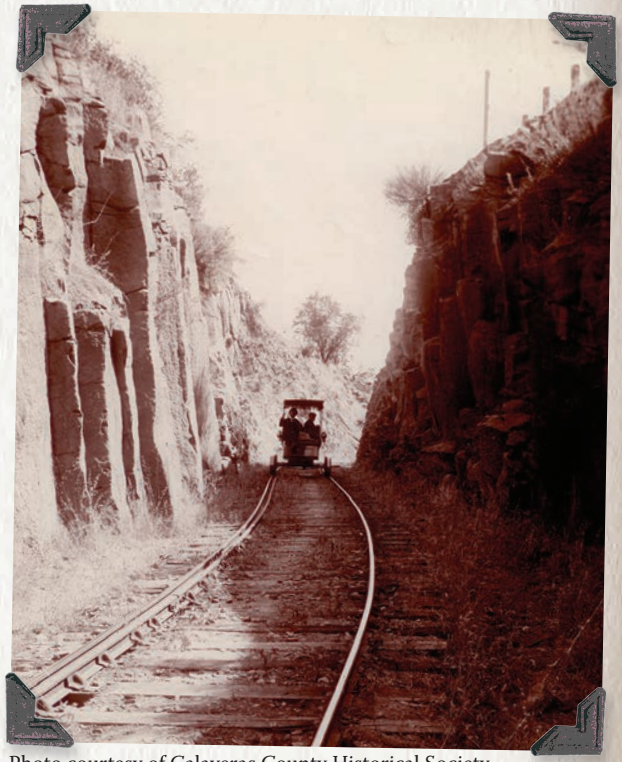


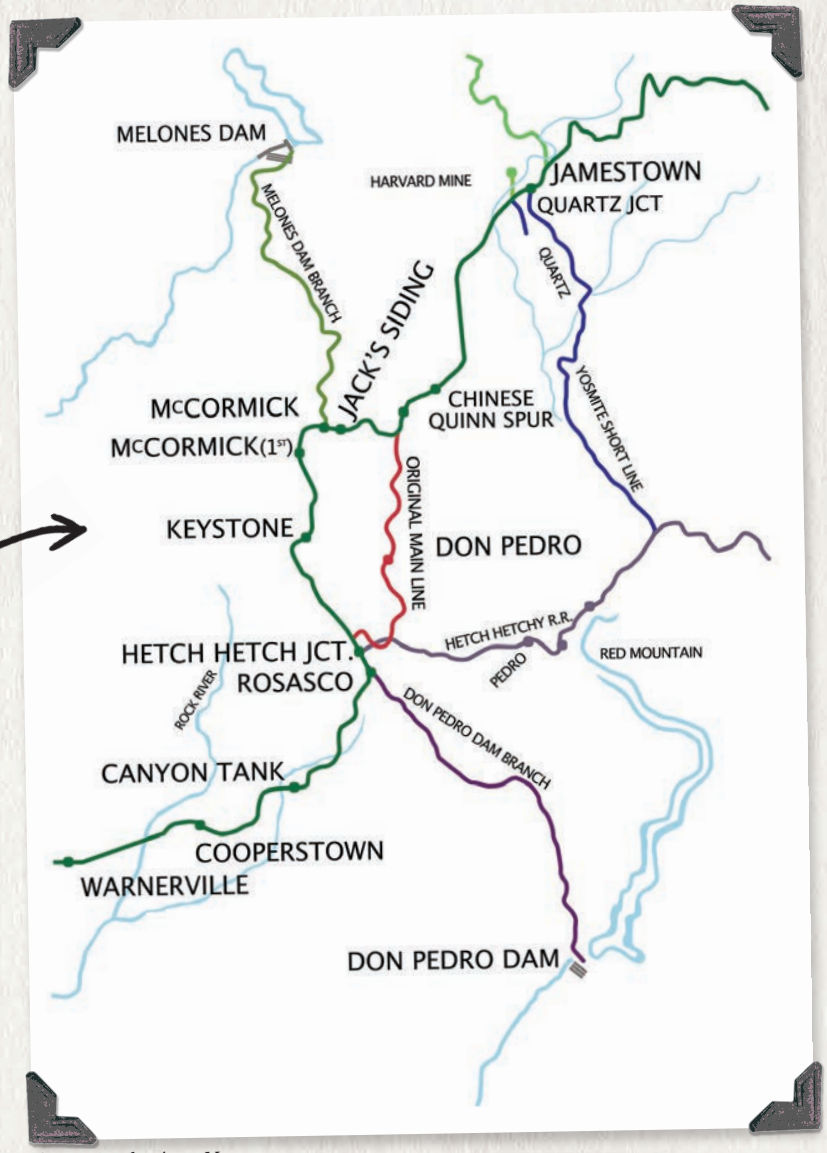
Photo courtesy of Calaveras County Historical Society

We'll write soon,
Ruth and Peter

December 24, 1898

Dear Diary:

The track has been rerouted away from Don Pedro. Now it goes around the Keystone Area. This new route will work better. In Don Pedro traffic jams would form. Not enough siding trackage had been built. Sidings allow some train cars or boxcars to move off to the side while others stay on the track. The boxcars with freight were in the way of the cars that needed to continue to the next depot. So the boxcars were unloaded and the freight was protected with tarps. Then the freight wagons would come to take away the freight. But sometimes the freight would be damaged or delayed. This was not an efficient way to move goods.

