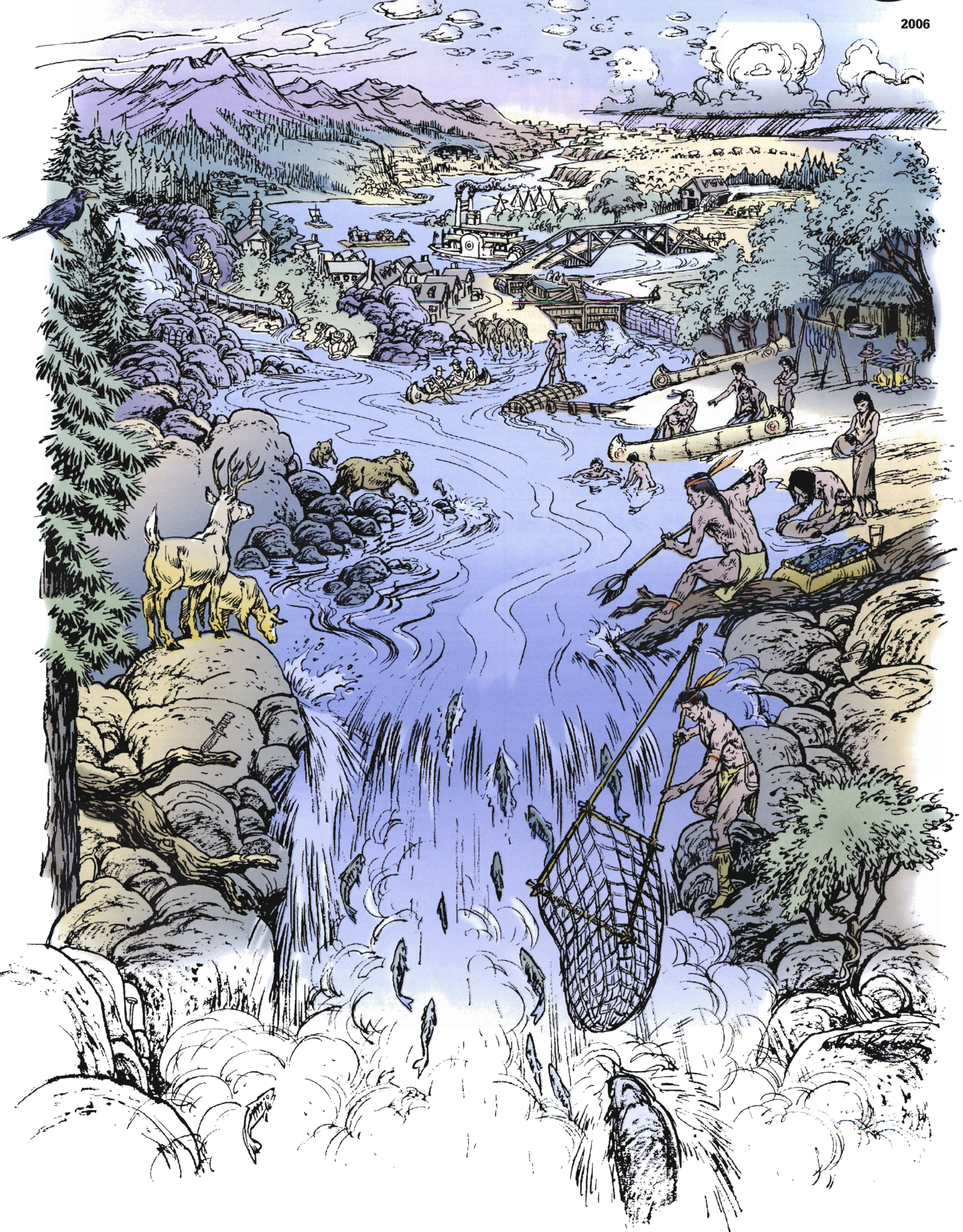


METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

WATERWAYS

A SUPPLEMENTAL WATER EDUCATION PROGRAM FOR FIFTH-GRADE STUDENTS

2006





THE PEOPLE BEFORE COLUMBUS

THE GREATEST RIVER OF ALL

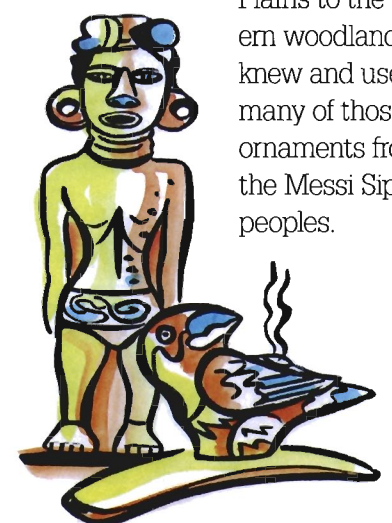
The Mississippi River is one of the most important rivers in the United States. That is why the Winnebago people called it the *Messi Sippi*, which means the Great River. The Mississippi runs from near Lake Superior in the north to the Gulf of Mexico far to the south. Many other rivers, called tributaries, run into it.

This Great River flowed through land that was warm and received plenty of rain. It was an ideal place for people to settle. Its broad valleys had fertile soil left behind from many floods. Many plants provided food, and the early people could grow crops in the wide river plains. There were more than enough plants, animals and fish, so finding food was easy. The way the rivers connected with each other made it easy to travel from one area to another to trade and learn new skills.

A great culture, called the "Mound Culture" grew up along the Mississippi River and its tributaries more than 10,000 years ago. Some villages had great mounds as their center point. Sometimes these mounds were used for burials. Other times the most powerful family lived on them. We do not know why some mounds were built.

The people of the *Messi Sippi* traded with others from Lake Superior to the Gulf of Mexico, and from Georgia to Oklahoma. They mainly traded jewelry and other ornaments because they had all the food they needed to survive. People from the Great

Plains to the eastern woodlands knew and used many of those ornaments from the *Messi Sippi* peoples.



ARTIFACTS TELL THE STORIES OF ANCIENT WAYS

We know how people lived in 1776 during the American Revolution because we can read their letters, books and diaries. But Native Americans who lived in this country before the Europeans arrived in 1492

did not have writing. How do we know about how they lived? One way is to study the objects they left behind, such as their pottery, tools, housing, artwork and even their garbage. We call these objects artifacts. The people who use these objects to learn about the past are called archaeologists. An archaeologist who finds a large pot with a gourd beside it, for example, might guess that they were for holding and scooping water.

We have also learned a lot about the Pre-Columbian Native Americans through their stories told by one generation to another generation. This section of *Water Ways* will give you some interesting stories about how Native Americans, before Christopher Columbus' time, used water.

PEOPLE EVERYWHERE COMMUNICATE THROUGH ART

Pre-Columbian Native Americans often communicated with others through pictures. They drew scenes on pottery and animal skins. They wove designs into blankets. Some of these pictures told stories about things that happened: buffalo hunts, battles or strange events like the blackening of the sun at midday. Other pictures asked the spirits for help.

Many people painted or drew pictures on rocks. Pictures painted on stone are called pictographs. Pictures carved into stone are called petroglyphs. These rock pictures often marked the place where something important happened or they were part of a ceremony.

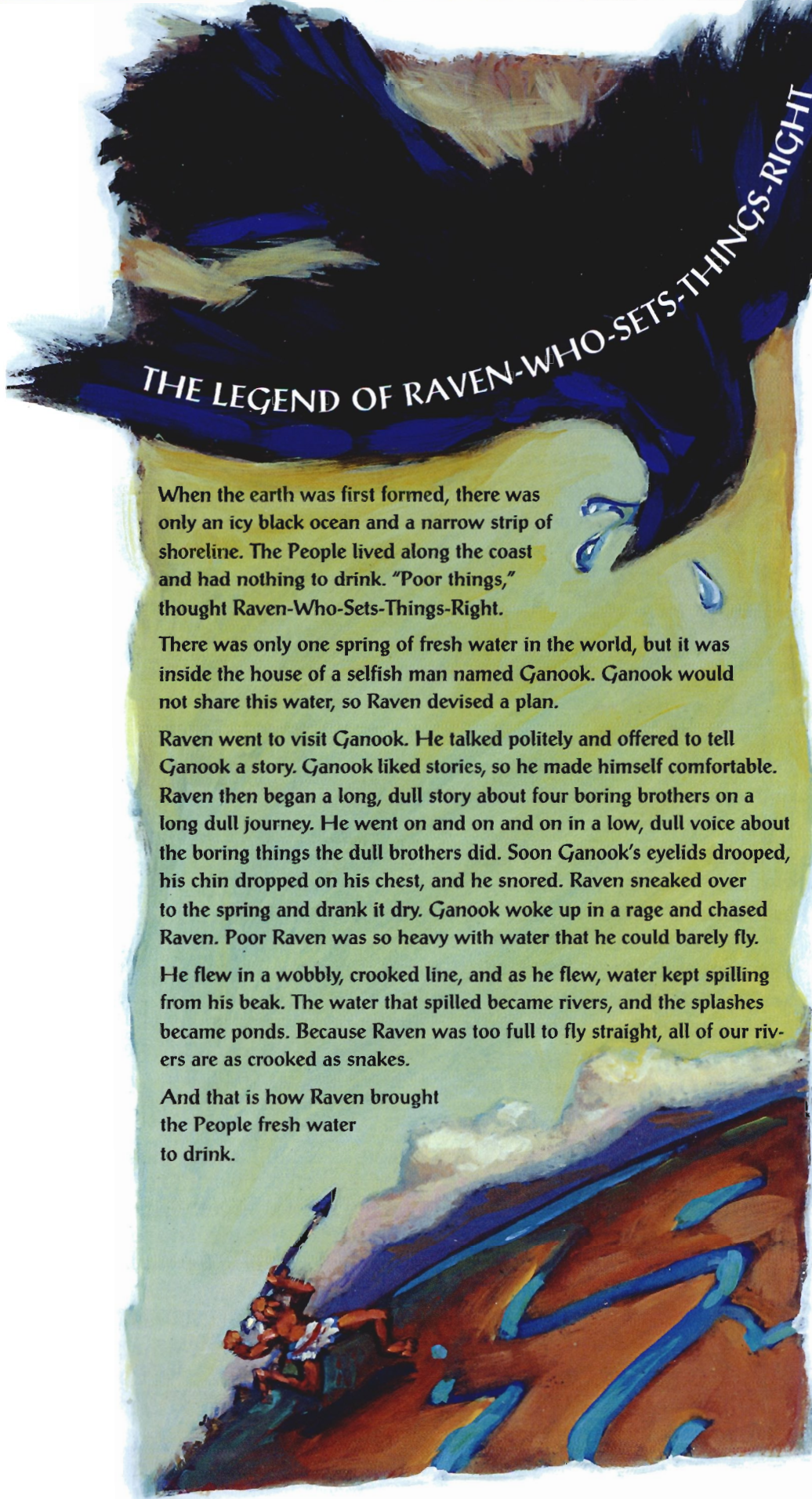
Native Americans explained nature by telling stories called legends or myths. *The Legend of "Raven-Who-Sets-Things-Right"* (see facing page) tells how ponds and rivers were formed. It was told by the Chinook people who lived in the Pacific Northwest. Other tribes had their own legends to explain the world around them (see pages 4 and 5).

