
INITIATIVES POUR L'AVENIR
DES GRANDS FLEUVES
INITIATIVES FOR THE FUTURE
OF GREAT RIVERS
MISSISSIPPI
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THE MISSISSIPPI

Visiting the Mississippi is no mean feat.

And trips with Delta Airlines are no pleasure party! Once one has arrived at New York, at terminal 1 of J.F. Kennedy Airport, and once done with the police formalities, one must walk through the snow in the darkness of the night to terminal 2, where other inspections await. Yet again one must face the night and snow to reach the shuttle which, in only seven minutes as announced, takes you to terminal 4 where your plane is nowhere to be seen. Following its late arrival, you have lost your turn in the frenetic whirligig of take-offs.

So you wait for two hours until a slot becomes free, but too late. Since it's cold outside, the fuselage and wings of your plane have iced up. De-icing has to be earned, too. At last you take-off four hours late. Too bad for you, a violent headwind has risen between times, so the flight will take a good extra third of the time scheduled. I'll be brief. We arrived at 2:48 a.m. in this good city of New Orleans, the capital of this old slice of France sold by Bonaparte to the Americans one sad day in 1803.

In the language of the Ojibwas Indians, Mississippi means "The father of all rivers".
The Mississippi, the emblematic river of the south, cotton plantations, the river of paddle steamers, women in crinolines and slaves.

The Mississippi, the hymn of an old man.
Old Man River, the mythical song written in 1927 by Oscar Hammerstein to the music of Jerome Kern, is the story of a black docker.

"Here we all work 'long the Mississippi
Here we all work while the white folk play
Pullin' them boats from the dawn till sunset
Gettin' no rest till the judgment day

Don't look up and don't look down
You don't das make the boss man frown
Bend your knees and bow your head
And pull that rope until your dead

Let me go 'way from the Mississippi
Let me go 'way from the white man boss ..."

The Mississippi is 3,780 kilometres long and crosses 41% of the Unites States directly or indirectly, and it drains the 3rd largest watershed in the world (after the Amazon and the Congo), with tributaries just as legendary (Missouri, Arkansas, Ohio, etc.).
It finally ends up in Louisiana with a flowrate three times that of the Rhone!

The Mississippi is still an essential artery for the US economy. It irrigates much of its agriculture, supplies water to 20 million people, and transports a 10th of the country's goods. The five ports at its mouth are among the busiest in the world and include Baton Rouge, New Orleans and Luisiana.

The father of all the waters that has gifted America with Louisiana, a daughter born from the sediments he transports. But sometimes fathers devour their offspring and not only in mythology. This is the very worrying story that we hear from our first two contacts, Mark Davis, an eminent professor of environmental law and Ricard Campanella, a historian and geographer.

★ROUTE PLAN★

New Orleans
Baton Rouge
Vicksburg
Chicago
Minneapolis
Milwaukee

The river at the port of New Orleans

New Orleans will soon celebrate the 300th anniversary of its foundation (1718-2018). How many more anniversaries will it celebrate before it is swallowed whole by the sea? Did you know that two thirds of New Orleans is already below sea level? The same mechanism is in play everywhere and threatens deltas all around the world. In order to satisfy legitimate needs such as agriculture, drinking water and renewable energy production, water is pumped from it upstream; a lot of water which obviously reduces the flow rate of the river.