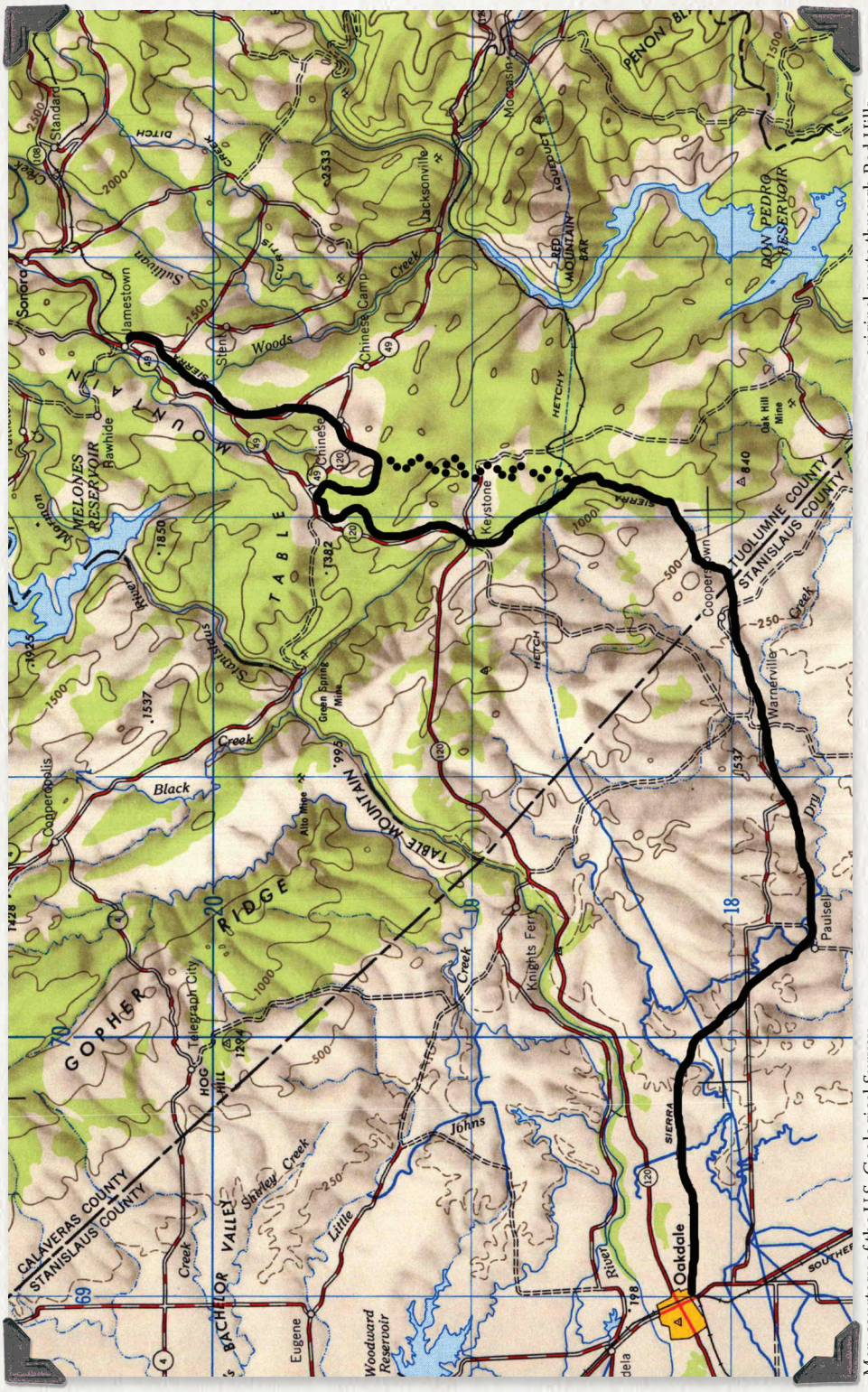


The green line shows the new route around the Keystone Area.

Illustration by Amy Hay

We'll write soon,
Ruth and Peter

Sierra Railway Route between Oakdale and Jamestown



July 28, 1899

Dear Diary:

The newspaper says there's a contract to build the railroad between Jamestown and Angels Camp!

It also says, "the road runs through a very mountainous country and one or two tunnels will be necessary." The Sierra Railway's Chief Engineer, William H. Newell, will need to think about engineering solutions.

San Francisco Call
July 28, 1899

To Construct a Railroad

Prince Poniatowski to Run a Line From Jamestown to Angels.

A contract has been let by T. S. Bullock, representing the West Coast Construction Company, to A. E. Buckman and R. B. Campbell of San Francisco to construct the railroad between Jamestown and Angels in Tuolumne and Stanislaus counties, a distance of about twenty miles. The road runs through a very mountainous country and one or two tunnels will be necessary.

The firm is now building a railroad for the same company on the line running from Sonora to Summerville, where a large gang of men and teams are now working. This work will be finished within a few months and will complete a broad gauge line from Oakdale clear through to Summerville.

From Summerville a narrow gauge railroad will be constructed up into the sugar pine district. Large sawmills and factories will be constructed at Summerville, from which point lumber will be shipped to different parts of the State.

This is one of the great enterprises that is now going on in the State of California under the direction of Prince Poniatowski and T. S. Bullock, and will very much improve the facilities for getting material, machinery, lumber, etc., into the mining districts of Tuolumne and Stanislaus counties.

California Digital Newspaper Collection, Center for Bibliographic Studies and Research, University of California, Riverside, http://cdnc.ucr.edu.

This part of the article talks about a narrow gauge railroad. We just learned about those!

Father pulled out maps of the area again. Now we are curious about how Mr. Newell will deal with the difficult terrain.

