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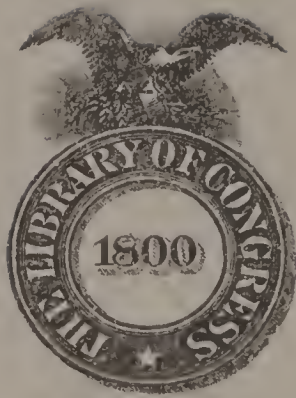
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A TRIP

ON

No. 6

MANY WATERS



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CHILDREN'S SCIENCE SERIES

A TRIP ON MANY WATERS

Federal writers' project, Pennsylvania

CHILDREN'S SCIENCE SERIES

A TRIP
ON
MANY WATERS

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PREFACE

A Trip on Many Waters is the sixth in the Children's Science Series. It was prepared by the Pennsylvania Writers' Project, sponsored by the Pennsylvania Department of Public Instruction.

This booklet was written by Mark Bartman and edited by Katharine Britton, Field Editor.

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CONRAD C. LESLEY
Acting State Supervisor

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The Walls of Rock are as High as a Forty-story Building.

A TRIP ON MANY WATERS

Most of us live near some body of water. Perhaps it is a brook, or a creek, or a big river. The water flows along and we don't know where it comes from, or where it is going. But we do know that it is going to empty at last into a big lake or an ocean.

The stream does not go alone on its long journey to the sea. Along the way it meets other streams. They join one another and flow on together.

Long ago the Greeks watched the meeting of such streams. They thought the waters looked as if they were tumbling about together like a couple of romping playmates. So the Greeks made up a story about it.

They said that one day a beautiful girl named Arethusa sat alone beside a stream in the woods. She was dipping her feet in the cool water when a big wave washed toward her and five foamy fingers stretched out to her. She screamed with fear, for she saw in the water the shape of the river god Alpheus.

Jumping to her feet, Arethusa ran. She felt spray stinging her body. The hands of the river god were touching her hair. He was calling softly, "Arethusa, do not run from me."

Arethusa prayed to the goddess of the mist to hide her. And suddenly, Arethusa was gone. In her place was a cloud of tiny drops of water that fell to the earth in a shower. Arethusa had become a beautiful little dancing brook.

Now she felt no fear, and she ran on gladly as if she were playing a game with Alpheus. Over rocks and down hills she leaped. And always the river god ran beside her, calling to her in his low sweet voice.

At last Arethusa held out her hand to him and they met, just as brooks and rivers have been meeting ever since.

If we followed any big stream of water for a long way, we should find many places where other streams flow into it. These streams that flow into it are its tributaries, or its branches. The stream

and all its tributaries make up a river system. The land drained by the river system is the river basin.

The streams of the river system flow through the basin and carry all the extra water down to the sea. They drain the land. They carry a great deal of dirt and stones with them, too. And because they carry so much earth from one place to another they change the shape of the land.

Each stream in any river system has a beginning. The place where a stream begins is its source. The source may be a small spring, or a tiny pond. But what made the spring or the pond? How did the river really begin?

A river begins with drops of rain. The rain that falls on the hills must run down to lower ground. And as it runs



A Mountain Brook Rushes along Swiftly.

down it makes little pathways in the earth. More and more rain falls, digging bigger and bigger pathways.

When spring comes, the snows on the mountain will melt. These melting snows run down the mountain and flow along the biggest of the pathways made by the rain. Then this becomes a brook, a small stream of water. Just like Arctusa, it goes bubbling and gurgling and leaping along.

A small brook rushes along swiftly when it is leaping downhill. And it is very strong, because it is moving so fast. It is strong enough to push most things out of its way, and so it rushes straight down the hills. If rocks try to stop it, the water picks them up and tumbles them along with it. It carries sticks and dirt, too.

Even the great Mississippi River, the Father of Waters, began in this way. It is the largest river in the United States and one of the largest in the world. But it began just as small rivers do, with drops of rain.