ONE PICTURE IS WORTH A THOUSAND WORDS

CAN YOU TELL what the Pre-Columbian Native American might have been saying about water in this petroglyph? _____

Create your own pictograph below it, using water as the subject. Write a sentence to explain it: _____





THE LEGEND OF RAVEN-WHO-SETS-THINGS-RIGHT

When the earth was first formed, there was only an icy black ocean and a narrow strip of shoreline. The People lived along the coast and had nothing to drink. "Poor things," thought Raven-Who-Sets-Things-Right.

There was only one spring of fresh water in the world, but it was inside the house of a selfish man named Ganook. Ganook would not share this water, so Raven devised a plan.

Raven went to visit Ganook. He talked politely and offered to tell Ganook a story. Ganook liked stories, so he made himself comfortable. Raven then began a long, dull story about four boring brothers on a long dull journey. He went on and on and on in a low, dull voice about the boring things the dull brothers did. Soon Ganook's eyelids drooped, his chin dropped on his chest, and he snored. Raven sneaked over to the spring and drank it dry. Ganook woke up in a rage and chased Raven. Poor Raven was so heavy with water that he could barely fly.

He flew in a wobbly, crooked line, and as he flew, water kept spilling from his beak. The water that spilled became rivers, and the splashes became ponds. Because Raven was too full to fly straight, all of our rivers are as crooked as snakes.

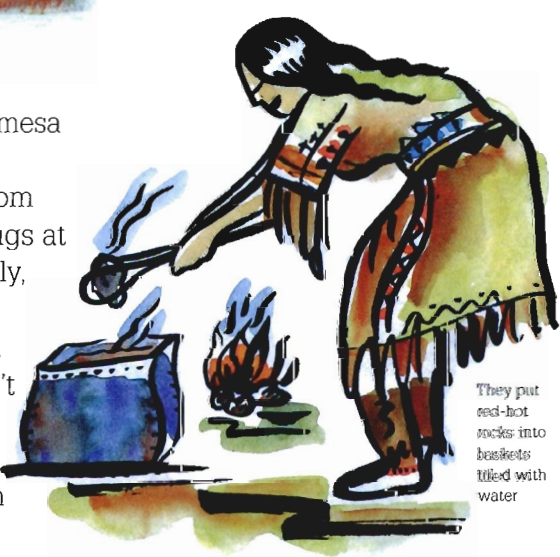
And that is how Raven brought the People fresh water to drink.

GATHERING WATER MAY BE HARDER THAN YOU THINK

In the Pre-Columbian days, water did not flow into the homes of the Native Americans. They had to search for water.

The Anasazi, or "Ancient Ones," who lived in the Southwest desert had a difficult time getting water. Their villages

were built on cliff sides or mesa tops. The Anasazi women climbed down the cliffs from their homes to fill water jugs at springs or pools. Amazingly, the cliffs had no steps—only small, almost invisible, toe holds. The women didn't even seem to touch the walls with their hands as they climbed back up with their jugs full of water.



The people who lived in the Northeast, some of whom were later called the Massachusetts, the Narragansett and the Wampanoag, usually lived near streams or lakes. Though they lived near water, it was still sometimes difficult for them to gather water in the family's water jar. Many days, they had to break the ice or melt snow over a fire to collect water.

WATER BASKETS

Many early people did not have pottery. The Paiute who lived in the Great Basin area wove water-tight baskets, like the one below, to carry water. They made them watertight by sealing them with pine resin or tar. These baskets would burn if held over a fire, so how do you think people boiled water in them? Look at the picture below for the answer.

DANCES AND SONGS BROUGHT LIFE-SAVING RAIN

Water was very important to the early Native Americans. The less water they had, the more sacred it became to them. They often used water to purify and cure. For instance, the Paiutes of the Great Basin bathed to get rid of bad spirits and to take away bad thoughts.

Native Americans who lived in dry climates held rainmaking ceremonies to bring the life-giving rain. The Zuni and Hopi of the Southwest asked the Great Spirit for rain during a Snake Dance. The snake



was the guardian of the spring and it took messages to the rain gods. Before the dance, the dancers caught snakes and gave them a shampoo of sacred yucca water. After the dance, they released the snakes to deliver their message. When the dark rain clouds appeared in the sky, the people knew that their prayers had been heard and the Great Spirit was pleased.

Today, modern Americans try to bring rain by flying above clouds and sprinkling them with special chemicals. This practice, called cloud-seeding, sometimes works and sometimes doesn't.

Here is a Zuni rain chant from a Snake Dance.

*In the west at Flower Mountain
A rain priest sits
His Head feathered with cumulus clouds.
His words are of clouds over Itawana.
"Come let us arise now."
Thus along the shores of the encircling ocean
The rain makers say to one another.
Aha ehe, aha ehe!*

*In the south at South Lake Mountain
A rain priest sits
His head feathered with mist.
His words are of covering Itawana with rain.
"Come let us go."
Thus in all the spring
The rain makers say to one another.
Aha ehe, aha ehe!*

*"The beautiful world germinates.
The sun, the yellow dawn, germinates."
Thus the corn plants say to one another.
They are covered with dew.
They bring forth their young.
Aha ehe, aha ehe!*

People who lived in brush houses in the hot desert south of the Anasazi cliff dwellings had to be very careful how they used water. This story about a Papago girl's use of water is surely different from the way you use water!

WATER IN THE DESERT:

Making Every Drop Count

In the land of tall, large cactus, the water near the Papago girl's small village dries up in the winter, and she must fetch her family's daily water supply from far away.

She wakes up before daylight, fills a big net with water jugs, and hangs the net over her back. Then she and the other girls run far over the desert to the mountains where they know of a pool of water. (The water is red from the earth, and it turns their food red, but it tastes good!) They fill their water pots, put them in their nets and run all the way back to the village. Although they run, they do not return until the sun is high in the sky.

Her mother pours some water into the cooking pot to begin the day's stew. They do not bathe because water is too precious, but each family member washes his or her face. They save the rest of the water for drinking. Instead of washing their dishes with water, they scrape the bowls and pots with a stick.

The Papago share their water despite its scarcity. Outside every hut is a water jug with a gourd ladle, and any thirsty guest may take a drink.

Her family bathes in a special sweat house built to trap heat and steam. They build a fire on the stone floor; then they take out the ashes and pour water on the hot stones to create steam.



WATER, CLIMATE AND LAND SHAPED THE LIFESTYLE OF PRE-COLUMBIAN NATIVE AMERICANS

Living near water was very important to Native American tribes all over the land that is now the United States.

The Gabrieliños, who lived in the Southern California area, lived around streams, marshes, estuaries and oceans, as well as mountains and forests. They built their villages by fresh streams. Food was plentiful: they had grasses with nourishing seeds, trees full of nuts and acorns, shellfish that was easy

to gather, fish of every kind, ducks and birds in the marshes, and deer, rabbits and game in the forests. Available water and mild weather enabled them to stay in their villages all year round, taking short journeys into the hills to gather acorns or hunt game. It was not so for all Native Americans in this country.

FARMING AND IRRIGATION PRACTICES HELPED NATIVE AMERICANS WITH FOOD SUPPLY

The Gabrieliños had so much food they did not need to farm. Yet most Pre-Columbian Native Americans had to grow crops to survive. They depended on three crops that they called the "three sisters"—beans, corn and squash.

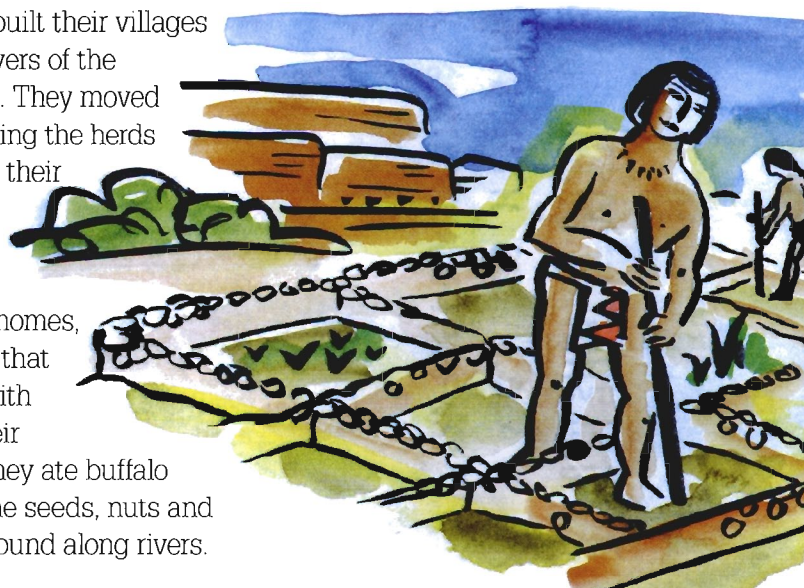
The Anasazi could grow enough of the "three sisters" to feed villages as large as 1,000 people. The Zuni and Hopi, who have lived in the desert since the Anasazi, continued these practices.

They needed water for these crops, so they had to think of ways to gather enough water to make the crops grow. The Zuni and Hopi designed small gardens that looked like waffles to capture the scarce rainfall. In the dry stream beds that only carried water when it rained, they built stone dams to slow down the water and trap the soil it was carrying. After soil built up behind these dams, they planted crops in it.

The Anasazi had an amazing way to irrigate their plants. They built low earthen dams that channeled rain water into

The people of Great Basin—now called the Ute, Paiute and Shoshone—lived in rugged canyons and sandy deserts with hot, dry summers and cold winters. The largest lake in their area was salty, and most of the water that was good to drink dried up in hot weather. Not many animals lived there, particularly in the dry months. Because of this, the people moved from place to place throughout the year to find water to drink, animals to hunt and places to harvest seeds, nuts, roots and cactus fruit. They lived in small bands rather than villages because there was not enough food or water in one area to support large groups of people.

The Great Plains is a huge prairie of tall grass where rolling fields stretch beyond eyesight. In Pre-Columbian times, the Native Americans we now call Sioux, Pawnee, Crow, Blackfoot and others built their villages along the rivers of the Great Plains. They moved often, following the herds of buffalo to their watering holes. They lived in portable homes, called tipis, that they took with them on their journeys. They ate buffalo meat and the seeds, nuts and fruits they found along rivers.



THE SWALLOWER OF CLOUDS AND THE HERO TWINS

WHEN THE WORLD WAS YOUNG, a giant lived above the canyons. He caught the clouds and squeezed them into his mouth. He was called the Swallower of Clouds.

Because he swallowed the clouds, the snow and rain stopped falling; the mist above the mountains disappeared; the springs dried up; the crops wilted; and the People began to suffer and die.

The Hero Twins were friends of the People, and they killed the monsters that harmed them. When the Hero Twins saw what was happening, they went to kill the Swallower of Clouds.

They threw him over the cliffs, and he turned into a great red stone. Now the clouds could pass over the mountains, and the rain and snow fell once again. The mist returned; the springs returned; crops grew again; and the People were well and happy.

Now when the Zuni see the great red stone that was the Swallower of Clouds, they are thankful for the deed of the Hero Twins and the life-giving rain.



This Zuni story tells about a time when the rains stopped coming.

The Pre-Columbian Native Americans looked at the earth's resources as gifts. They hunted and fished in their territory, but they did not think they "owned" the land or the water. This legend from the Abenaki of the Northeast woodlands tells of someone taking away the water in the river that ran by a village.