We'll write soon,

Ruth and Peter

Photo courtesy of Andy Bell, Center for Watershed Sciences, UC Davis

ANGELS LINE SECTION 1

FINISH

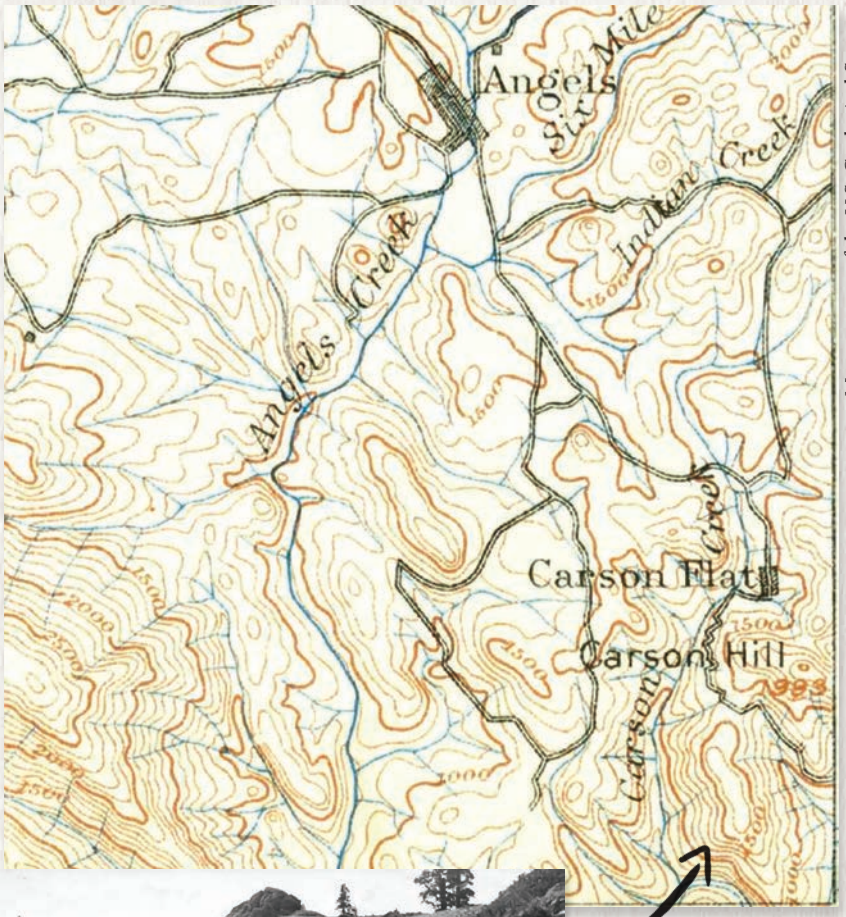
Map courtesy of the U.S. Geological Survey

Photo courtesy of U.S. Geological Survey Department of the Interior/USGS, photo by G.K. Gilbert, 1905

Photo courtesy of U.S. Geological Survey Department of the Interior/USGS, photo by G.K. Gilbert, 1905

Photo courtesy of Tuolumne County Historical Society

FINISH



Map courtesy of the U.S. Geological Survey

ANGELS LINE SECTION 2

X

START

Photo courtesy of U.S. Geological Survey, Department of the Interior/USGS
U.S. Geological Survey/photo by F.L. Ransome, 1898.

What I've Learned about Laying Track

Geographic Challenges in the Jamestown – Angels Camp Sierra Railway's Branch

Instructions: Using the topographical maps that show Jamestown to Angels Camp, describe two challenges the Sierra Railway will face and offer a solution for each. Use the information learned from class discussion and Ruth and Peter's diary.

1. Geographic challenge #1:

_____

_____

_____

Engineering solution:

_____

_____

_____

2. Geographic challenge #2:

_____

_____

_____

Engineering solution:

_____

_____

_____

Use the outline below to defend the need for parallel rails to ensure the smooth movement of a train. Provide a written reason and draw a diagram to explain or support your evidence.

Claim Statement: Parallel rails are needed to ensure the smooth movement of a train.

Reason 1:

_____

_____

_____

Drawing:

The Science behind a Steam Locomotive: Part 1

September 26, 1897, morning

Dear Diary:

Today we were talking to father and mother about how steam locomotives work. They explained that the fireman puts coal into the firebox. The heated air goes through fire tubes in the boiler. Water is around those fire tubes. The water is heated. It boils and makes steam. The steam is forced through a large pipe to cylinders. The steam goes into one end of the cylinders. This moves the piston in the cylinder. The piston is attached to the wheel. When the piston moves, the wheel also turns.

We'll write soon,

Ruth and Peter

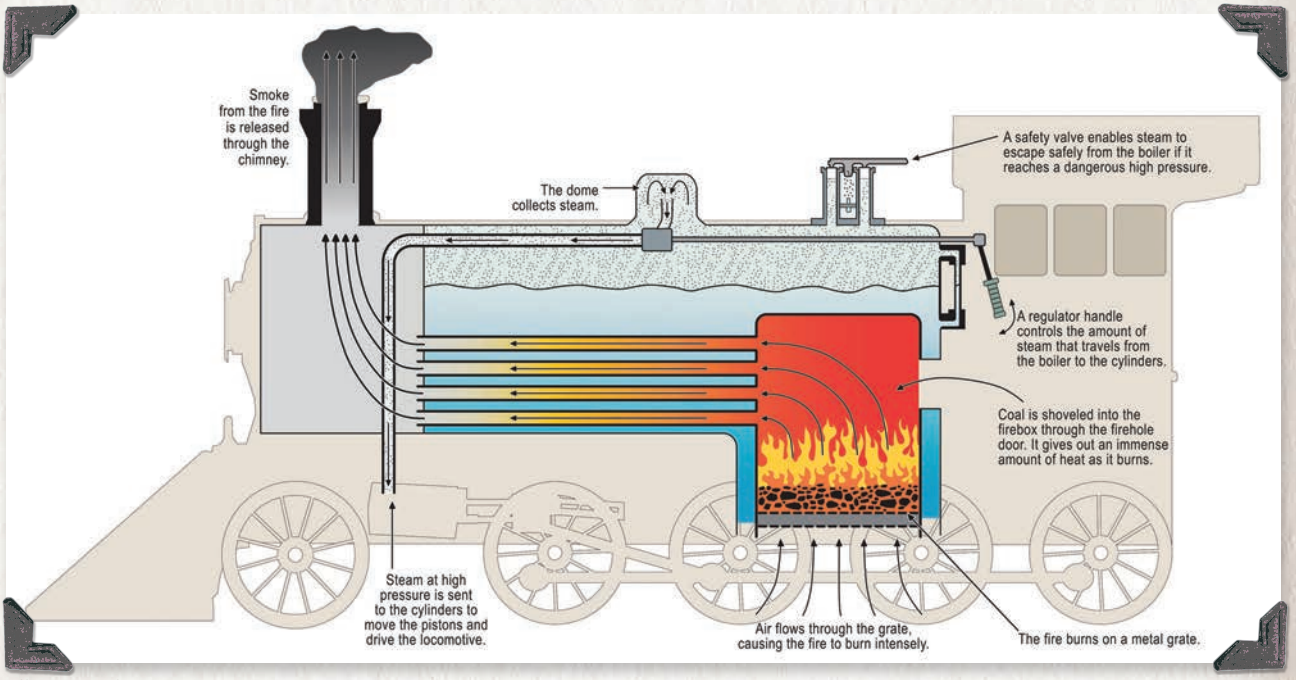
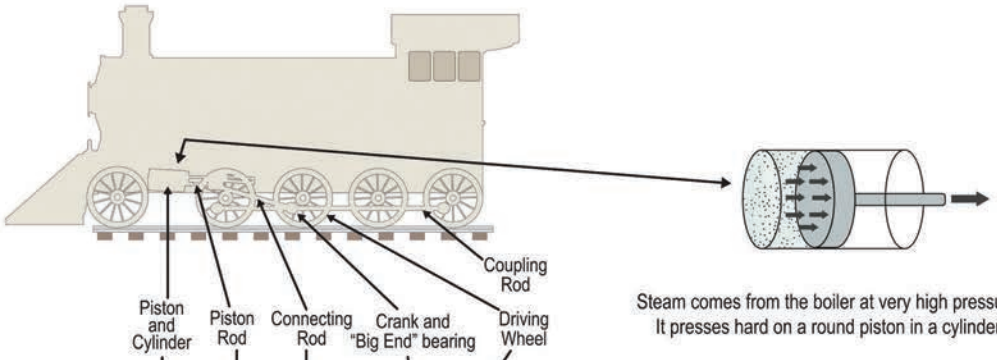
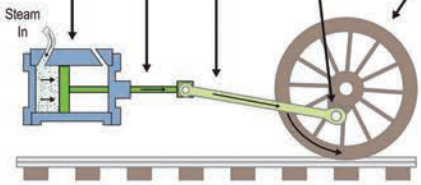