Far up in the northern part of the United States runs a brook. It is in the state of Minnesota, about 100 miles from the Canadian border. This brook is called the Infant Mississippi. It is called that because it is one of the little streams from which the big Mississippi grows. This is the source, or beginning, of one of the many streams in the Mississippi River system.

Long, long ago there was no brook at this spot. But rain fell and started to move forward, and made a pathway. Then other drops of rain and melting snow

from the hills flowed along the pathway and made a brook.

Coming down from the northern Minnesota hills the Infant Mississippi is cold and clear as glass. It ripples over rocks and hurries along until suddenly it comes to a great big hollow in the earth. It flows into this hollow and fills it, just as water fills a washbowl in the bathroom.

There are many of these big hollows in the northern part of our country. Thousands of years ago they were made by huge mountains of ice that moved over the land. These ice mountains, called glaciers, moved along slowly, and they scraped out big holes in the earth.

Some of these hollows have filled with water and now they are lakes. The Great Lakes were made in this way.



Rapids are Very Dangerous to Swimmers and Canoes.

They are so large that, on the map, they look like great seas. If we could stand beside one of them, it would seem almost like the ocean to us.

The hollow into which the little Mississippi flows makes a lake — like the Great Lakes, but very much smaller than any of them. It is called Lake Itasca. Many little streams flow into Lake

Itasca, and the little brook mixes with these streams. Then they all flow out of the lake together.

When the Mississippi leaves Lake Itasca, it is no longer an infant. It is larger than a brook, but it is not yet large enough to be called a river. It is a creek.

We can usually jump right over a brook. But a creek is too big to jump over. Still, it is not big enough to float a big boat. Only a river can do that. A river is often deep enough and broad enough to carry several boats beside each other. Some rivers are more than a mile wide.

A creek has a bigger bed than a brook. The bed is the ground the stream flows over. And the banks or sides of the creek are higher. The creek that leaves

Lake Itasca is about as wide as a small room, and it is almost two feet deep.

Now the Mississippi sweeps in a wide circle through damp muddy land where flags and reeds and water grass grow. This is called a swamp. Every once in a while the creek flows into other lakes much larger than Itasca. From each it gathers more water.

All this time the Mississippi is going downhill. Its water is still clear, and sometimes it becomes very playful. As it rushes along, it finds many rocks in its way. Over the rocks it jumps, swirling and twisting, splashing and making a great noise.

The places where a stream of water acts like this are called rapids. Rapids are very dangerous to swimmers and canoes. The water is flowing very fast.



DAVE
GAIN



It sweeps around the rocks and pounds against them. It would smash a canoe to pieces. It would throw a swimmer against the rocks and hurt him.

But after a while the Mississippi changes so that it seems like a different stream. It seems to settle down, and becomes more quiet, more peaceful.

Now it is big enough to be called a river. Many streams have flowed into it to make it grow. It is in the second part of its journey to the sea.

Very many things are different about the second part of any river's journey. The second part begins when a stream comes out of the hills. Its bed is not tilted downhill so much now. The stream is running almost on level ground.

And because of this, the stream runs more slowly. The water is not so strong



At Last Part of the Pile of Stones Sticks out of the Water.

now as it was when it was moving fast. So it cannot carry so many stones or such heavy stones. It leaves the larger stones in its bed and carries away only the mud and the sand. That is why the middle part of a river is very stony. The river bed would hurt our feet if we walked on it.

Sometimes a stream will drop many large stones in one pile. Then, as the water flows past these stones, some dirt catches there. More and more dirt is

dropped. The pile keeps growing. At last part of it sticks out of the water. And so an island is made.

The Mississippi is dotted with islands all through the middle part of its course. More than seven hundred and fifty of the islands are large enough to have names. Most of them are covered with trees, and some of them have caves.