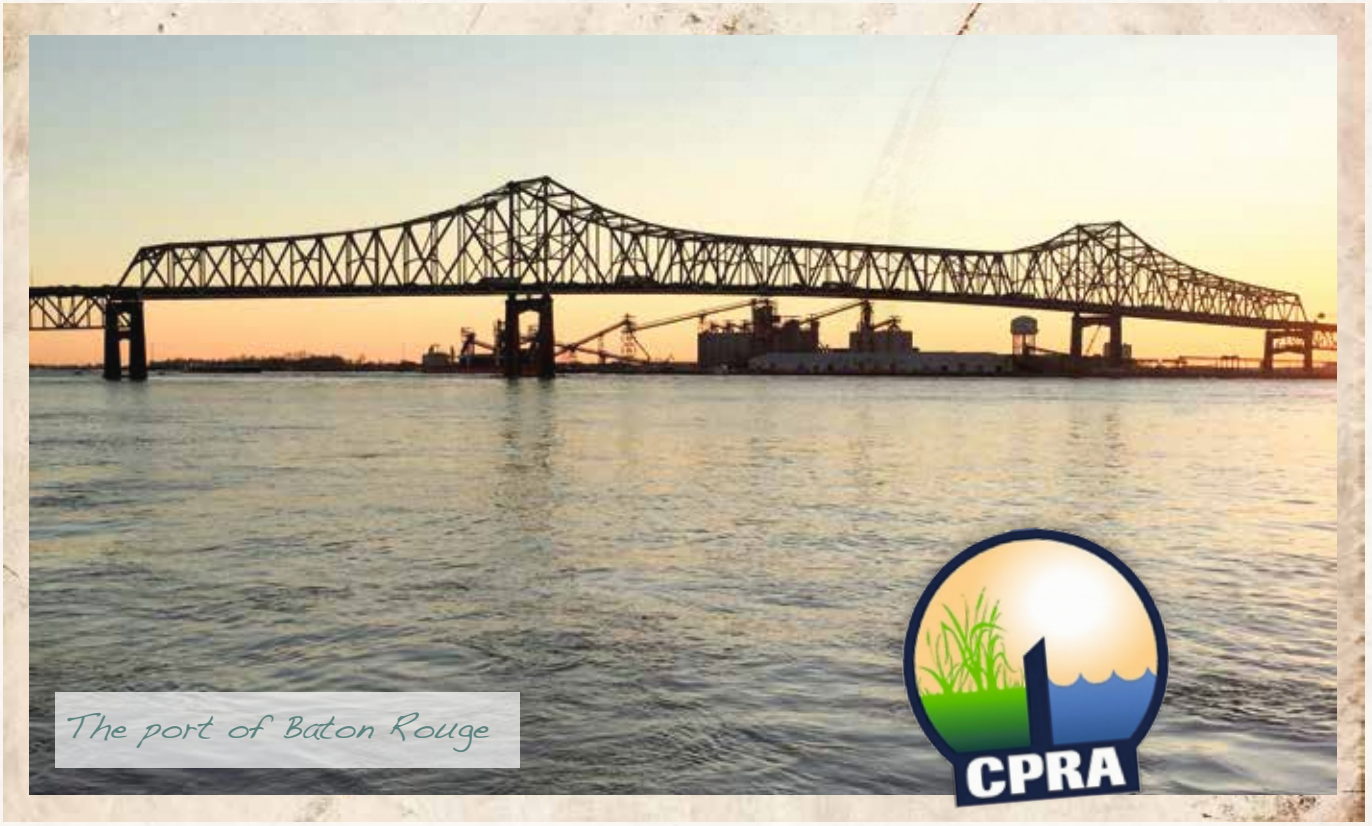
The first series of impacts: the sediments subject to less velocity tend to deposit on the bed instead of being swept out to sea. The river bed rises and the water threatens the surrounding land. Levees have been built to combat flooding but these also stop the sediments from spreading, thus causing them to accumulate even more, hence the higher levees.

The second series of impacts: the lower flow rate of freshwater is less able to resist the inflow of saltwater from the ocean, which swells and rises due to global warming.

The third series of impacts: there is less sediment downstream, meaning that it no longer supplies the deltas, causing them to lower and increasing their vulnerability to more and more frequent violent climatic episodes (due to climatic warming). Nothing is more catastrophic for the banks than a hurricane.

Conclusion : the model has to be re-invented by taking into account the rising water levels and the price of water in order to teach its value to the population.

The floodable land of the delta



The port of Baton Rouge

It is a genuine issue of national defence in the service of environmental defence.
That is why the future of New Orleans, just as that of Louisiana, is uncertain. The land they stand on is YOUNG, only 6,000 years old.
How can one believe eternal that which dates from only yesterday ?

Our second meeting at Baton Rouge where the Coastal Protection and Restoration Authority works. As its name suggests, its purpose is to respond to the threats of submersion described to us by professors Dais and Campanella. Set up in 2007 to group all the organisations responsible for protecting and restoring the coast of Louisiana, this agency is not huge

in terms of numbers of employees. It gathers 160 people of whom 67 are scientists specialised in water management (salt and freshwater), 43 engineers and 9 legal experts, all essential given that most of the coastal land concerned is private property: there is no Coastal Conservatory here in Louisiana !