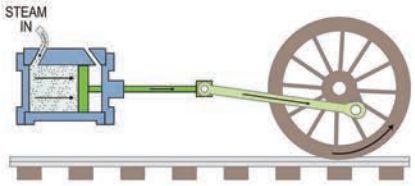
Illustration by Amy Hay



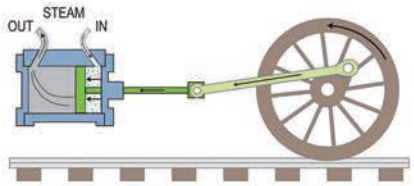
Steam comes from the boiler at very high pressure. It presses hard on a round piston in a cylinder.



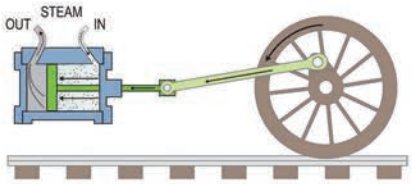
1. The piston and rod push on a connecting rod that turns the wheels.



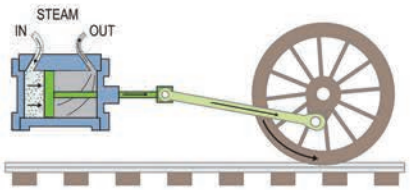
2. Steam enters the left end of the cylinder and pushes the piston to the right. This turns the wheel.



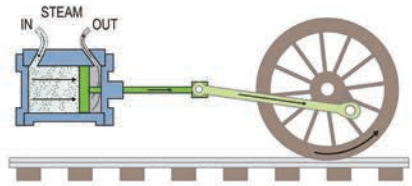
3. Steam now enters the other end of the cylinder and pushes the piston to the left. It pulls the connecting rod that pulls the wheel round in the same direction.



4. Steam is let out of the cylinder. It travels up the chimney as exhaust steam. The steam enters and exits both ends of the cylinder by a valve.



5. Steam is let into the left end of the cylinder again. The piston keeps turning the wheel the same way. The last bit of steam is let out through the chimney.



6. The piston continues to push and pull the wheel around. Steam continues to exit through the chimney, creating a steam engine's well-known chugging noise.

All of these steps are repeated as long as the train needs to keep moving.

Illustration by Amy Hay

The Science behind a Steam Locomotive: Part 2

September 26, 1897, evening

Dear Diary:

We have been thinking about energy in a steam locomotive. What happens when the fuel is burned? How does energy transfer? We found an article that explains some things.

We'll write soon,

Ruth and Peter

Combustion (burning) of coal. Heat from burning coal is transferred from the coal to the gas (air). This happens because they are at different temperatures. Heating transfers energy from the burning coal to the gas. Burning also transfers energy through sound (crackling) and light (flames).

The heated gas travels through the fire tubes. Water is in the boiler around the fire tubes. When the hot gas goes through the pipes, the heat is transferred to the pipe and the water. Heating of the water occurs. Energy is transferred from the hot gas to the metal pipes, and then to the water.

The boiling water results in steam (gas). The gas is forced through a large pipe to the cylinders. The pistons are inside the cylinders. The gas expands and pushes against the piston. A transfer of energy occurs from the gas to the piston.

The piston moves. This is called kinetic energy. The piston is attached to a rod. The rod is attached to the wheel. When the piston moves, the wheel also moves. Energy is transferred to the wheel and the wheel turns.

When the wheel turns, it rubs on the track and other moving parts. That rubbing causes heat. Some of the kinetic energy is transferred through heat to other parts. Those moving parts also make noise. Some of the kinetic energy is transferred through sound.

Gas (steam) is then pushed into the other side of the cylinder. This moves the piston back to its starting position. The wheel turns more since it's attached.

Some of the gas is let out of the cylinder. It travels up the smokebox and then out the chimney. When it does that, we hear "choo choo." Some of the energy is transferred by sound.

What I've Learned about the Science Behind a Steam Locomotive

In the spaces below, answer the two questions. Your answers to the first question do not need to be in complete sentences. Answer the second question by creating a diagram.

1. Provide at least two examples in which energy is transferred from place to place by sound, light, heat, or electrical currents. Describe where the energy starts and to where the energy is transferred. If you know, also write the type of energy.

a. Example 1:

_____

_____

_____

_____

b. Example 2:

_____

_____

_____

_____

2. Diagram one transfer of energy in a steam locomotive.

October 3, 1897

Dear Diary:

The track to Jamestown is almost complete! We read in the newspaper that only six miles are left. The newspaper says "Prince Poniatowski is much interested in the future development of Jamestown." A new hotel will be built. Houses will be built. A sewer system will be built. And facilities for the train will also be built.