Another thing happens in the middle part of the stream because the water is moving more slowly. The water begins to twist. And as it twists, it wears away the right bank in one place and a little farther on it wears away the left bank. Then it wears the right bank again, and then the left. And so little by little the river begins to curve. It no longer runs straight as it did when it was running downhill.

And little by little the river curves more and more. It swings farther to one side and then farther to the other. As it swings like this, it is always wearing away the land on the outside of the curves. And on the inside of the curves it leaves a layer of mud and dirt.

As the water wears away the land on the outside of the curves and fills in new dirt on the inside of the curves, the river bed is slowly changing its place all the time. The stream is like a great snake, curling this way and that, moving its great body from place to place, eating out a wide pathway for itself.

A stream that flows like this is called a meandering stream. When the meander has been wearing away the land on the outside of its curves for a very long time, always changing its bed,

there will be a broad plain around the river. And at some time during its long story, the river has flowed through every foot of that plain, and has left behind a layer of rich dirt.

On each edge of the plain, or valley, the land rises sharply. If we could look down on the valley from the sky, it would look like a very broad road running between high straight walls. And the river would be winding between these walls.

The valley of the middle part of the Mississippi is three miles wide in some places. In other places it is eight miles across. And the walls of rock on each side of the valley are as high as a forty-story building in some places.

For miles the river winds between these rocky bluffs and cliffs. Sometimes

it flows right beside one for a while. Then it cuts over to the other. If we stand on the top of the bluffs, the river far below us looks like a curling silver road.

At one time, very long ago, there must have been no river here. There was just a broad table of solid rock. Yet the water wore away that rock and made this broad valley.

Water can wear away rock just by washing over it for a long time. But the water in the river does not wear away its bed and its banks all by itself. The stones that it carries help it. These stones rub against the banks and the bed of the river. Little by little they help to cut out the river valley. It takes many thousands of years to do this.

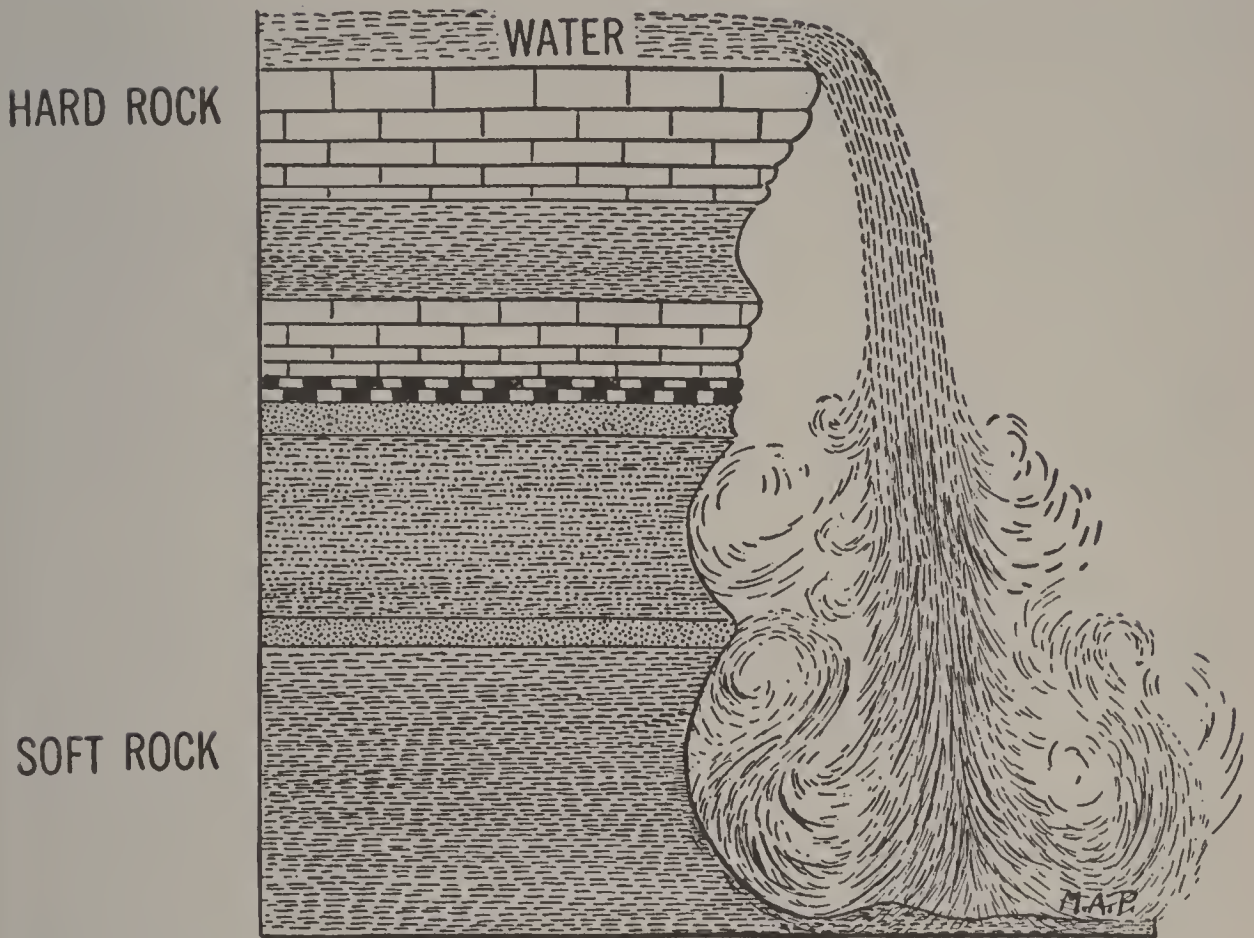
Sometimes a river cuts a very deep and narrow valley, with very high walls.