The reason this agency is endowed with such a large budget, about $700 million (without the participation of the federal government), is because all the stakeholders have understood the importance of the issue: the land lost every year is equivalent to the surface area of the island of Manhattan, and this has been going on for 70 years, meaning a loss of 1,780 square kilometres. And if nothing is done, New Orleans will go the same way as Grande Isle, a former seaside town and kind of local Deauville much appreciated by wealthy city dwellers, but now practically submerged (it has been engulfed several times and was totally destroyed by Hurricane Katrina in 2005). This encroachment by the sea involves everyone, fishermen, the oil, gas and tourism industries,

New Orleans after Hurricane Katrina

agriculture, shipping companies, land and property owners, port managers and insurance companies. Everyone and the rest of the country. "What will become of the American economy if it is deprived of its main ports for exporting and importing its products? What height do we want and when?"
Each corporation has its own agenda of needs and urgencies which differ from those of the others.


Grande Isle

Some want salt, like the oyster farmers, others depth in the channels. Some give priority to protection, others demand restoration. Some defend the birds, others property development. Some want immediate results; others look to the long term.

The initial, hellishly difficult work of the Authority is to find an agreement between all these interests, as legitimate as contradictory.

An example is the famous spillway of Bonnet Carré, the pride and joy of its engineers.

They had not thought that by filling Lake Pontchartrain with water from the Mississippi they would disturb the balance of its ecosystem and its immediate surroundings. It attracted oyster farmers to set up at the outlet of the lake. However, the current from the lake is not as salty as before, hence the problems with their oysters. But for all that, the patient explanations, painstaking comparisons of the advantages and disadvantages of each solution, finally end with projects being accepted. These are extremely


Lake Pontchartrain

diverse since each section of the coast is different from the others. Here, huge blocks are installed to conserve a piece of coast, with the risk of seeing these heavy loads sinking into the soft terrain. There, preference is given to oyster beds, the creation of marshes or dredging the river and depositing the sediment in sensitive areas. To ensure lasting effects, preference is often given to diverting part of the river so that the water does the job itself. These solutions are applied following painstaking evaluations of the results obtained elsewhere. The budget assigned to these works is a reflection of the challenges and problems to be dealt with: $18 billion over 5 years. And the total of all the works to be carried out in order to perhaps win land back from the encroaching sea amounts to more than $50 billion.

What the CPRA does not say, or only hints at, is the huge responsibility of the gas and oil industries in weakening the environment, especially since fracking for shale gas has required enormous quantities of water to break the rock. Hence the canals opened up more or less everywhere. Hence the instability of the subsoil, now even more unstable than it was before.
This poses another question to the voyager. The outcome of the war against the sea in the southern United States seems uncertain, despite the resources used. What of elsewhere with far less scientific and financial resources, in areas equally threatened and far more populated like the Mekong delta, the Red River, the Ganges and the Brahmaputra ?

The Mississippi plays hide and seek.
It seems invisible between New Orleans and Baton Rouge. We travel along a green levee and guess it must be flowing on the other side. But we miss the sight of the ships, all as different as huge: oil tankers, gas tankers, cargo ships, passenger liners, not forgetting the incredible convoys of four times three barges, followed by two, again followed by one and all powered by a single push-tow !

It's true, one becomes quickly addicted to the sight of the river. Our humour is only slightly lightened by several strange signs, for example

one hanging on the front of a store announcing : refreshment solutions for school, work or weekend. These "refreshment solutions" must be necessary seeing as the temperature rises to over forty degrees! Another sign seen more or less everywhere in big letters says DOLLAR GENERAL, the name of a chain of discount stores. The size of the industrial installations along the road also astounds: gigantic silos for wheat, maize, soya, and hectare after hectare of piping and flares dedicated to the chemical weather.
At last we arrive in Bonnet Carré! A place-name that recalls its French origin !