TAKING CARE OF THE ENVIRONMENT

The Shasta of the Northwest coast were very aware of the importance of protecting a valuable food source—salmon. They relied on the salmon, herring and other fish that "ran" upstream in the spring. The fish were so thick at some small waterfalls that the people scooped them right from the river. These fish runs even brought tribes from all over together for a few days of fishing, storytelling and sharing of food.



The Shasta thought the plentiful salmon were put on earth to feed their people, so it was very important for them to protect the salmon. When the salmon swam upstream each year to lay their eggs, the first fish had to pass untouched. They caught the second fish, had a ceremony to dry it, and then the village people ate it. Afterwards, the bones were returned to the water so there would always be more salmon. Only then could the Shasta catch all the fish they needed for food.

KOLUSCAP AND THE WATER MONSTER

Once there was a village of people who lived by the side of a stream. One morning they awoke and found the stream dried up. Life became very hard for them.

They sent someone upstream to find out why the stream had stopped. He found a great dam across the stream, guarded by a Water Monster.

The Water Monster kept all the water for himself and would not share any with the People who lived downstream. The village prayed to their creator, who sent Koluscap to help the people.

Koluscap walked up the dry stream bed and saw the dead fish and turtles and frogs.

When he came to the dam, he asked the Water Monster for water, but a big voice thundered, "GIVE HIM NONE, GIVE HIM NONE!"

Koluscap became angry. He stomped his foot, and the dam began to crack. He stomped his foot again. Then he started to become taller and taller, taller even than the Water Monster. Koluscap struck the dam with his club, and water began to flow out. Then he grabbed the Water Monster and squeezed him until his eyes bulged out like a bullfrog.

"Now," said Koluscap, "you will no longer keep water from the People. But I will take pity on you and let you live in this stream as a bullfrog." Then Koluscap threw him in the stream. To this day, you can still hear the bullfrog say, "Give him none, give him none!"

As the water flowed down to the village, some people were so happy that they dove into the water, and they still live in the river as fish, sharing the water with every living being.



wide stone-lined canals. The canals led to the fields, and when they opened a gate, water ran to their crops. They could take rain water from one place and move it to a field far away. Some of their biggest villages even had stone pools, called reservoirs, where they could save water for rainless times.

The Paiute who lived in a valley on the western edge of the Great Basin (that we now call the Owens Valley) built their villages on one of the only year-round rivers in the Great Basin. There were the only permanent villages in the region. They learned how to provide food for many people. The wild grasses in the valley had healthful seeds for them to eat. To help the grasses grow, the Paiute dug irrigation ditches and brought the water to the places where the grasses grew best.

The Owens Valley Paiutes also tamed the soil with a wooden tool that did not disturb the roots.

This way, more grasses would grow every year.

To protect the grasses forever, they only harvested half an

irrigated area each year and the other half the next year. That way the grasses stayed plentiful because the soil stayed fertile.

Irrigating the grasses also helped them catch fish. When they diverted the streams to

water their grasses, the fish left in the stream bed were easy to catch. With plenty of grain and easy-to-catch fish, the valley supported nearly 2,000 Native Americans.

CHIEF SEATTLE SAYS...

This type of puzzle is called a double crostic. Fill in the clues, then transfer the numbered letters to the bottom. The answer is a quote from Chief Seattle.

CLUES

10 — 25 "Trickster" figure from the tribes of Pacific Northwest who, according to a legend, created the world's rivers and streams

13 — Ancient picture carved in stone

1 — Native Americans who lived in the Southern California area

21 — Relics of ancient civilizations that are studied by archaeologists

8 — The name of the largest river and river system in the U.S. (in Winnebago)

11 — Modern technique for bringing rain. Involves putting chemicals in the clouds

12 — The area of the U.S. that consists largely of grassy prairie

7 — A Zuni rainmaking ceremony

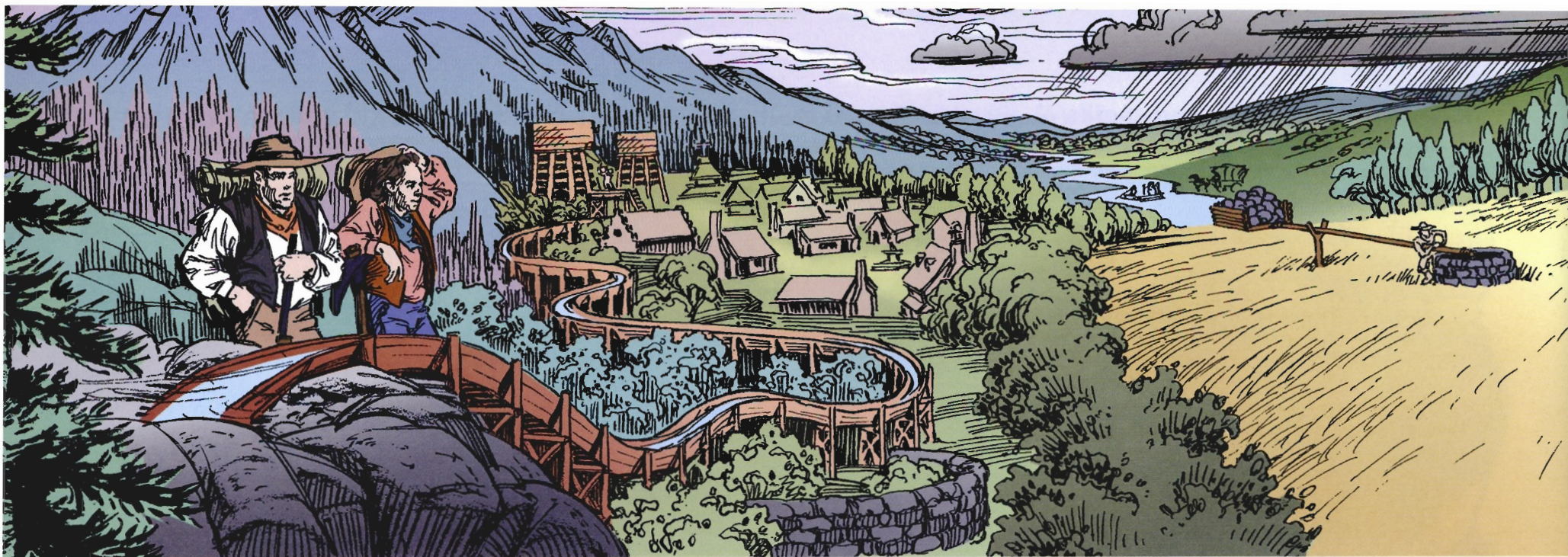
9 — Ancient Native Americans of the Southwest whose name means "Ancient Ones"

18 — They flow from the mountains to the sea

28 — The People of the Southwest who told the story of the "Swallower of the Clouds and the Hero Twins"

19 — 16 — 23 — 26 — 24 — 6 — 22 — 3 — 20 — 17 — 27 — 28

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28



SETTLING THE COLONIES

WATER IN THE NEW COLONIES

When the Europeans came to America, they changed life in this land—and the land changed them. Water played a major role in their new lives, and their new life changed America's water resources.

Rivers shaped the settlement of this country. From Massachusetts to Georgia, people settled along rivers, especially where they entered the sea. Rivers offered food and rich soil for farming. Rivers provided a way to travel, since there were no roads. Rivers allowed people to trade with other inland settlers. On the seacoast, harbor cities could trade with other settlements along the

coast and in the far away cities of Europe. Rivers provided energy for mills and factories.

Of course, not everything related to water was good. Swampy areas bred mosquitoes, and sometimes they carried the deadly disease, malaria. Sometimes drinking water became polluted, and people got sick or died. Floods and storms could wash away crops and wipe out towns.

As you read how people lived in colonial times, think about the role water plays in your own life and community.



ESTUARIES: SHARED BY MANY EARLY SETTLEMENTS AND COLONIAL CITIES

Question: What do Boston, New York, Philadelphia, Wilmington, Washington, Jamestown, Norfolk, Charleston and Savannah all have in common?

Answer: They are all early American cities that grew on a site where a river empties into the ocean.

"Estuaries" occur where rivers flow into the ocean, and fresh-water and saltwater mix. We call an estuary's mix of salty and fresh water "brackish" water. An estuary is a perfect home for fish and birds. The size of an estuary depends on the geography of the area and the height of the tides: flat areas with high tides have the largest estuaries, and they often have huge saltwater marshes or deltas.

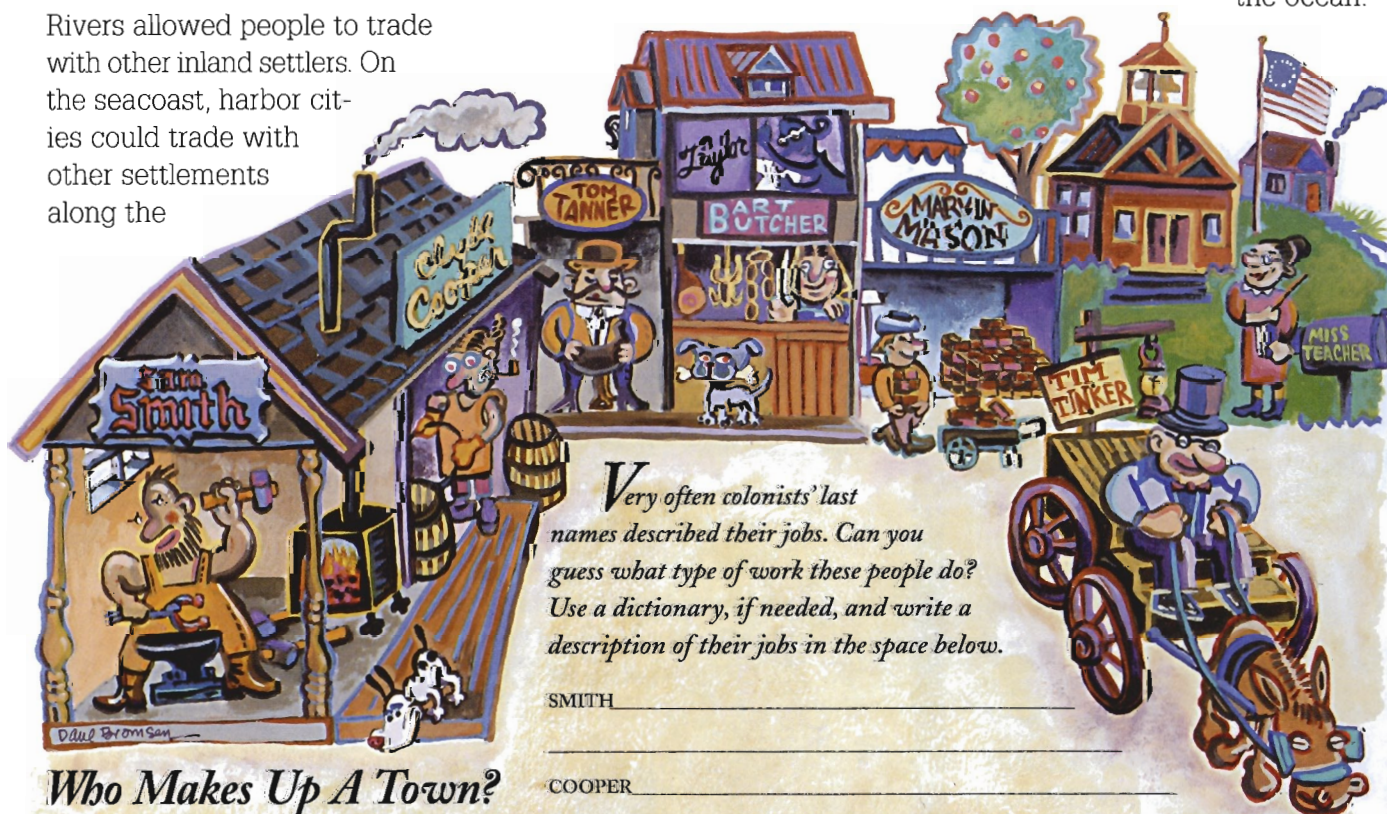
Most early American cities grew near an estuary. This happened because estuaries provided food, fresh water and trading opportunities. The colonists could travel the rivers to trade with other inland people, and they could travel the oceans to other continents and other seaports.