The train will travel regularly throughout the region. Eventually it will go to Sonora and Angels Camp. And maybe even further! This made us wonder:

"What is going to happen with people and businesses?"

"What will happen with towns along the railroad?"

"What is needed right away by the people who migrate to a town?"

"What resources are needed to build a town?"

We know the Sierra Railway will transport many things. Freight will include mail, groceries, timber, lumber, apples, and cows going to market. Trains will also transport goods being mined in the foothills, such as coal, limestone, marble, and ore. And of course, people will be passengers on the train!

How will the train affect people and the towns they live in?

We'll write soon,

Ruth and Peter

San Francisco Call
October 3, 1897

Hurrying on to Jamestown

Work on the Sierra Railway Being Pushed With Great Energy.

The Rails Are Now Laid to Within Six Miles of the Terminus. The Officials of the Company Preparing for a Formal Opening of the New Line.

Prince Poniatowski is much interested in the future development of Jamestown. The corporations which he controls will see that the place gets a new sewerage system at once. Good streets will be constructed and a splendid hotel erected immediately upon the advent of the railroad. Extensive terminal facilities for the railway will be provided.

The new road will develop what is conceded to be the richest mining district in the State, and for that reason it has been as well constructed as money and men could make it.

The projectors of the Sierra Railway hope to have the road completed to Jamestown within ten days. Track has already been laid a distance of thirty-seven miles from Oakdale, leaving but six miles to lay until the terminus at Jamestown is reached. Of this stretch thirty miles are in operation, regular trains being run from Oakdale to Don Pedro.

The officials of the road will celebrate its formal entry into Jamestown with a sort of railroad housewarming. The citizens of Jamestown will probably remember the event as an epoch in the history of the little mining town, for since it became known that it was to be the important point of the Sierra Railway its citizens have prepared for big things. For many years Sonora has been the metropolis of the mother lode, as well as the county seat of Tuolumne County. Now they are saying that Sonora will have to play second fiddle to Jamestown, as it is away from the railway and over the divide.

California Digital Newspaper Collection, Center for Bibliographic Studies and Research, University of California, Riverside, http://cdnc.ucr.edu.

What I've Learned about Planning a Town

In the spaces below, answer the two questions by writing complete sentences. Each answer should contain at least three sentences.

1. Describe the relationship between natural goods produced by natural systems and the growth of towns in the era of the Sierra Railway.

_____

_____

_____

_____

_____

_____

_____

_____

2. Explain the relationship between movement of people and growth of towns.

_____

_____

_____

_____

_____

_____

_____

_____

A Network of Iron: Part 1

September 16, 1902, morning

Dear Diary:

We read in the paper today that the first Sierra Railway train traveled to Angels Camp yesterday! Now the Sierra Railway goes from:

— Oakdale to Jamestown
— Jamestown to Sonora
— Sonora to Carters/Summersville
— Jamestown to Angels Camp

The mines along the road to Angels Camp will be able to use the Sierra Railway. They can transport the ores extracted from the mines. They're probably excited to not have to rely on horse drawn freighters or mule teams.

The timber and lumber companies in the foothills near Carters/Summersville have been transporting their goods for two years on the Sierra Railway. The West Side Flume and Lumber Company is one of those. They transport their lumber to the valley.

The local newspaper has published interesting data about the Sierra Railway. We're going to look at it to figure out the story the numbers are telling us.

We'll write soon,
Ruth and Peter

San Francisco Call
September 20, 1902

Open to Angels

The Sierra Railway opened its line for regular traffic to Angels [September 15] placing this active mining town in regular rail communication with the outside world for the first time. Passengers are now relieved of the tedious, long and dusty ride to Milton. Leaving San Francisco at 9 a. m. you arrive at Angels at 5:45 p.m.

California Digital Newspaper Collection, Center for Bibliographic Studies and Research, University of California, Riverside, http://cdnc.ucr.edu.

San Francisco Call
July 4, 1897

Mines and Miners

The new Sierra Railroad, which is being rapidly pushed into the mining region of Mariposa and Tuolumne counties, is going to add a great new impetus to the revival of mining development now going on throughout these and other mother-lode counties. It will illustrate anew the immense advantage of railroad communication to any mining region. G. A. Helmore, who has mining interests about Sonora, which the railroad will reach this fall, was in the City last week and told of the new prosperity of old Tuolumne.

"There is an immense increase in mining activity up there," he said, "but it will be greatly increased by the new railroad. It has been a long stage trip for visitors and a long and expensive haul for freight. Railroad communication will bring in more capital, more buyers and make the mining resources better known. It will cheapen transportation for machinery and supplies and so aid development. Then it will result in many low-grade mines being opened and worked. There are hundreds of mines held by poor men who cannot erect mills. With railroad transportation they will work their claims and ship the ore to the Selby Smelting Works or to the smelter at Stockton, if one is erected there.

California Digital Newspaper Collection, Center for Bibliographic Studies and Research, University of California, Riverside, http://cdnc.ucr.edu.

A Network of Iron: Part 2

1. Study these two timetables

SIERRA RAILWAY SCHEDULE					
Departure	**Time**	**Departure**	**Time**	**Arrival**	**Time**
Carters/Summersville (Tuolumne City)	6:18 A.M.	Sonora	7:00 A.M.	Oakdale	9:50 A.M.
STAGECOACH SCHEDULE					
		Sonora	9:00 A.M.	Oakdale	7:00 P.M.

a. Which is faster?_____

b. How do you know that? _____

_____

c. Which do you think can carry more products and goods at one time? _____

_____

2. Study these three timetables

SIERRA RAILWAY SCHEDULE — DOWN TRAIN							
Departure	**Time**	**Arrival**	**Time**	**Arrival**	**Time**	**Arrival**	**Time**
Carters/ Summersville (Tuolumne City)	6:18 A.M.	Sonora	7:00 A.M.	Oakdale	9:50 A.M.		
SANTA FE SCHEDULE — NORTH BOUND							
Oakdale	10:35 A.M.	Stockton	11:20 A.M.	Berkeley	2:05 P.M.	San Francisco	2:30 P.M.
SOUTHERN PACIFIC SCHEDULE — SOUTH BOUND							
Stockton	1:10 P.M.	Oakdale	2:30 P.M.	Merced	4:10 P.M.		

a. What do you notice about the Oakdale station?