And at last we see our river again. Here it seems to want to leave its bed. The flow rate today exceeds 60,000 m^3 a second. The Indians accepted these floods as being part of the very nature of this fruitful but wild god. The new arrivals from Europe didn't see things that way. Dikes were raised at the beginning of the 18th century to protect the young city of New Orleans from the water. These dikes multiplied but were never high enough to prevent disasters: 1844, 1850, 1858, 1870. The Civil War didn't improve things either. The Confederates had other enemies. Peace returned and the inhabitants called on the aid of the federal government. So the US Army Corps of Engineers were given the task of combating the floods. The Mississippi River Commission (MRC) was set up in 1879. Its seven members are appointed by the President of the United States in person :

three generals including the president of the commission, an admiral and three engineers from the private sector. This composition has not changed since and proves how seriously the fight against an enemy that threatens national safety and prosperity is taken. For a long time the Commission's strategy upheld a single principle: dikes and still more dikes. They were reinforced year after year, the network extended, and again reinforced. They now embrace the river along 3,500 kilometres. During the winter of 1927, a flood more awful than the other destroyed more than 30,000 km² (an area as large as Belgium), making 700,000 people homeless and drowning 500, decimating herds and ruining homes. It was proof that an addition to dikes had to be found.

The idea of a giant spillway came from the military engineers. Then the right place for it had to be chosen. It was enough to remember the places where the dikes were usually breached. This led to the choice of Bonnet Carré, fifty kilometres upstream of New Orleans. It was often here that the dikes failed. Doubtless the pressure here is higher than elsewhere. Titanic works were launched comprising a dam eight kilometres long with 350 gates. It was not until the Mississippi vented it rage anew, in 1937, when the river threatened New Orleans, that the engineers opened the gates. Some of the water flowed into fields and forests bordered by two levees. The water soon reached that of Lake Pontchartrain which is linked to the sea and the Gulf of Mexico. Long live the army engineers who had taken the sting out of the Mississippi's violence.

This giant safety valve is only used about once every ten years and we were lucky enough to be in the right place at the right time. This Monday 18 January 2016, there was water as far as the eye could see. First that of the Mississippi, a huge current that flowed quickly downstream to New Orleans, and then the water that was being withdrawn from it, up to 7,079 m³ a second if necessary. It seems to be sucked through the gates. The water surges in and is then discharged in great churning volumes. It soon becomes calm and spreads between the trees and electricity pylons.

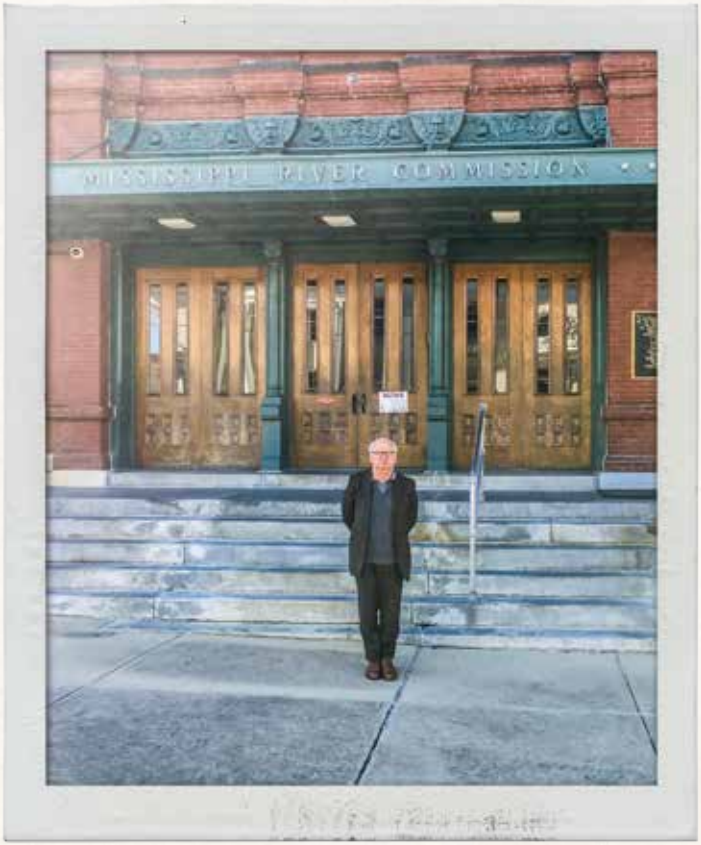
Opening the spillway gates

During the subsidence, meaning to say between two major floods, this vast surface area dries only partially and becomes a place for fishing and strolling, a semi-wetland much appreciated by birds. The army engineers have built similar installations at two other places on the river, Old River and Morganza. Their purpose is also to divert some of the Mississippi's water, but this time to the Atchafalaya River, a far calmer and less important stream.