The first permanent English settlement in America was Jamestown, Virginia. It was located in an estuary that people called the "tidewater" because much of the region was flooded during high tide. The land around Jamestown had so much native food that the original settlers wrote, "The woods were full of game. The oysters in the bay were over a foot long, and the strawberries were four times bigger and sweeter than those in England."

CONTRASTING LIFESTYLES: IS WATER GOOD OR BAD FOR YOU?

The European settlers and the Native Americans used water very differently. The Native Americans started each day with a plunge in the river to keep clean. The settlers hated the idea of bathing. They just splashed their hands and face, and that was all their washing for the day.

The Native American's favorite drink was water. They believed it kept them healthy. The settlers, on the other hand, almost never drank water. In the crowded cities of Europe, where they came from, the water was polluted with untreated waste.



Very often colonists' last names described their jobs. Can you guess what type of work these people do? Use a dictionary, if needed, and write a description of their jobs in the space below.

SMITH _____

COOPER _____

TANNER _____

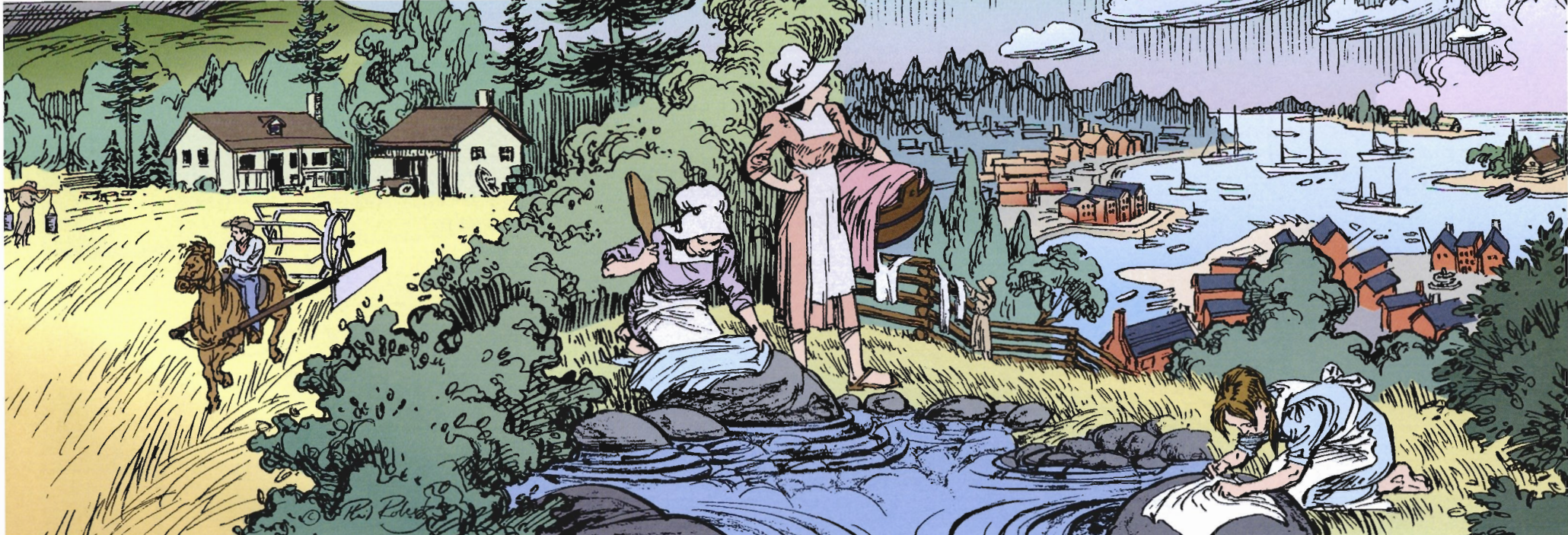
MASON _____

TEACHER _____

TINKER _____

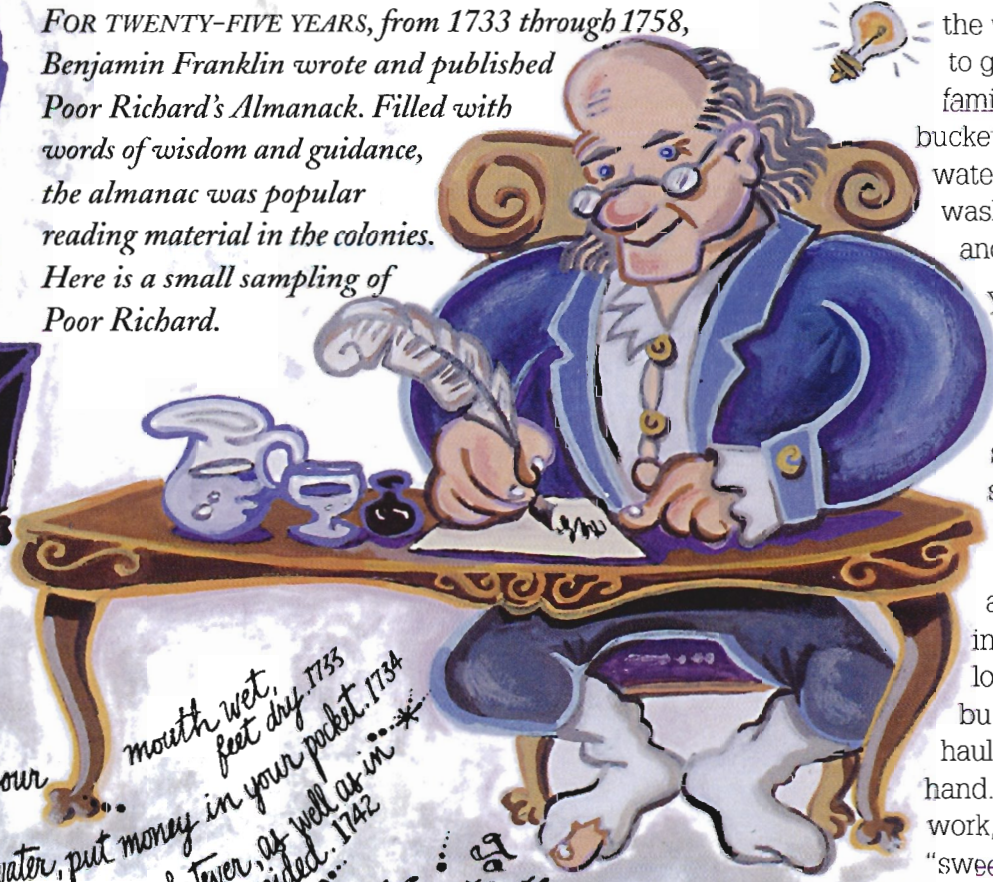
Who Makes Up A Town? It's All In A Name

Many of our last names come from different cultures, and sometimes these names describe a profession in a different language. For example, Schumacher means "shoemaker" in German. Find out if your name means something in another language. Below, make up a name that might be given a water engineer.



The Wit & Wisdom of Poor Richard

FOR TWENTY-FIVE YEARS, from 1733 through 1758, Benjamin Franklin wrote and published *Poor Richard's Almanack*. Filled with words of wisdom and guidance, the almanac was popular reading material in the colonies. Here is a small sampling of *Poor Richard*.



Keep your
 * Drink water, put money in your pocket. 1734
 * mouth wet, feet dry. 1733
 Excess in all things
 Meat & drink, is to be avoided. 1742
 if your head is wax, don't
 walk in the Sun. 1749
 * In the boiling pot,
 the flies come not. 1752
 * In Rivers & bad Government,
 the lightest things swim at
 the top. 1754

THE WATER WELL

If you lived in colonial times, you would go to the well each morning to get water for your family. It took a lot of bucketfuls to get enough water for cooking, washing, the animals and the garden.

Your well would be a hole in front of your house, lined with stones, and surrounded by a stone wall about three feet high to keep children and animals from falling in. Some people lowered a wooden bucket on a rope and hauled it up hand over hand. This was hard work, so others built a "sweep"—a long lever—to make the job easier.

Settlers got their water from wells instead of streams because well water was—and still is—cleaner. It is cleaner because animals and decaying plants cannot reach it. It is also more reliable even during long dry periods, when many streams dry up.

Wells reach down to underground "aquifers." Aquifers are places where groundwater collects, and they are often sandy pockets areas underneath layers of soil and rock. All along the East Coast of North America, the water table is very high, so underground water lies close to the surface. As a result, the colonists did not have to dig deep wells to reach water. Many wells were fifteen feet deep or less. In other parts of the country, such as the Southwest, the underground

water can be very deep. There can even be huge aquifers underneath hot, dry, deserts. Do you think there are aquifers in Southern California? Do you think people still use wells today?

A BATH EVERY SATURDAY: A LITTLE WATER WENT A LONG WAY

In colonial days, people did not use as much water as we do today. They were not concerned about water conservation; it was just too much work to haul a lot of water!

In those days, there were no kitchen sinks or bathrooms. Most people lived in small, one-room houses with no privacy for bathing. Many of them just stood at the well to wash—even in the snow! The lucky ones had a pewter basin they could bring inside to warm over the fire.

In later years the wealthiest people in the colonies had a fieldstone bathtub! Once a week—or less—the family would fill the tub with water heated in a big kettle hanging over a fire, and the entire family would take turns bathing.

In colonial days, there was more than enough water to go around, but it was hard to use. Today,



using water is easy, but there is not enough water to go around. As a result, we must conserve water whenever we can.

(continued on page 10)

Make up your own saying about water pollution, protecting water or conservation.

The Wit & Wisdom of

(FILL IN YOUR NAME)

“ _____ ”

They had learned that drinking water and frequent bathing caused terrible diseases and often killed people. Instead, they drank fermented drinks, such as cider, beer, ale or wine. The fermenting killed the disease-causing germs, so it helped keep the people healthy.

When the colonists had nothing else to drink except water, they were shocked to find that their health improved! The water in

the colonies was still pure and disease-free since there were so few people there.

Water is still the healthiest drink in the world, as long as it is not contaminated. Today in this country, we have very high water quality standards and we almost never have waterborne diseases. Yet many places in the world do not have good water quality, and drinking water can cause health problems.



Geographic Regions and People Groups Before Columbus

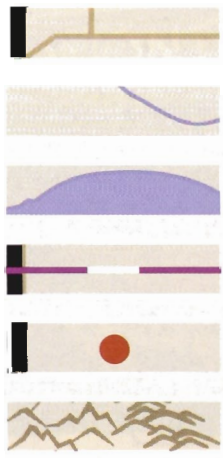


WATERWAYS

Mapwork Activity Pages

LEGEND

You'll notice that the large map above looks pretty blank. That's because it's your job to fill in the missing pieces. You will be instructed by your teacher to complete the map through mapwork activities. Hang the finished poster in your room if you'd like.