_____

_____

_____

3. Study these charts that describe products and goods transported by the Sierra Railway over time

Highlights of Products and Goods Transported by Sierra Railway Company of California Over Time (1 ton = 2,000 pounds)
(Data from Railroad Commission of the State of California Annual Reports)

Commodity	Total Freight Tonnage: Year 1900	Total Freight Tonnage: Year 1909	Total Freight Tonnage: July 1, 1913 – June 30, 1914	Total Freight Tonnage: July 1, 1914 – June 30, 1915
Grain	4,332	906	1,535	2,084
Flour	1,398	362	1,082	1,496
Hay	2,145	1,872	983	807
Fruits and vegetables	1,218	739	1,498	1,666
Livestock	202	27	124	390
Bituminous coal	2,897	406	485	685
Ores	5,512	13,862	13,158	12,332
Lumber	6,972	33,879	54,329	45,883
Petroleum and other oils	471	614	1,414	1,504
Sugar	400	123	569	574
Machinery	2,094	1,277	2,036	1,302
Household goods and furniture	336	146	639	651

a. List two changes you notice happening over time:

1) _____

_____

2) _____

_____

b. Does the Sierra Railway transport its own source of energy? _____

_____

c. List the two sources of energy you learned about in a previous lesson and that are also listed in the charts above. _____

_____

_____

A Network of Iron: Part 3

September 16, 1902, evening

Dear Diary:

Sierra Railway trains leave from Oakdale at 2:35 p.m. and arrive at Carters at 6:15 p.m. They leave from Carters at 6:18 a.m. and arrive at Oakdale at 9:50 a.m. The total travel time across 56.5 miles is a little more than 3.5 hours. The slightly shorter trip (46.1 miles) between Oakdale and Sonora on a stagecoach used to take 10 hours! Compare 10 hours to 3.5 hours! Wow! That's a big difference. The stagecoach would leave Sonora at 9 a.m. and arrive in Oakdale by 7 p.m. Now that the Sierra Railway is running, faster transportation is available. The freight cars carry more than a stagecoach. One train car can transport more in one trip than even mule trains with 10 mules pulling a large wagon. The Sierra Railway has made the transport of goods and people more efficient.

The Sierra Railway connects the foothills to the valley. It also connects the region to the country because two national trains also stop at Oakdale. The Atchison, Topeka and Santa Fe Railroad travels to many places in California, including Oakdale. It also goes to Kansas, a state, and New Mexico, a territory. The Southern Pacific Railroad also travels throughout California. It goes to Oakdale, Stockton, Merced, and Los Angeles. It also travels to Louisiana, which is another state. Since the Sierra Railway goes to Oakdale, it connects to this transcontinental route. That means the Sierra Railway connects California's gold and timber to the rest of the country!

Since 1886 the Southern Pacific Railroad has had refrigerated cars. This keeps fresh food from spoiling during transport.

We think that over time the Sierra Railway will transport different goods. Different resources may be extracted from mines. More or less timber will be harvested in the foothills. People in town will have different businesses and needs. New migrants will want other things. All of these goods can travel on the Sierra Railway. They can be bought or sold locally or throughout the country since the three railroads meet in Oakdale.

Map courtesy of the U.S. Geological Survey

We found an article about fuel used in steam locomotives.

The fireman has to burn fuel in order to heat the air (gas). That heated gas travels and heats the water in the boiler. The water boils and forms steam. The steam makes the pistons and wheels move. The Sierra Railway locomotives started burning coal, and then switched to oil recently. Oil is cheaper to buy than coal. Both are natural resources that come from the ground. Coal is mined from the ground and oil is pumped from the ground.

Pumping oil and mining are important and necessary, just like cutting trees for lumber. We need these resources in order to build our towns.
We'll write soon,
Ruth and Peter

What I've Learned about a Network of Iron

In the spaces below, answer the two questions. Answer the first question by drawing a diagram. Answer the second question by writing at least three sentences.

1. Diagram the concept of the need for energy to transport goods using the Sierra Railway as an example.

2. Describe the importance of the connection of the Sierra Railway to transcontinental routes.

December 18, 1926

Dear Diary:

We have gathered for the holidays. Our father, mother, and our own families are here. We have been talking about all the changes that have happened in the area in the last 20 years. Of course we are now adults. We both have children of our own. We have been reading our diary about the Sierra Railway to our children. They have enjoyed learning about the Railway's history, especially since they are familiar with the train.

Many local and world events have happened since we last wrote. In 1906, the San Francisco area had a very large earthquake. It was awful. The shaking made buildings crumble. Gas mains broke, causing fires. More destruction occurred due to the fires than the shaking.

Cars became popular starting in the 1910s. They use gasoline as their fuel. In California in 1912 construction began on a statewide road system. Trains continue to transport people and freight, but stagecoaches aren't used as much.

The Sierra Railway has also gone through changes. They are captured in the news clipping on the next page.

Not sure when we'll write next,

Ruth, Peter, and our children

In 1913 the Sierra Railway depot in Jamestown burned down. The depot was rebuilt, but unfortunately all the company's paper records burned in the fire. In 1919 the Sierra Railway was in a movie called "The Red Glove." The next year it was in another movie. This is a new source of income for the railroad. Hopefully it will continue! The surrounding towns also benefit because the film crews and actors need food and lodging during the filming.

While the Sierra Railway continues to transport goods across three counties, it makes fewer trips than in the past. Many of the mines closed during World War I. Fewer train trips are made because there is less freight to transport. The Angels Branch in Calaveras County still transports people and mined goods. Transportation of people and freight continues between Oakdale in Stanislaus County and Tuolumne City in Tuolumne County. Timber and lumber products from the foothills are still transported locally. At Oakdale, the Sierra Railway makes connections with the two national trains. The goods are then transported throughout the country.