A valley that looks like this is called a canyon. One of the most beautiful canyons in the world is the Grand Canyon of the Colorado River, in the western part of the United States.

Perhaps the Mississippi Valley looked like the Grand Canyon once upon a time. We do not know.

But we do know that the river is always changing the shape of the land around it. Some day the rocky bluffs that face each other eight miles apart will not be there. The river will cut even farther into the land and wear them away altogether.

The Mississippi winds very calmly, almost lazily between these high valley walls. But all of a sudden an accident happens to jar it out of its sleep. It trips right over a cliff!



The Hard Rock was Left, Sticking out to Form a Cliff.

The cliff is so high and steep that there is no place for the river to step down slowly and carefully. It pours over the edge of the cliff like rain pouring off a roof after a thunder-storm. Tons of water fall over the cliff with a great roar. Whipping up a great spray, the water wets everything. As the rays of

the sun play on it, we see many rainbows.

The funny thing is that the river is tripping over a cliff that was made by the river. Here where the cliff stands there were once two layers of rock, one on top of the other. The top layer was hard and so the water could not wear much of it away. Underneath was soft rock and the river wore that away quickly. So the hard rock was left, sticking out to form a cliff.

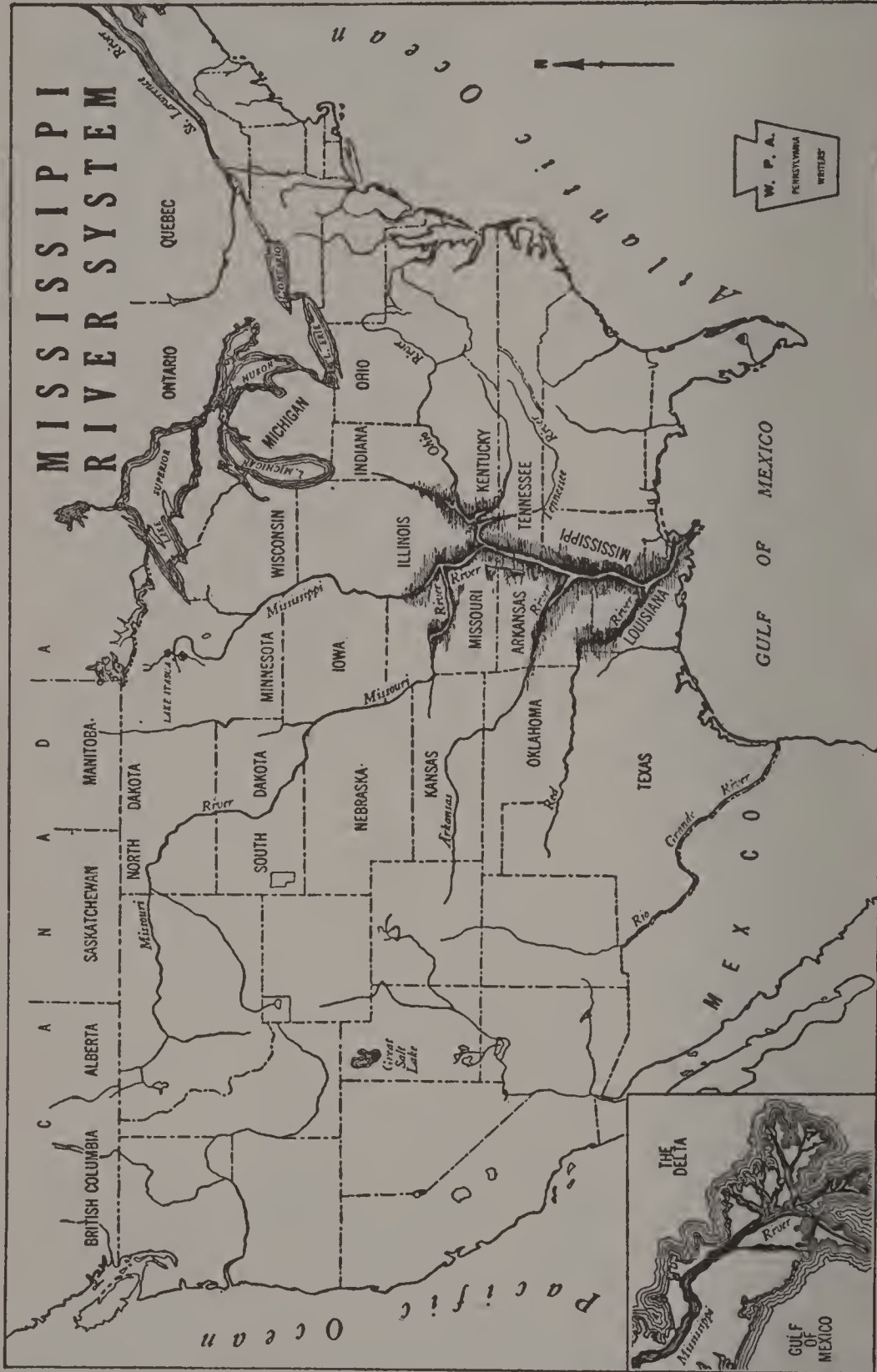
Gracefully, the Mississippi gathers itself up from its fall. Lazily it moves on again as if nothing at all had happened to it. Farther down stream something really important is going to happen. The rocky bluffs are going to end and the river is going to meet the great Missouri River.

All this time, as it flows along mile after mile, the river has been meeting other large streams, and it has been growing. During its whole journey to the sea it will meet all together two hundred and fifty other streams or tributaries.

Some of the tributaries are very large, and they stretch for many miles. In fact, the Mississippi river system spreads out so far that it drains almost one-half of the whole United States. And the basin drained by the river system is so big that sixty million people live within it. That is almost one-half of all the people in the United States.