- States**
- Rivers**
- Lakes**
- Trails**
- Cities**
- Mountain Ranges**



LAUNDRY DAY

Washing clothes was very difficult in colonial days. Laundry day came once a week in some houses, once a month in others. The hard work of laundry was almost always done by women. A woman would get up before dawn to fill the big kettle with water from the stream. She would heat the kettle over the fire, melt some lye soap (made from ashes and animal fat), then plunge her arms into the near-boiling water to scrub the clothes. She pounded them on rocks in the river to get them clean, rinsed them in the stream and spread them on the fence to dry in the sun. It took all day, and children were usually glad to find some other chore to keep them busy on laundry day.

The simple tasks were hard for colonists. They had to carry all the water they needed for household use from a stream. Imagine their daily routine of washing, bathing, cooking and cleaning. How would it be different from yours? These tasks are still difficult in other parts of the world. Find out how people in less developed countries meet their water needs.

ROADS, FERRIES AND BRIDGES

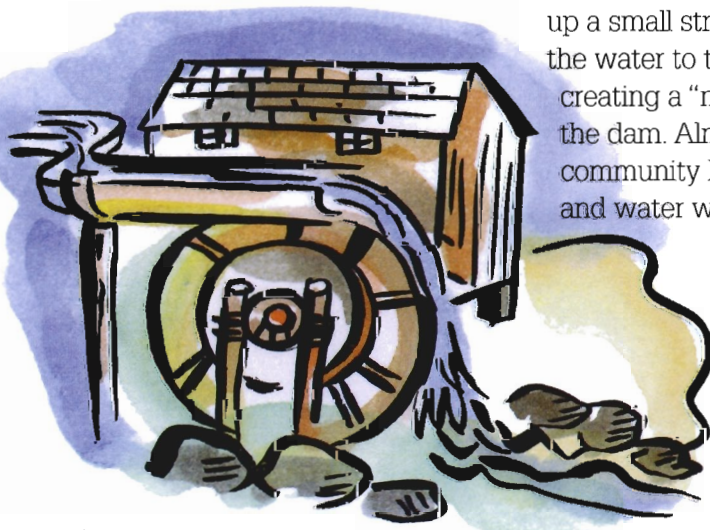
The early colonies did not have many roads. The few roads they did have usually led from town to river or farm to river, rather than from town to town. It was easier to carry goods on boats than by wagon because the roads were so rough. Building roads through the forests and swamps was very hard and slow work.

It was also a challenge for wagons to cross streams and rivers. If the streams were shallow, people could "ford" them—they could ride right through the water. When the

water was high, though, such as after heavy rains or in the spring when the snow melted, many rivers and streams were too dangerous to ford. Then people just had to wait to make their journey—sometimes for weeks!

Bridges could have solved some of these problems, but most of the colonists were not engineers. They did not know how to build a bridge that could cross a river more than 100 feet wide. Sometimes they tried to support the bridge with a pole in the middle, but a heavy storm could wash the bridge away. As a result, there were many ferries for carrying people and wagons across rivers. Ferries were often just flatboats poled by a nearby farmer for a fee. They were not very stable when loaded with a wagon and horses, and they often sank.

When the colonists learned to build bridges with trusses



(cross supports) that could support a lot of weight, road travel became easier. Most bridges, though, were still fragile and narrow. They were covered to keep their wood from rotting. The bridge traffic was "one way," and "speed" limits kept them from shaking apart.

A COLONIAL SING-ALONG

Colonial songs often had catchy tunes and were fun to sing. Perhaps the most familiar colonial song is "Yankee Doodle." Make up a song about water and sing it to the tune of "Yankee Doodle." Accompany yourselves on "colonial" instruments you build yourself. You can find other colonial songs in books at your library.

Yankee Doodle went to town,
A ridin' on a pony
Stuck a feather in his cap
and called it macaroni.
Yankee Doodle keep it up,
Yankee Doodle dandy.
Mind the music
and the step and
with the girls be handy.



Here are a few colonial-type instruments you can make and play

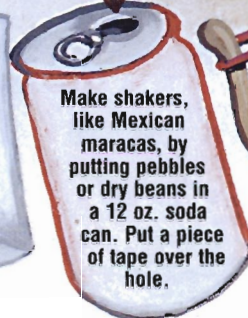


Make a drum of an empty coffee can with a plastic top.

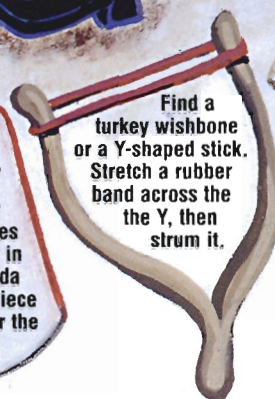
Beat it with a pencil.



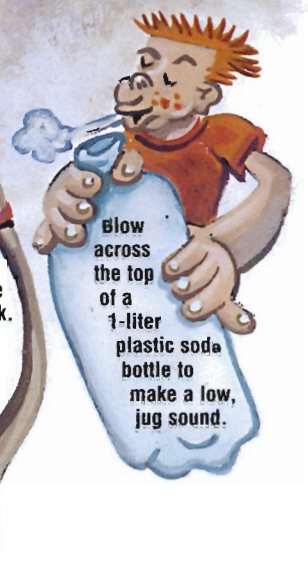
Hold a comb gently against your lips and hold a piece of wax paper tightly against the back of the comb... a homemade kazoo!



Make shakers, like Mexican maracas, by putting pebbles or dry beans in a 12 oz. soda can. Put a piece of tape over the hole.



Find a turkey wishbone or a Y-shaped stick. Stretch a rubber band across the Y, then strum it.



Blow across the top of a 1-liter plastic soda bottle to make a low, jug sound.

THE WATER WHEEL

The early colonists built mills for sawing lumber and grinding flour and corn. They got the power for those mills from a water wheel. They often dammed up a small stream to channel the water to the water wheel, creating a "mill pond" behind the dam. Almost every small community had a mill pond and water wheel.

A water wheel did not need a steep waterfall to produce power. Instead, they often used a "mill race," a trough

that carried the water along a nearly level course. When the mill race reached the water wheel, the water poured onto it, filling buckets near the top of the wheel. The weight of the water in the buckets turned the wheel, and the buckets dumped their water when they reached the bottom. The power of the

wheel came from the water's weight, not the speed of the flowing water in the river or stream. Fancier mills used gears to speed up the turning of the shaft or to give it more power.

FIRE!!

Most houses in early colonial times were made of wood, and they had fires burning in open fireplaces almost all the time. Chimney fires were common. Fire in one house could spread easily and destroy whole sections of towns and cities.

How could the colonists fight the fires? There were no pressurized water systems with fire hydrants like we have today. They had no way to hook up a hose and spray a fire... they didn't even have hoses.

Most communities fought fires with a bucket brigade. As soon as the fire call went out, everybody ran to the fire with all the buckets they could carry. The people formed a long line between a water source, such as a river, and the fire. They passed full buckets to the fire and empty buckets back to the water. The best these fire brigades could usually do was keep other buildings from burning; they could rarely save the one that was already on fire.



THE FIRST PUBLIC WATER UTILITY

Do you know how your city gets its water? Do you know where that water comes from? Since you live in Southern California, it probably comes from some place hundreds of miles away, and it is delivered to you by a public utility.

Long ago, in the mid 1700s, the people in Bethlehem, Pennsylvania knew how important their water supply was to them. They chose the site of the town because it had a good spring nearby. But the town was built uphill from the spring, and getting water from the spring to the people was not easy. Every drop of water had to be carried up the hill in buckets. Finally, they asked two townspeople, who were engineers, to devise a better system. Since water power ran oil and bark mills nearby, they thought the water could do even more work for the townspeople. The two men built a water tower and two holding tanks throughout the city. They built pipes, made of hemlock tree trunks, to carry the water. A pump, powered by the water, pushed the water along. On June 27, 1755, water was successfully pushed through the pipes to the people. Bethlehem Water Works, the first American public utility of its kind, had begun. How do you think your water utility differs from the water utility in colonial Bethlehem?

EARLY AMERICAN WATER POLLUTION

In early colonial days, many visitors from Europe were very curious about how the settlers lived on this "wild, new" continent. In those days, most of the forests in Europe and England had been cleared, and wood was precious. These visitors were horrified at the wastefulness of the early American sawmill. One-fifth of every log ended up as sawdust or unused wood. The sawdust was dumped in marshes and streams, making the water cloudy and polluted and driving away the fish and wildlife.

In colonial days, this continent seemed like a "land of plenty" with unlimited, never-ending resources like forests and water. The colonists could not imagine running out of them. Today, people in this country are more careful about not polluting waterways with industrial

FUR TRAPPERS LEARN ABOUT THE INTERIOR WILDERNESS



While the cities and farms of the East Coast were growing and thriving, some brave Europeans ventured into the interior of the new land. The French had the best access to the interior through the Quebec province in Canada and the Great Lakes. Later, the American fur trappers began to hunt and trap animals, and they became known as the Mountain Men.

The trappers came to know the uncharted rivers and streams farther west. They set up trading posts, often at the sites of old Indian trading centers. Most of the trading posts were along rivers, since the rivers were the only means of transportation through the wilderness. One of these trading posts, St. Louis, grew up on the opposite side of the river from the cultural center of the Indian mound culture.

The fur trade made New Orleans an important and rich city. Traders would take their furs (and later other producers) down the Mississippi River to New Orleans, where ships would take them to destinations on the East Coast and in Europe. Water was the only practical way to move goods.



waste. We understand that clean water is a valuable and limited resource. Yet we still have many polluted bodies of water. Can you think of ways we are polluting the water today? Do you know of any bodies of water that are polluted? How does the colonist's attitude towards water (and pollution) differ from that which you read about the Native American's attitude?

OUTGROWING THE EAST COAST

By the early 1700s, America no longer seemed like the land of plenty. Colonists had cut down forests to clear fields for farming and to sell timber. Once the best land was being farmed, farmers drained the water from wetlands and swamps to produce more land.

This draining of wetlands and cutting of forests gradually changed the ecosystem. In their natural state, forests and swamps soak up the melting snows of winter, releasing it slowly during the summer. With fewer forests and swamps, there was more flooding in the spring and more drought in the summer.

These changes made farmland less productive. To make matters worse, the soil began losing its fertility because most farmers did not rotate crops or let their fields lie empty after several years of planting. People did not worry too much about the soil because there was always more land farther west. It just had to be cleared.

Year after year, farmers pushed the frontier farther west, until they met the Great Barrier: the Appalachian and Allegheny Mountains. There was no practical way to get over them: no roads or trails and no rivers, just steep mountains. Only the most rugged individuals ventured over them, carrying their possessions on the back of a mule.