Most recently the Sierra Railway began serving another industry—the dam construction business. The growing population in the San Francisco Bay Area needs more water. Expanding towns require more water to grow food, meet the basic needs of people, and to create power. As a result, three new local dams have been built.

The Sierra Railway helped people build the O'Shaughnessy Dam. It moved construction materials from Oakdale to Hetch Hetchy Junction where it met up with the Hetch Hetchy Railroad. The freight was transferred at this depot to the Hetch Hetchy Railroad and carried to the dam site.

Two short Sierra Railway branches were built to support the construction of two other local dams. An eight-mile branch was built to transport materials and workers during construction of Don Pedro Dam on the Tuolumne River between 1921 and 1923. This dam is being used as a power plant this year, 1926. A seven-mile branch was also built to support the construction of Melones Dam on the Stanislaus River.

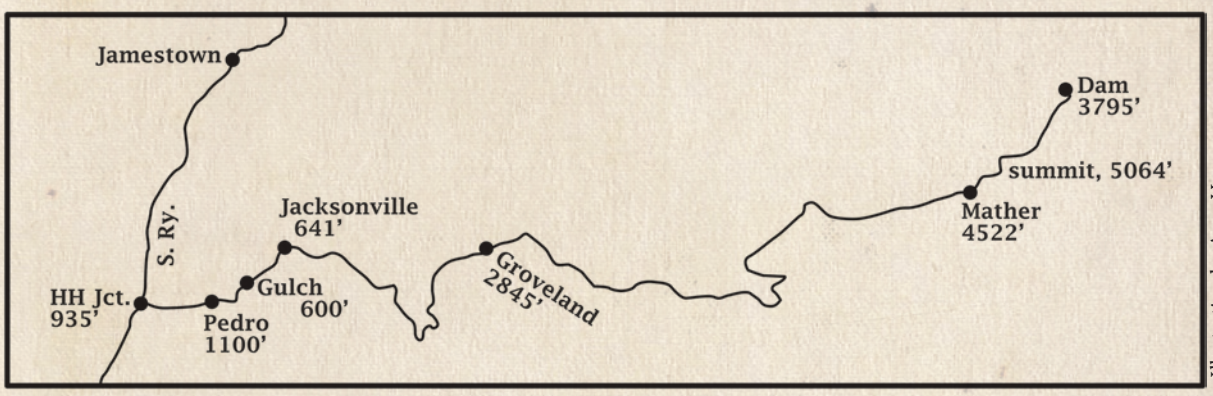


Illustration by Amy Hay

When a dam is built the environment is changed. A lake forms behind the dam. The amount of water that flows down the river is changed. When the Don Pedro Dam was built, a whole community was flooded behind the dam. Of course the people were able to move first. But the plants and animals that depended on the river may not have survived. The dam also blocks free movement along the river. Fish can no longer easily swim up and down the river because the dam is in the way. At the same time, a new habitat is created – a lake – which is usually used as a reservoir to store water for people and agriculture. The lake may now meet the needs of different animals that move in to the area, and other plants that need more water.

Also, dams convert energy from potential to kinetic energy by forcing water to move through a specific channel where a turbine is moved by the moving water. The kinetic energy from the turbine can be captured, converted to electrical energy, and used to power homes and businesses.