The largest of all the large tributaries is the Missouri River. Once the Missouri has flowed into the Mississippi, the river is really full-grown. In some

MISSISSIPPI RIVER SYSTEM



places it becomes more than a mile and a quarter wide. Sometimes it is thirty feet deep. It is huge and powerful and important. The Mississippi-Missouri system is the longest river system in the world.

For a few miles after the Missouri has joined the Mississippi we see a strange thing. The two rivers have joined, but their waters do not mix right away. The clear, clean Mississippi water flows side by side in the same bed with the red muddy waters of the Missouri. Then bit by bit the waters run together and the two rivers really become one.

Now we are in the part of the Mississippi that we know about from songs and stories. It is full of excitement and mystery.

Men who study the earth to learn

about things that happened long ago tell us that once the Gulf of Mexico extended much farther inland than it does now. It covered all of the Mississippi Valley up to Cape Girardeau, where the Missouri flows into the river. The Mississippi was much shorter then than it is now, and it emptied into this great sea.

Year after year the river carried mud and dirt and stones from the hills down to the sea. Year after year it dropped the dirt upon the bottom of the sea. Little by little it added to the land. The sea was pushed back farther and farther. At last all the land was built up down to where the Gulf of Mexico begins today.

And the river is still adding more land. It is still pushing the sea back, very, very slowly.