Some Colonial School Games

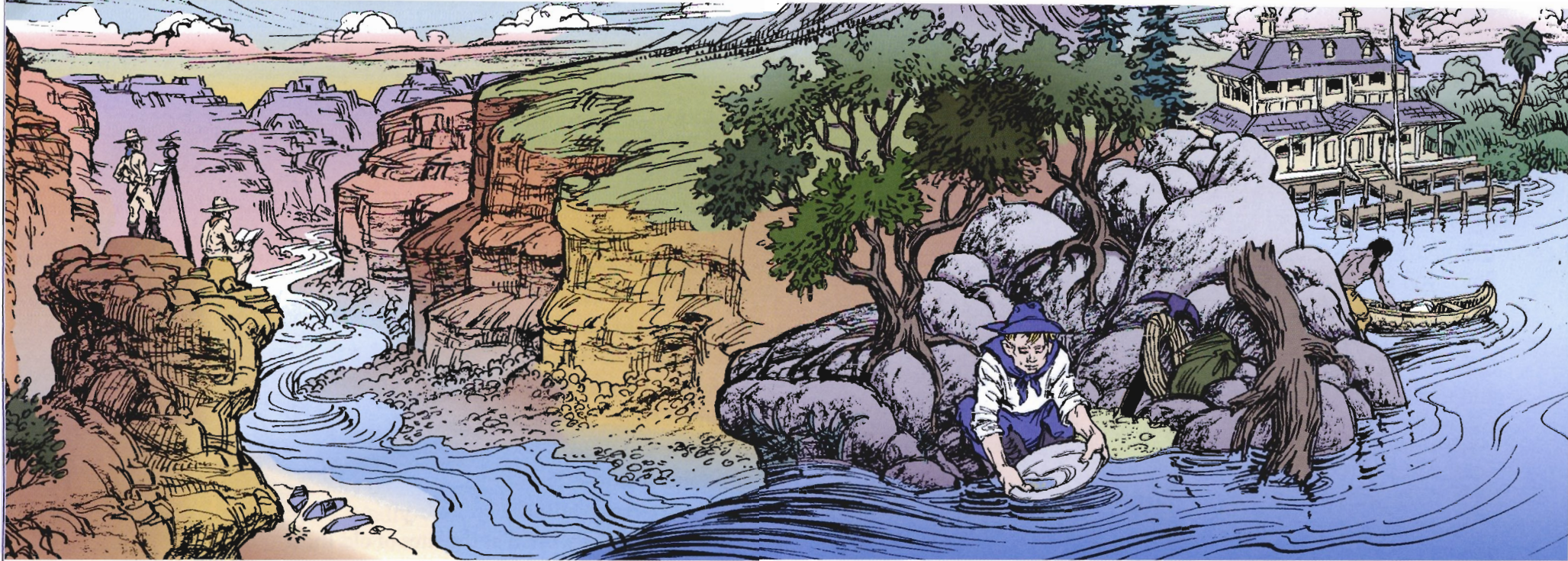
Some things from the 18th century have changed very little over the past 250 years. Back then, school children loved to unscramble words, and they loved to play charades.

Unscramble these words. Each word is something you learned about in this section about the colonists.



Charades

Have you ever played charades? It's great fun. You try to act out an idea to the class while everyone tries to guess it. Think of some way to save water around school or around your house. Act out your conservation idea until someone gets it. One rule: you cannot speak!



MOVING WESTWARD

TRADE AND TRAVEL ALONG THE MISSISSIPPI RIVER

Millions of years of flooding made the soil of the Ohio, Illinois and Mississippi River valleys rich and perfect for farming. These valleys attracted many settlers who soon had farm products, timber and furs to sell.

To sell these goods, they needed a way to move them to market. The roads were rutted and narrow, and travel by horse and wagon was slow and dangerous. They had to ship the goods down the Mississippi River to New Orleans, load them onto a ship and then sail them to

WESTWARD HO!

The American Revolution made the thirteen colonies a new nation, but Americans knew very little about the land west of the colonies. Many people were eager to explore the West. They wanted to settle there and make it part of the U.S.

connected by the tributaries of the Mississippi and Missouri Rivers. That description of the territory was very vague, and no one knew how much land that was or what it was like! Jefferson sent two men, Meriwether Lewis and William Clark, to find out. He also hoped they would find a water route to the Oregon Territory and California.

water route to the West. It did show, though, that there were fertile farmlands in the river valleys.

No one on the expedition noticed gold flecks in the sand along the river beds, but not long afterwards, gold—not fertile farmlands—brought settlers rushing into the area.

In 1775, explorer Daniel Boone crossed the Cumberland Gap and blazed the Wilderness Trail. The trail crossed the Allegheny Plateau, a range of the Appalachian Mountains, at the western tip of present-day Virginia. This trail opened the first land route across the eastern mountains.

Traveling the Wilderness Trail was slow and dangerous, so people wanted to find a water route to the West. There were no rivers across the mountains so people created their own “rivers”—canals! They also invented the steamboat. After that, there was no stopping the westward expansion. America soon stretched from the Atlantic to the Pacific.

In this part of *Water Ways*, you will read about the role water played in the westward expansion and life on the frontier.

LEWIS AND CLARK FOLLOW THE WATERS TO THE PACIFIC OCEAN

When President Jefferson signed the Louisiana Purchase in 1803, he bought all the land

The Lewis and Clark Expedition followed the Missouri River to its headwaters in modern-day Montana, just east of the Rocky Mountains. As they crossed the mountains, they saw the first small stream that ran west instead of east. They had crossed the Continental Divide! They followed the stream to the Clearwater River, the Snake River, the Columbia River and all the way to the Pacific Ocean.

The trip took two years and brought many hardships. Sometimes the travelers had to pull their boats upstream with ropes. They struggled over slippery banks and rocks. The trip chewed up their boats and often left their feet bleeding. They had to make sure they crossed the mountains before winter. Also, food was hard to find. But they made it without losing a boat.

They also saw many awesome natural wonders. At a place called Rainbow Falls, Lewis wrote in his diary, “If a skillful painter had been asked to make a beautiful cascade, [it would be] the precise image of this one.”

The Lewis and Clark Expedition showed that there was no easy

THE THINGS YOU CARRY

Imagine you lived in the early 1800s and you and your family are leaving your farm in Virginia to start a new life in western Kentucky.

You will travel on the Wilderness trail and can only take one pack horse. What will you take with you?



AXE

CLOTHES

KNIFE

SHOES

AMMUNITION

Here are some items you might take. Circle the items you would need. Put an X through the items you think you would not need. Draw in and label additional items you might need. On a separate piece of paper explain why you need each of the items.

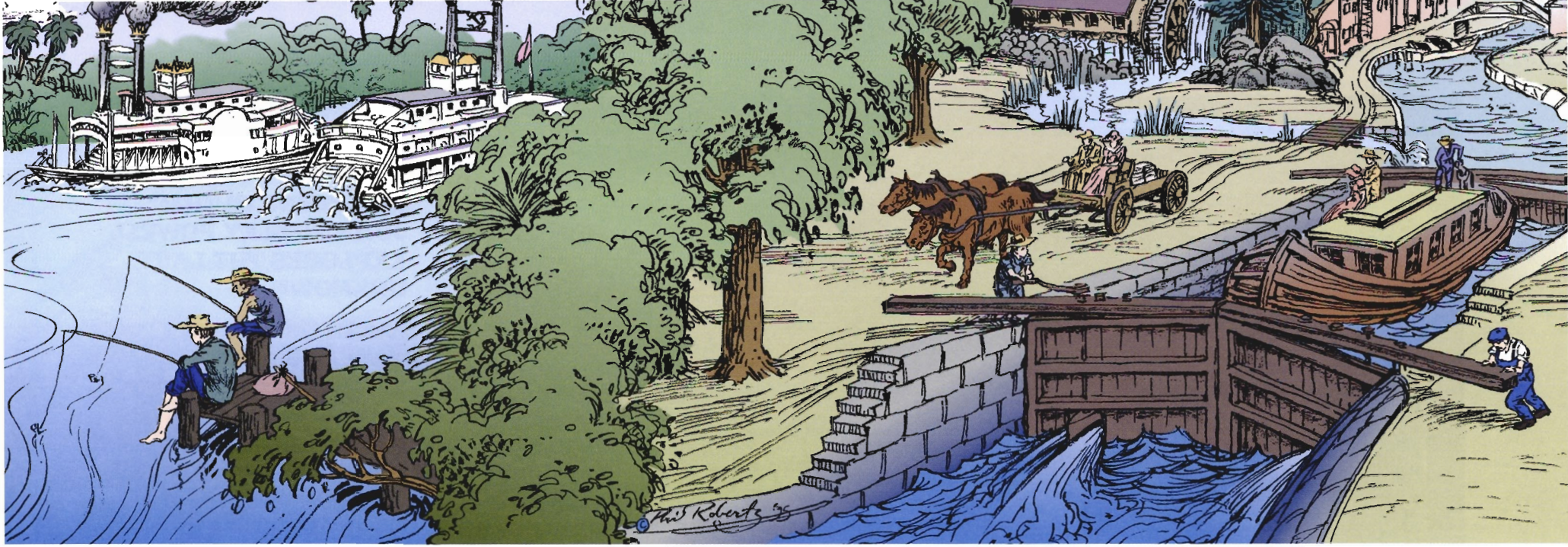
POTS, EATING UTENSILS

STAPLES: FLOUR, SUGAR, SALT

NAILS

SEWING NEEDLES





cities along the East Coast or to Europe.

The Mississippi River bustled with business! During this period, the steamboat was invented. The steamboats made two-way travel up and down the river easy, and they brought great changes to the West. They soon chugged up every river that was wide and deep enough. They carried goods and passengers, and connected the river towns to one another. Steamboats caused towns along the rivers to grow and become wealthy. They also brought hardships. For example, river towns had to care for the many people wounded in the frequent steamboat explosions, fires, groundings and collisions.

MARK TWAIN'S MISSISSIPPI

Samuel Clemens, or Mark Twain as we know him, grew up on the Mississippi River and even worked as a steamboat pilot in his younger years. These passages from Twain's work showed his love for the river and his amazing sense of humor.

In his book *Huckleberry Finn*, Huck and his friend Jim, a runaway slave, float down the Mississippi on a raft. Huck seeks adventure, and Jim seeks freedom. Their slow journey on the river allows them to think about the evils of slavery, and it shows the reader a glimpse of river life, as described in this passage by Huck:

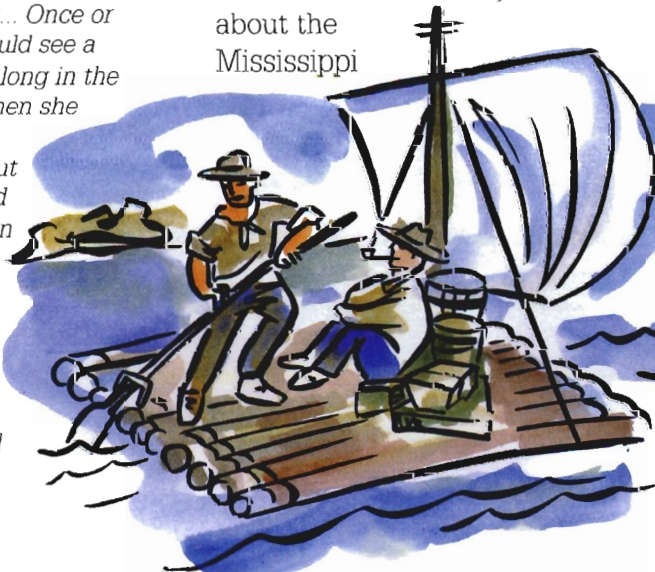
We said there warn't no home like a raft, after all. Other places do seem so cramped up and smothery, but a raft don't. You feel mighty free and easy and comfortable on a raft... Once or twice a night we would see a steamboat slipping along in the dark, and now and then she would belch a whole world of sparks up out of her chimblies, and they would rain down in the river and look awful pretty; then she would turn a corner and her lights would wink out and her powwow shut off and leave the river still

again, and after that you wouldn't hear nothing for you couldn't tell how long, except maybe frogs or something.