Don Pedro Dam

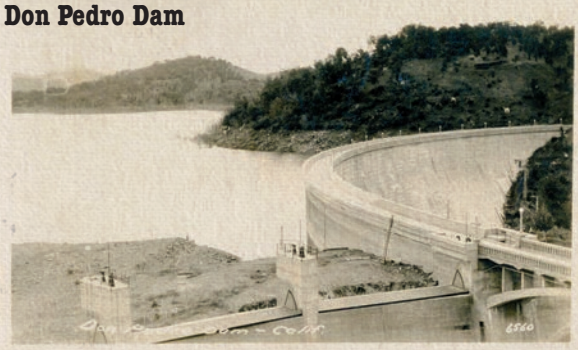
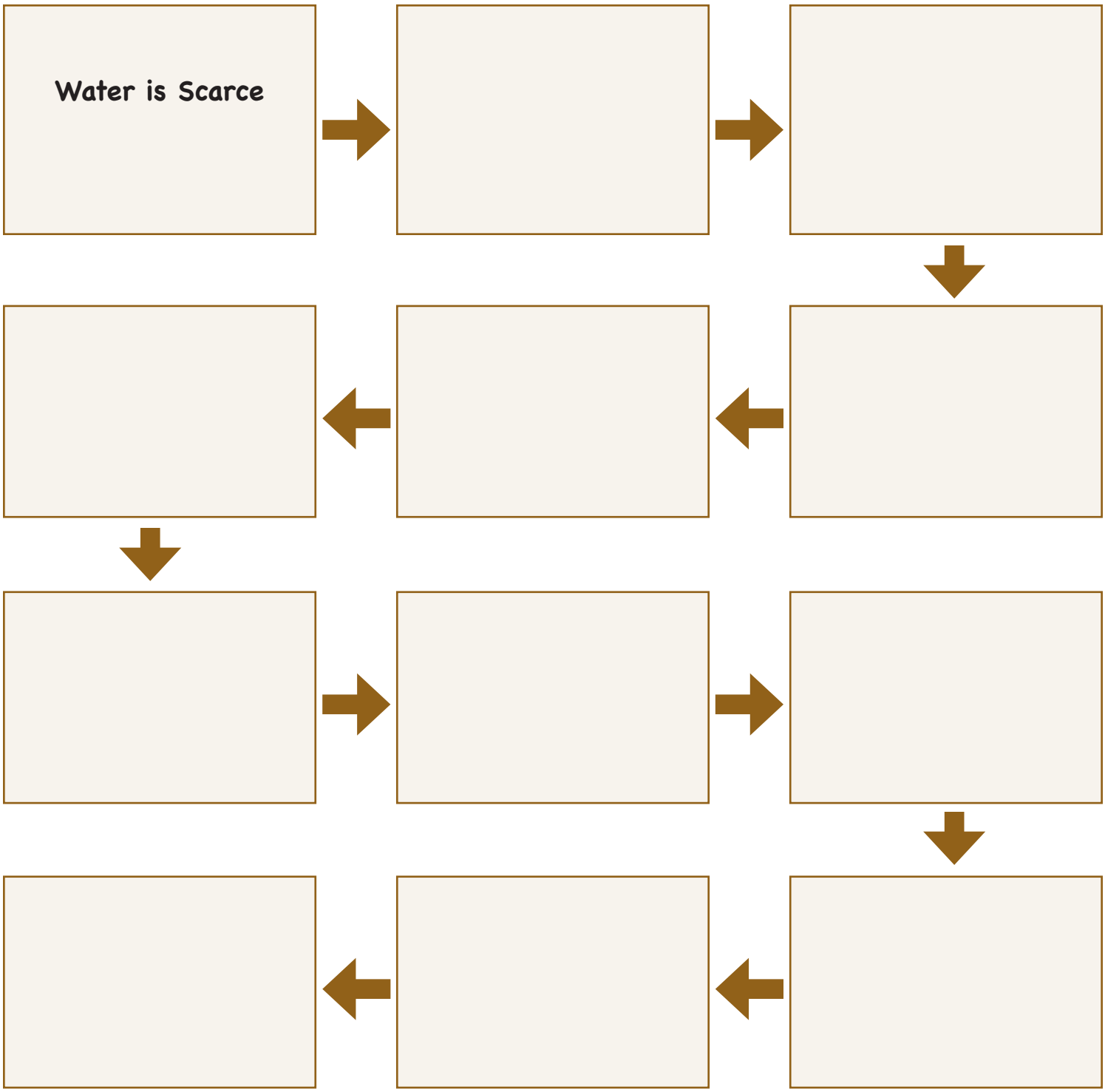
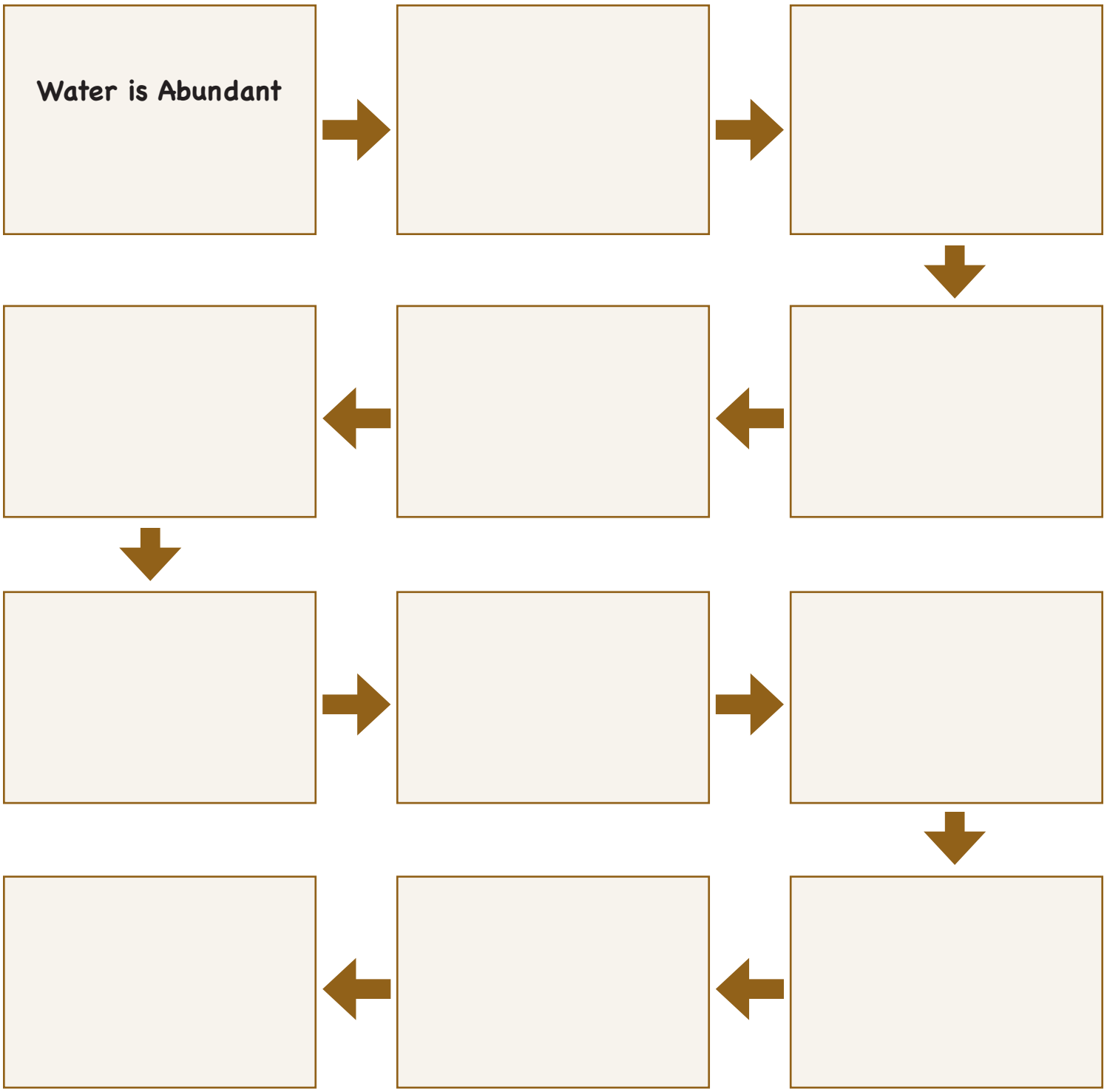


Photo courtesy of CA-A-0014, WaterArchives.org

Cause and Effect Charts




Water is Abundant

What I've Learned about Driving Forces of Resources

In the spaces below, answer the two questions using complete sentences. Each answer should contain at least three sentences.

1. Describe how the Sierra Railway adapted over time as a result of changes to industry in the area.

_____

_____

_____

_____

_____

2. Describe the importance of water in the growth of towns and cities.

_____

_____

_____

_____

_____