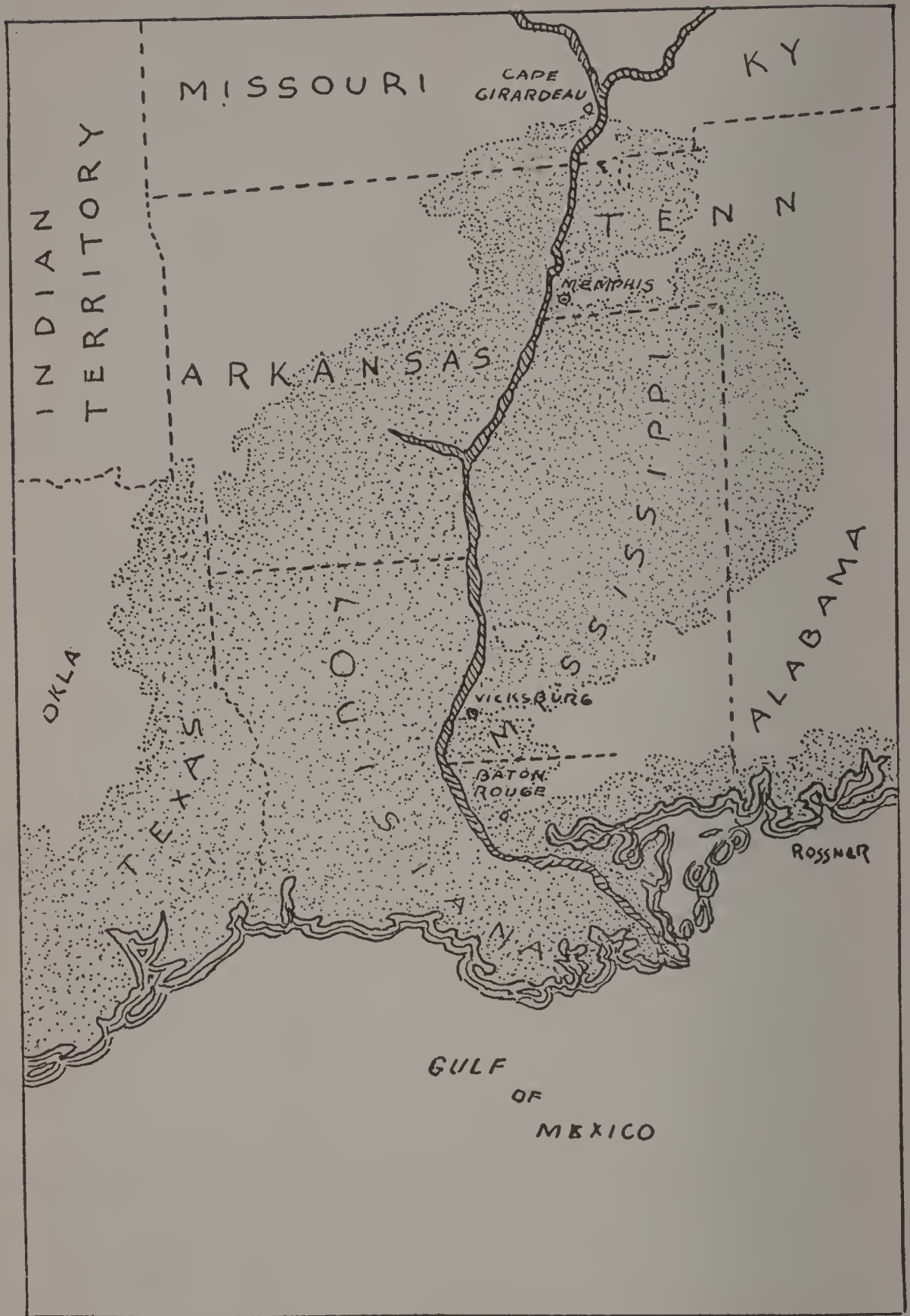
This broad plain that the river built

is very important to men. Crops can be grown here easily, for the soil is rich and fertile.

The land around most rivers is fertile. Much fresh, new earth has been washed down upon it from the hills and mountains. And this land is close to the water which all living things must have. When men settled in new countries, they almost always settled near rivers or other bodies of water.

Because the Mississippi Valley is so rich, it has always drawn men to it. Many years ago, before white men came to America, there were Indians here.

And before the Indians there were other people. Scattered through the whole Mississippi basin are strange piles of stone and earth built by these early settlers. We call these people the



Once the Gulf of Mexico covered the Mississippi Valley up to Cape Girardeau.

Mound Builders. Within the mounds these people lived and worked, perhaps. They grew corn in the rich valleys as people do today.

The river has never stopped its work of making the valley fertile. Often when the snows are melting it overflows its banks and spreads all over the land for many miles. To all this land the flood carries rich fresh earth. This earth is left on the land when the river returns to its bed. The land covered by the floods is called the flood plain.

Flood plains of all rivers are good for farming. One of the richest flood plains in the world is that of the Nile River in Egypt. The Egyptians are always glad for the flood because it brings them new earth from far-off places.

When the Nile begins to overflow, the



Flood Waters Carry off Barns and Houses.

people living near the river pack their things and go away. When the Nile returns to its proper size, they go back and start their planting. The new earth and the fresh water have done the tired, thirsty earth much good. It will now have enough strength to give rich harvests again.