Twain was always amazed at how much the weather caused the Mississippi to change its course. It could shift several miles east or west within a few months, leaving a city that had been built along the river either flooded or high and dry. It could also shorten itself by breaking a new, straighter course through snaking curves. In his book, *Life on the Mississippi*, he humorously discussed the river's changes.

In the space of one hundred and seventy-six years the Lower Mississippi has shortened itself two hundred and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi River was upward of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-rod. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three-quarters long, and Cairo (Illinois) and New Orleans will have joined their streets together.

Mark Twain didn't only write about the Mississippi



River. He also wrote a book called *Roughing It* about the Nevada desert. He was not impressed with the size of the rivers in the West!

People accustomed to the monster-wide Mississippi... feel rather disappointed when they stand on the shores of the Humboldt or the Carson and find that a "river" in Nevada is a sickly rivulet. One of the pleasantest and most invigorating exercises one can contrive is to run and jump across the Humboldt River till he is overheated, and then drink it dry.

THE GREAT RACE!

CALLING ALL MATHEMATICIANS & SCIENTISTS! ANNOUNCING

A CONTEST TO SOLVE THE MYSTERY BEHIND THE GREAT RACE BETWEEN THE ROBERT E. LEE AND THE ECLIPSE, TWO STEAMBOATS OF SPEED UNKNOWN TO THE RESIDENTS OF OUR TOWN. THE GREAT MARK TWAIN CLAIMS THE R. E. LEE'S TRIP WAS SLOWER THAN THE ECLIPSE'S, YET THE R. E. LEE MADE THE JOURNEY IN THREE DAYS AND ONE HOUR AND THE ECLIPSE MADE THE TRIP IN THREE DAYS, THREE HOURS AND TWENTY MINUTES. WHO CAN PROVE THIS GREAT AUTHOR RIGHT OR WRONG? WHO WILL FIGURE OUT WHICH STEAMBOAT MADE THE TRIP BETWEEN NEW ORLEANS AND CAIRO IN THE FASTEST AMOUNT OF TIME. IF YOU CAN SOLVE THIS PUZZLE, YOU'LL BE A WINNER, WINNER, WINNER!

COME ONE, COME ALL!

Complete your solution on the application below and turn it into the race committee by the end of business today.

<p>HOW CAN TWAIN CLAIM THE ROBERT E. LEE'S TRIP WAS SLOWER THAN THE ECLIPSE? HINT: THINK ABOUT THE MISSISSIPPI RIVER'S HABIT OF CHANGING COURSE. IN 1853, THE DISTANCE BETWEEN NEW ORLEANS AND CAIRO WAS 1,080 MILES. IN 1870, THE DISTANCE BETWEEN THE TWO PORTS WAS ONLY 1,030 MILES. USE OF A CALCULATOR FOR THIS CONTEST IS PERMITTED. FOLLOW THESE HELPFUL HINTS TO SOLVE THE PUZZLE.</p>	<p>a. FIND THE TOTAL TRAVEL TIME IN HOURS FOR EACH BOAT</p>	
	<p>ECLIPSE:</p> <p>3 days = _____ hours</p> <p>3 hours = _____ hours</p> <p>20 minutes = .33 hours</p> <p>Travel time = _____ hours</p>	<p>R. E. LEE:</p> <p>3 days = _____ hours</p> <p>1 hour = _____ hour</p> <p>Travel time = _____ hours</p>
	<p>b. DIVIDE TOTAL DISTANCE TRAVELED BY THE TRAVEL HOURS</p> <p>_____ Miles = _____ MPH</p> <p>_____ Hours</p>	
	<p>d. WHICH BOAT TRAVELED FASTER?</p> <p>_____</p>	
<p>d. HOW MUCH FASTER DID THE BOAT TRAVEL?</p> <p>_____ MPH</p>		

THE ERIE CANAL

With the western settlements shipping their products down the Mississippi to New Orleans, the major East Coast seaport towns, such as Boston and Philadelphia, lost millions of dollars in business. They wanted a waterway that linked the seacoast with the interior.

The governor of New York, DeWitt Clinton, decided to build a canal connecting New York Harbor with the Great Lakes. People laughed at him and



ALBERT BIERSTADT - VALLEY OF THE YOSEMITE

GIFT OF MRS. MAXIM KAROLIK FOR THE KAROLIK COLLECTION OF AMERICAN PAINTINGS, 1815-1865. COURTESY OF MUSEUM OF FINE ARTS, BOSTON

called it "Clinton's Ditch," but Clinton had the last laugh.

The canal cut across New York State—and the Appalachian Mountains—from Albany to Buffalo. Boat traffic could sail along the Hudson River to Albany from New York City. The canal followed the Mohawk River for much of the way because it is one of the few waterways that passes through the Appalachian Mountains. The canal spanned 350 miles and rose 555 feet before reaching Lake Erie above Niagara Falls.

Building the canal took a lot of hard work and creativity. When Clinton advertised for a canal engineer, no one applied because there were no canal engineers in this country! So Clinton had to send someone



to England to study their canal system and become a canal engineer.

The canal had to be cut through swamps, forests and rocks. Workers had no dynamite to blast rocks, no earth-moving equipment to dig trenches and no power tools to pull up tree stumps. They did everything by hand. Among other things, the workers invented the wheelbarrow and a special lever for pulling up tree stumps.

The work began July 4, 1817, and ended in 1825. The canal had 83 locks, aqueducts for crossing rivers, 11 Roman arches and countless "low bridges."

The Erie Canal was very successful and paid for itself almost immediately. It brought wealth to all the new towns along the canal, and it made New York City one of the most important port cities in the entire world. It also started "canal fever." Soon canals crisscrossed the country.

LOCKS: GOING UPHILL ON LEVEL WATER

The Erie Canal allowed boats to sail uphill and downhill. Boats were raised and lowered through a series of steps called "locks." In the Erie Canal, the locks were made of high stone walls and wooden gates. Here is how locks work: A boat pulls into the first lock and the gates close behind it. Vents in the sides of the lock open, causing water to rush in and the boat to rise. Soon the water level inside the lock is the same as the level of the canal beyond the upstream gate. The canal tenders pull the gate open, and mules drag the boat into the next gate. Again the gates close and the boat is raised to the level of the third lock. After a series of locks, the boat can continue along the canal at an elevation that is higher than when it started.

HOME ON THE RANGE

To reach the West Coast, cross-country travelers moved in wagon trains across trails. The wagon trains heading to Oregon and California tried to cross the Great Plains quickly because they did not think the land there had any value. There was not much rain and not many trees. Soon, though, people discovered that

underneath the thick prairie grass was fertile soil. This news attracted farmers from the East Coast and from Europe. This was the beginning of "homesteading."

About the time that people began to settle the Great Plains, a strange thing happened. For ten years, it rained much more than usual. Before that time, the Great Plains had been known as the Great American Desert. Suddenly it had plenty of rain! People tried to explain this change. They began to believe that "rain follows plow." People were very disappointed when, several years later, the rainfall dropped back to its normal low levels.

To survive on this dry prairie, people had to dig wells. Under the Great Plains lies one of the largest aquifers in the country, called the Ogallala Aquifer. The aquifer holds the water from an ancient sea and from thousands of years of rainfall. By digging wells, some of which were as much as 400

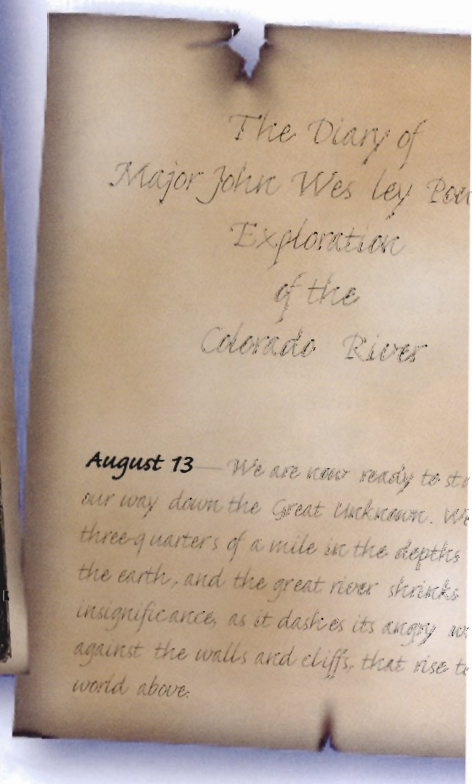
feet deep, homesteaders could continue to farm the land despite the shortage of rain.

A MOMENT IN TIME: JOHN WESLEY POWELL EXPLORES THE LAST UNKNOWN

After the Civil War, many canals, roads, trails and railroads connected the whole continent. Yet, a section of the Southwestern U.S. had not been explored and was labeled "unknown." People knew that the area was a desert filled with steep canyons. But the area had never been explored, and no one knew exactly what was there! In 1869, President Ulysses Grant sent a one-armed Civil War veteran, Major John Wesley Powell, to find out.

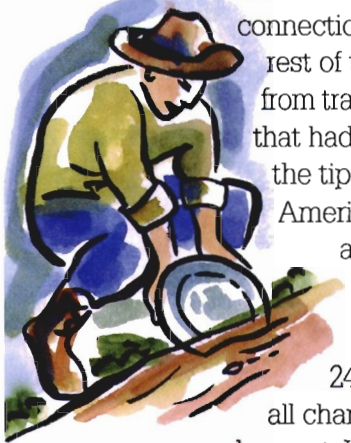
Powell took 11 men, four wooden boats, and surveying equipment on the most hair-raising whitewater trip in history. They traveled down one terrifying rapid after another until they reached the Grand Canyon. Their trip took 13 weeks. Only six men and two boats finished the trip. Powell proved that the two rivers to the north, the Grand River and the Green River joined to make the Colorado River, and the Grand River was renamed the Colorado.

Major Powell's exploration of the mighty Colorado River was very important. Mapmakers could now map that last section of the country. It also helped settlers understand and use the river. While the first settlers found the river to be wild and unwelcoming, others later found it helped produce some of the most valuable farmland in the nation. Today, the Colorado River is a major source of drinking water to almost 25 million Southern Californians, its water produces 15% of the nation's crops, and it generates more than 11 trillion kilowatt hours of electricity a year.



GOLD FEVER

The huge deserts and rugged Sierra Nevada Mountains had kept most American settlers out of California. California's only connection with the rest of the U.S. was from trading ships that had to sail around the tip of South America to get to and from the East Coast.



On January 24, 1848, that all changed. An employee at John Sutter's sawmill on the American River found nuggets of gold. Gold fever brought Americans by sea and overland trail to strike it rich in the California hills.

The valuable gold was mixed up with rock, gravel or sand. Gold miners had to first find the gold and then separate it from other minerals. The easiest way to do this was with water.