The Mississippi River Commission is installed in Vicksburg, a small town between New Orleans and Memphis, not far from where Faulkner conceived his novels.
Would you like to know how to manage floods, even the worst ones? Then go to Vickburg and meet the army engineers and the civilians who work alongside them. They'll teach you humility since the water will always be stronger than you are.

A very severe flood occurred not far from here in 2011. The MRC reduced its impact as much as possible. A great deal of land was flooded

but much less than in 1927 (60,000 ha were preserved). It leads one to take a liberty with language and say one must leave to water what fire would burn, as in the strategy of the spillways described above.



The entrance of the Mississippi River Commission at Vicksburg

The war against floods is not the only mission accomplished by the MRC. It also has to fight drought as in 2012, a year after the floods of winter 2011. The farmers must still irrigate their land and the ships still need channels 3 m deep to continue sailing. The last role fulfilled by the MRC is political, that of regularly bringing together all the river's stakeholders and listening to their suggestions and discontents. Although the population downstream is aware of the urgency and the work to be done in common, it is a different story upstream where selfishness and corporatism remain.

So it goes with the Mississippi valley, a gift from the river like Egypt is the gift of the Nile according to the well-known adage. But this gift is subject to a dual threat: freshwater and saltwater.

Minneapolis is much farther north and far colder, though still on the course of the Mississippi. It owes its name to the river, as 'Minne' in Indian means 'water'. Minneapolis, the city of water. The first European explorers chose to settle on this site due to the falls, which gave them an inexhaustible source of

energy and hence the rapid success of the city. The farmers of the region needed mills, and the mills needed current to operate. Cargill, the giant multinational grain and processing corporation started in Minneapolis and has stayed there. It's not by chance.

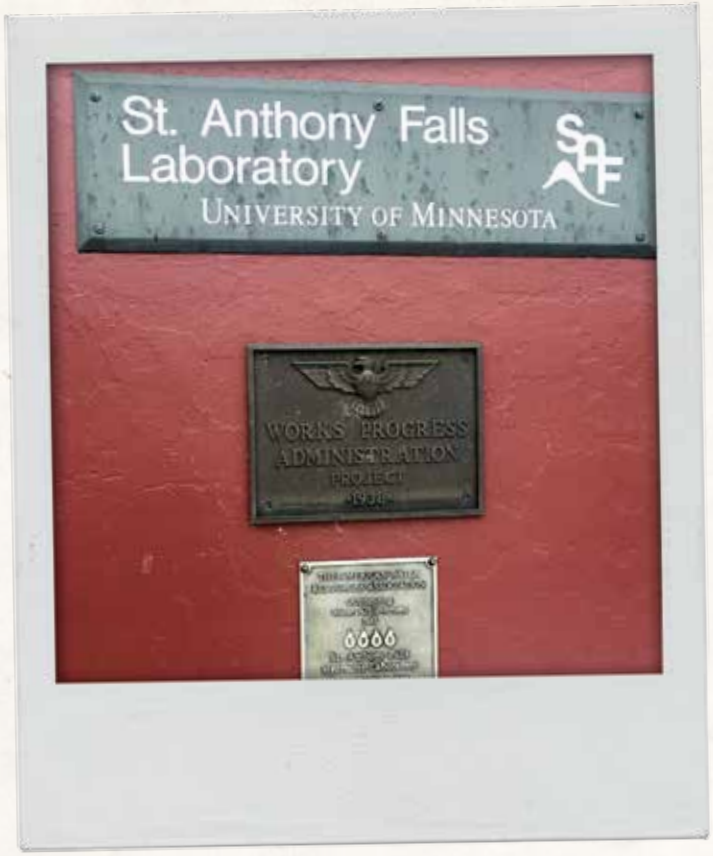
Even a short visit gives one the opportunity to see two original features of this city (in addition to the very beautiful dark blue theatre, designed by Jean Nouvel).