But all the work of floods is not good. Flood waters tear down fences and carry

off barns and houses. They drown animals. Sometimes they drown people. And sometimes they sweep over fields of growing grain and other crops.

The floods on the Mississippi are much wilder than those on the Nile. So the people around the river are afraid of the floods. They watch the river all the time with great care.

And they try to make the river do what they want it to. They build cement sides to keep the water in a certain bed. They build the banks higher to keep the water from overflowing. This is done by piling dirt along the banks and planting grass to hold the dirt in place.

These raised banks are called levees. They are like grass hills, sloping gently up to the river.

All along this part of the Mississippi the floods have made small streams that leave the river and run alone for a while. Then they come back and join it again.

These runaway streams are made when the water overflows and finds new pathways in the land beyond its bed. These are the Mississippi bayous. They are the river's children. Now it can really be called the Father of Waters.

By the time the river has reached the last part of its journey it is sometimes more than sixty feet deep, and it carries tons and tons of dirt. It is traveling south toward the Gulf of Mexico, and it is going to pour all its water and dirt into the Gulf. The place where the river meets the Gulf is the mouth of the river. The mouth is the gateway between the river and the sea.

When the moving water of a river meets the quiet water of the sea, it must slow down. As it slows down, it can no longer hold the dirt it is carrying. This dirt sinks to the ocean bed.