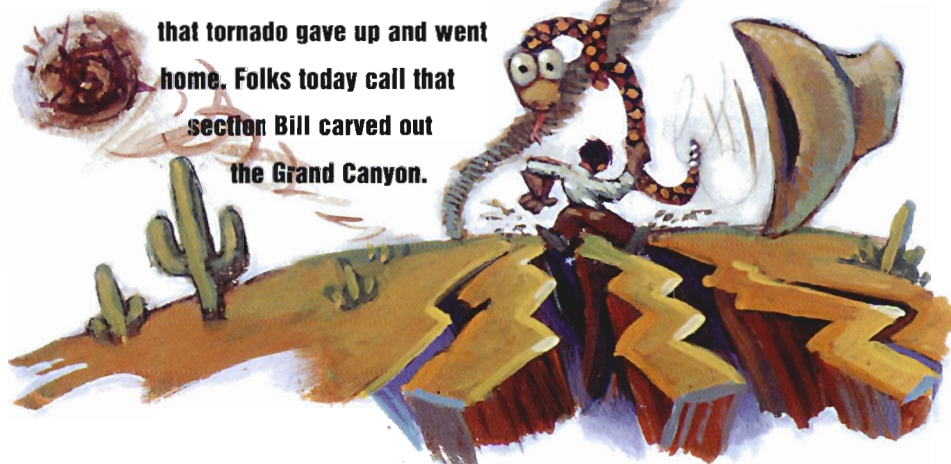
Gold is a very heavy metal, so it sinks, while lighter materials wash away. Most gold hunters simply took wide-bottomed, low rimmed pans to a stream bed, filled the pan with the stream's sand or gravel, and patiently swirled the sand in the pan just below the surface of the flowing water of the stream. The gold was left in the bottom of the pan while the other minerals washed out. Some miners found their pans lined with gold; others found nothing.

Some miners built different kinds of contraptions to sift out the gold. One of the most elaborate was the "sluice," a human-made channel for water. Miners built them across the sharp bends of streams. Instead of flowing through the streambed, the water flowed through the sluice. The sluice consisted of a series of open-ended boxes with "riffles" on the bottom.

Along with the settling of the American West came many a "tall tale"—stories that, like the wide open west, were bigger than life. One of the best stories described how the Grand Canyon came to be formed. It is written in dialect, so it is particularly fun to read aloud...

Now, y'all know all about Pecos Bill and how he was raised as a coyote. One day Bill realized he was a human bean, not a coyote. So, he got himself a steer to use as a hoss, and a 10 foot rattlesnake to use as a lasso. He went a chargin' round the range as purty as everthin. Soon enuf, Pecos Bill had the biggest ranch in the southwest. Why, his ranch was so big the corral was in New Mexico and the pasture was in Arizona. He was doin' just fine until a drought came along. It was so dry that the rivers turned as powdery as flour and the prairie grass caught fire. Bill lassoed up water from the Rio Grande to water his ranch, but he just couldn't get enough water to drown that drought. His horses and cows were dryin up and blowin away like tumbleweeds. Just when it seemed like the terrible end was near, a cyclone with a big black funnel come along. Bill yelled, "Yahoo!" and lassoed that cyclone. The cyclone bucked like a wild bronco, but Bill hung on and wrung the rain out of its wind. He wrung out so much rain that he flooded half of Texas. Now, the cyclone got mad and tore all around the plains trying to shake ole Bill off, but Bill, he rode that tornado all the way across the Rocky Mountains. Then he dug in his heels, a zigzaggin about and a diggin out canyons and rivers

all through the desert. After a while that tornado gave up and went home. Folks today call that section Bill carved out the Grand Canyon.



A "riffle" is a deep groove that prevented the gold from flowing out. As the water flowed down the sluice, the riffles trapped the gold. After a while, the miners stopped the flow of water

and collected the gold. Sluices could be 200 to 2000 feet long, and the larger sluice operations could divert a whole stream, leaving no water for downstream prospectors and panners!

The men often put several sluice boxes together to keep a whole crew of miners busy shoveling gravel into the troughs. Sometimes sluices were dug right into the ground—like shallow ditches. Then they would send the loose gravel down the ditch to a sluice box at the bottom where they'd separate out the gold.



MINING AND THE ENVIRONMENT: NOT A GOOD MIX

Mining of gold was an important activity. The use of large amounts of water in mining gold, called hydraulic mining, was efficient but it was bad for the environment. The force of the water directed at the soft banks to loosen the dirt washed away hillsides, meadows, woods—even mountains. By the 1880s, hydraulic mining companies were using 40 million gallons of water each day.

The runoff from this made rivers of mud, flooded thousands of acres of farms and clogged navigable rivers. The rivers were filled with so much mud that fish could not live. Steamboats could not travel on them because their engines clogged with mud.

Farmers and people who lived downstream of the ruined rivers complained to the courts that their property was being ruined. Finally, the United States Supreme Court outlawed hydraulic mining because of the damage it caused to other people's property.

WATER INSPIRES ART

The beauty of the western wilderness inspired many painters. Often they used water as a focus of their painting. Water expressed their ideas about nature and the meaning of life.

Most Americans first learned about the natural wonders of the American West through these paintings. They had never seen such amazing scenery.

These paintings showed the need to protect the natural wonders from development and led to the creation of our country's national parks. You have seen a classic painting and a drawing in this section of Water Ways.

August 14 — About eleven o'clock, we hear a great roar ahead, and approach it very cautiously. The sound grows louder and louder as we run, and at last we find ourselves above a long, broken fall, with ledges and pinnacles of rock obstructing the river... We step into our boats, push off and away we go, first on smooth but swift water, then we strike a glassy wave, and ride to its top, down again into the trough, up again on a higher wave, and down and up on waves higher and still higher, until we strike one just as it curls back, and a breaker rolls over our little boats. Still, on we speed, shooting past projecting rocks, till the little boat is caught in a whirlpool, and spun around several times.

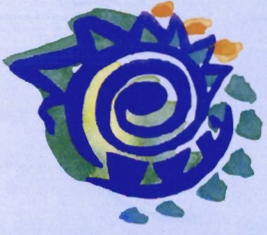
August 15 — The river is very deep, the canyon narrow, and still obstructed, so that there is no steady flow of the stream, but the waters wheel, and roll, and boil, and we are scarcely able to determine where we can go... Breaker after breaker rolls over the boat, and one capsizes her. The men are thrown out; but they cling to the boat, and she drifts down some distance, alongside of us, and we are able to catch her.

J.M. Powell



WATER WAYS

FOR FURTHER EXPLORATION...



THE PEOPLE BEFORE COLUMBUS

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- Cadillac Desert: The American West and Its Disappearing Water**
by Mark Reisner, Penguin Books, 1986.
- The Early American Wilderness as the Explorers Saw It**
by Bill Lawrence, Paragon House, New York, 1991.
- The First Americans**
series published by Facts on File, Benford Books, Inc., Oxford, New York, 1992.
- Handbook of the American Indians, Smithsonian Institute. Indians in America Before the Mayflower**
by Howard S. Russell, University Press of New England, Hanover, NH, 1980.
- New World Beginnings: Indian Cultures in the Americas**
by Olivia Vlahos, Viking Press, New York, 1970.
- The People of Chaco: A Canyon and Its Culture**
by Kendrick Frazier, W.W. Norton & Co., New York, 1986.



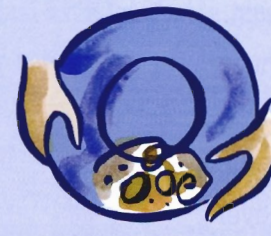
SETTLING THE COLONIES

RECOMMENDED READING

- Changes in the Land**
by William Cronon.
- Everyday Life in Early America**
by David Freeman Hawke, Harper and Row, New York, 1988.
- Everyday Things in American Life 1607-1776**
by William Chauncy Langdon, Charles Scribner's Sons, New York, 1965.
- Home Life in the Colonial Days**
by Alice Morse Earle, Macmillan Co., New York, 1926.
- Like It Was: Bicentennial Games 'n Fun Handbook**
by Adah P. Stobell, Acropolis Books, Ltd., 1975.
- The Reshaping of Everyday Life: 1790-1840**
by Jack Larkin, Harper and Row, NY, 1988.

PAINTINGS

- The Oxbow (View from Mt. Holyoke, North Hampton, MA after a Thunderstorm)**
by Thomas Cole. The painter was disturbed by the destruction of the landscape wrought by technology, so he painted an idyllic scene of how life had been before.
- Lake George** by John W. Casilear (1860). Shows the domestication of nature, with cows, canoe's wake, and a person on shore. Nature yields to the needs of man.
- New England Scenery** by Frederick E. Church. Shows covered wagon, wooden bridge, saw mill and cows. Portrait of a "perfect" place that shows the painter's ideal of harmony among human industry, rural life and nature.
- Niagara** by Frederick E. Church. Niagara Falls impressed all who saw it, and challenged painters to portray the untamed wilderness of America.
- Natural Bridge of Virginia** by an Officer of the British Royal Navy. The human being is dwarfed by the huge rock tunnel, reflecting people's sense of being overwhelmed by the enormity of the American wilderness.



WESTWARD MOVEMENT

RECOMMENDED READING (FICTION)

- Huckleberry Finn** by Mark Twain.
- Streams to the River, River to the Sea**
by Scott O'Dell. Based on the Lewis and Clark expedition as told through the eyes of Sacagawea.
- The Sodbuster Venture**
by Charlene Joy Talbot. About a girl on the Kansas prairie.
- Sweetgrass**
by Jan Hudson. Blackfoot girl, Plains Indian life and a smallpox plague.
- Timmy O'Dowd and the Big Ditch: A Story of the Glory Days on the Old Erie Canal**
by Len Hilts.

RECOMMENDED READING (NON-FICTION)

- American Heritage Junior Library**
Books on the Oregon Trail, Mississippi Steamboats, Daniel Boone and the Cumberland Gap, and the Lewis and Clarke Expedition.
- Americans on the Move Series**
by Tim McNeese, illustrated by Chris Duke, Crestwood House, New York, MacMillan Publishing Co., 1993.
- Growing Up in the Little House**
by Laura Ingalls Wilder.
- High, Wide and Lonesome**
by Hal Borland, J.B. Lippincott Company, Philadelphia and New York, 1956.
- The Oregon Trail**
by Frances Parkman, Library of America, 1991.
- By Wagon and Flatboat**
by Enid La Monte Meadowcroft.
- Whistles Round the Bend: Travel on America's Waterways**
by Phillip Ault, Dodd, Mead and Co., New York, 1982.
- Growing Up in the Old West** by Judy Alter.
- The Incredible Journey of Lewis and Clark**
by Rhoda Blumberg.
- Children of the Wild West** by Freedman Russell.

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ON THE COVER

If you look closely at the cover of **Water Ways** you will see many items that represent the concepts taught in the three units. For example, see how easily the Native Americans are using two different methods to catch fish as they travel upstream. Can you imagine having to carry all the water you use in the water jugs that those Native Americans are dipping into the water? Can you find a water wheel in the picture that colonists used to help them run machinery? Note the locks that were built in the canal systems, the flatboats used to carry cargo, the bridges that helped span the water and the steamboats that carried trade and people down the Mississippi River. If you look closely enough and let your imagination work for you, you might even see Huck and Tom floating lazily down Mark Twain's favorite river. Look as far as your eyes will take you and see if you can find the westward settlers hurrying to California to join the men by the river who are already panning for gold. What is the main idea that ties all three units together? It's flowing right through the middle of the picture. Water was important for all people—whether for cooking, traveling, supplying power, using in art or music or for growing crops.

For the fun of it, the artist has drawn in many items that were mentioned in this booklet. Can you find all of them? Look for the following items: ax, plate, knife, frog, raven, bathtub with legs, nail, wishbone, glass of water, corn cob, snake, wagon, bucket, drum, ladle, cactus.