The first is a hydropower plant in the city centre. One can imagine the horror of French populations confronted by such a situation and the countless angry petitions demanding its immediate removal. In our country of spoilt and hypocritical brats, we prefer to hide our production facilities. Production is dirty and it's by miracle that we obtain electricity by flicking a switch, that we obtain water 24 hours a day simply by turning a tap. On the contrary, the inhabitants of this city appear to appreciate

The St Anthony Falls in Minneapolis city centre

their small hydropower plant on the riverbank and benefit from its force. It's installed capacity is low (14 megawatts) but enough to supply 14,000 households with electricity. Another advantage: it proves that not all dams are monstrous, a plea worthy of being taken into account in a country that wants to develop its renewable energy potential, seeing that it's starting from a very low baseline, i.e. severe pollution. Better still, Xcel Energy, the company that runs the plant, has developed a project to install turbines in all the buildings that border the river. Why not ? Would you like more proof of Minneapolitan intelligence? Well, now for the second originality. Strangely, hydrology laboratories are usually built relatively far from rivers. Why not profit from their water and their currents. This decision was taken by the local authorities as far back as the 1930s to install the SAFL (Saint Anthony Falls Laboratory) on a bank of the Mississippi, alongside the hydropower plant mentioned above, by building a diversion canal to bring the water into the laboratory via a series of miniature locks. Researchers come from all over the world to benefit from these exceptional conditions to study erosion mechanisms, sediment transport and delta sediment supply, the debris circuit, and more generally fluid, aquatic and wind dynamics. Indeed, a giant wind tunnel facility completes the tanks filled with water and different gravels. The SAFL could exchange information with our Hydraulic Structure Behaviour Analysis Centre (CACOH). We bet that it would benefit both laboratories and also all those who know the importance of how our rivers and the deltas that extend them are evolving.

We go to Chicago the next day. However, we will admire this capital of modern architecture another day when we'll hail the Monets, Gauguins and Matisses at the Art Institute. This morning we have an appointment an hour away from the city, on the banks of a small river whose name evokes peace and our childhood reading, namely the "Calumet", a tributary of the River Illinois whose source is Lake Michigan close by and which flows into our dear Mississippi.



A large solid fair headed man awaits us in front of the lockkeeper's house. Colonel Baumgartner's smile is disarming, though he's dressed in the camouflage uniform of a solider on campaign. His badge and enthusiastic and determined speech immediately signal his membership of the prestigious army corps of engineers, the institution whose headquarters we visited in Vicksburg. This colonel is responsible for the district of Rock Island near Chicago, one of the areas through which the great river flows. One of his missions is obviously to plan and carry out flood protection works whenever possible. When floods occur, he coordinates emergency activities with the National Guard. More generally, he has to ensure the fluidity of boat traffic on this essential corridor. Proud of his mission, he talks to us with gravity of his three convictions. The first is that world demand for wheat will increase due to climatic, demographic and political constraints. The second is that the need for traditional energy, oil and gas, will also increase.

Third, trains and trucks have already reached the limits of their capacities. Just imagine: a convoy of 15 barges is 402 meters long, while its equivalent on the railway would be 4.4 km long, and that of trucks on a highway would be 18.5 km long with 870 semi-trailers placed end to end to carry the same freight.


TRUM

The T.J. O'Brien locks - Illinois waterway

Conclusion : one day the Mississippi will fulfil an essential strategic role.
He repeats the same expression all the time, that of a soldier or simply a patriot.
"As a Nation, the United States has to count on us."

Once again, we observe the military design and methods of American river policy. One has to admit that the army in the united States is much more deeply rooted in the population than in any European country. But there is a flaw in this well-oiled system : the USACE develops the rivers but does not manage how they are used. The word is out: the need for the concerted management of the stakeholders. This is the challenge of this river and all the institutions visited hammer it home: the need for coordination, explanation and carrying out joint actions. These words are honey to our

ears and our descriptions of the integrated management of a small French river amaze our hosts and make them jealous. What if the interest of Initiatives for the Future of Great Rivers found its focus here ?

Exchange and get rivers to dialogue with each other to improve cooperation !