Every day the river drops tons of dirt at its mouth. New land is added to the old land, and little by little the mouth of the river changes.

This has been going on for thousands of years at the mouth of the Mississippi. The new land formed sticks out a little into the Gulf. The river has to find its way over this new land, and so it makes several pathways across it. So the river really flows into the Gulf at three places. This land is called the Mississippi Delta.

On the waters flowing through the Delta we see many boats. Some of them

are ocean steamers loaded with freight for New Orleans. Some are going even farther up the Mississippi. For the river is so deep and wide that even very big ships can easily sail far up.

Since the Mississippi is so easy to sail on, it has always been used as a great highway. The Indians traveled upon it in canoes. When the first explorers came they used it to find their way deep into the heart of the Middle West and to reach the West. Later it was used by fur traders, and then by settlers.

When the Middle West began to grow, the Mississippi became the highway for trade. There were almost no roads at that time and none of the few roads was very good or very long. But on the river men could carry goods for many miles.

They built rafts and flatboats. The rafts were just logs tied together. Some of them were as big as a baseball field. On these rafts and flatboats men could float corn and pork, flour and animal skins and furs all the way from the North down to the Gulf of Mexico.

When they reached the Gulf they would come back up the river, pushing the raft with long poles. It took nine



They Build the Banks Higher to Keep the Water from Overflowing.

months to make this whole trip. And it was a trip full of danger.

One hundred years ago there were four thousand flatboats on the river. But already steamboats were being made. A few years later there were more than three thousand steamboats. The river was crowded with boats. There was coal to be carried from the East to the South. There were sugar and grain and cotton to be brought from the South to the North. Big cities grew up along the Mississippi. It became a very important river.

But the river was not always kind to the men who sailed upon it. Its bed changed from day to day. A place that had been fifteen feet deep when a boat passed it at one time might be only two feet deep when the boat came by again.

So many boats met with accidents and were lost.

The men who were willing to sail on the Mississippi River had to be strong and daring. They were men much like the early explorers. They were men who loved adventure and a free life.

When the railroads began to grow, there was not much use for the river. The Mississippi was no longer so crowded with boats as it had been once. But now the United States Government is making the river deeper so that bigger boats can sail there. Then the big ships that bring goods from other lands can carry their cargoes far up the river without using the railroad. We are finding new ways of using the river as a highway.

The Government is doing this not only with the Mississippi, but with other

rivers all over the country. For the Mississippi is like other rivers, except that it is so much bigger. All of our rivers have been used as roads for trading. Most big rivers have many big cities on their banks. And most rivers have farms and barns and orchards along their banks.

If we think of a little tree with its small twigs and branches, and then think of a big spreading tree with branches that stretch 'way up toward the sky and far out over a lawn, we can see how a little river system seems beside the big Mississippi system. Yet the trees are really very much alike in most ways.

And the big and little rivers, too, are alike. All of them, the largest as well as the smallest, begin in the same way.

And they all end in the same way. They flow into the sea or a big lake.

But the water from all these rivers does not stay in the ocean. The sun shines upon it and heats it. Some of the water turns into mist and floats up into the sky and makes clouds. After a while there are so many clouds in the sky that the air cannot hold them. When the warm clouds meet cool air or cool wind they turn into drops of water again. The drops of water fall back to the earth as rain.

This rain makes little pathways in the earth. More rain falls upon the pathways and makes a brook. The brook grows larger and becomes a river. The river flows for many miles until it empties into the ocean again.

And so these drops of water travel

farther and have more adventures than any of us ever do. They may flow over many miles of America, cross the sky in clouds, and then travel in rivers over many miles of other lands.

The same drops that tossed the ships of Columbus about when he sailed across the sea may now be flowing under the steamships that carry oil along the Mississippi. And thousands of years from now they will still be making new rivers for other people to travel on.

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