A change of scene. The former headquarters of a political association. The building with a neo-classical façade looks like an old post-office but inside all the walls have been demolished. In the vast open-plan offices that have replaced them very young architects, town planners and sociologists are building the city of the future. They have been chosen from all over the world by Jane Gang, the boss of Studio Gang :

A 15-barge convoy

85 employees in Chicago, 15 in New York. One is awestruck by their creativity when seeing the enthusiasm with which they present their projects, and it stirs a dream of being taken on as a trainee. One example concerned us. Towards the end of the 19th century, the authorities of Chicago found it increasingly difficult to supply drinking water to the population. The growing industrial activity generated waste that was discharged without treatment into the Chicago River. The river did its job of being a river and transported all the waste without delay to Lake Michigan. Someone then had a brilliant idea, to reverse the direction of the river. It would no longer flow into the lake but, after a short distance which allowed the elimination of most of the waste, it would flow into the Mississippi.

Milwaukee

Hardly was this brilliant idea heard than the earth was dug, the slope reversed and the Mississippi was obliged to accept what the lake no longer wanted. Everyone was wonderstruck by this solution. It was once again possible to drink the water of Lake Michigan without risk.

However, Mother Nature takes her revenge against the unnatural, however long it takes. The disadvantages became apparent a hundred and twenty years after the miraculous solution. The lake suffered from not receiving enough current from the rivers. It showed signs of exhaustion. Its level could even lower in the foreseeable future due to climatic warming which has increased evaporation, much to the consternation of shipping companies. Thus the idea is brewing to restore the old direction to the river by allowing

it to follow its natural course, which to say allow it to plunge once again into the lake without the risk of yore since the waste is now treated.

This is where Jane's Gang come in. When a municipality decides to renew its links with water, it must call on environmentally friendly town planners and architects.

By definition, the people who set up the School of Freshwater Sciences last year in Milwaukee, a hundred kilometres north of Chicago are friends and savants of nature. As its name suggests, this elite school welcomes PhD students working on every facet of water: biology, hydrology, river bed geology, climatology, pollution detection and control, etc. Although it does not shy away from providing its expertise elsewhere, it primarily focuses on studying the Great Lakes. Despite the fact that they represent 20% of the planet's freshwater reserves, their environment is vulnerable. Would you like an example, a bad example of globalisation ? One day in 2003, the captain of a ship from the Black Sea decided to empty its tanks in one of the lakes of the port. Chicago? Milwaukee? He was obviously unaware that by giving this polluted water to America, he was giving at curse: a mussel called Quagga, about two centimetres long and endowed with incredible reproductive powers.

Why accuse the Black Sea? Because this species of mussel could only be found in this area of the world before its journey across the Atlantic. In only a few years Quagga

Quagga mussels in the port of Milwaukee

mussels have spread like a carpet over the entire bed of this nonetheless huge lake. The result is that this invasive species prevents any vegetation from growing. The days of the lake's phytoplankton are over! The food chain has been broken. Lake Michigan has been emptied of fish which had almost nothing left to feed on. Then the fisheries closed down.
On the contrary, the Quaggas devour everything that passes between their open shells. Hence the water is clearer, the sunlight penetrates further into the depths and the temperature of Lake Michigan is higher than that of its neighbours. Another threat is moving up the Mississippi and lurks around the lake: the Asian Carp! Despite its name, it appears to have adapted to the extreme temperatures in the lake.

One of the professors of the School of Freshwater Sciences presents himself as follows: Jerry "River" Kaster. The idea for this nickname now on all his visiting cards was given to him by his colleagues irritated by his overwhelming passion for the Mississippi. Their love, though equal, is for the lake. Are you more for the "lake" or for the "river"? The water that passes or the water that stays? Nobody can decide for you. It's a question of temperament and distant penchants.

I have made my decision. Guess which ?


Teaching about rivers


GOLFE DE MEXIQUE
Le Cours du
MISSISIPI
ou de St LOUIS
LOUISIANE
LAC SUPERIEUR
LAC DES ILLINOIS
LAC MICHIGANE ou des HURONS
LAC ERIE
Les Panis
Les Panimahouls
Les Illinois
PROVINCE DE QUIVIRA
MEXIQUE
LA LOUISIANE
PAYS DES CHAQUANONS