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

Synopsis sheets

Rivers of the World

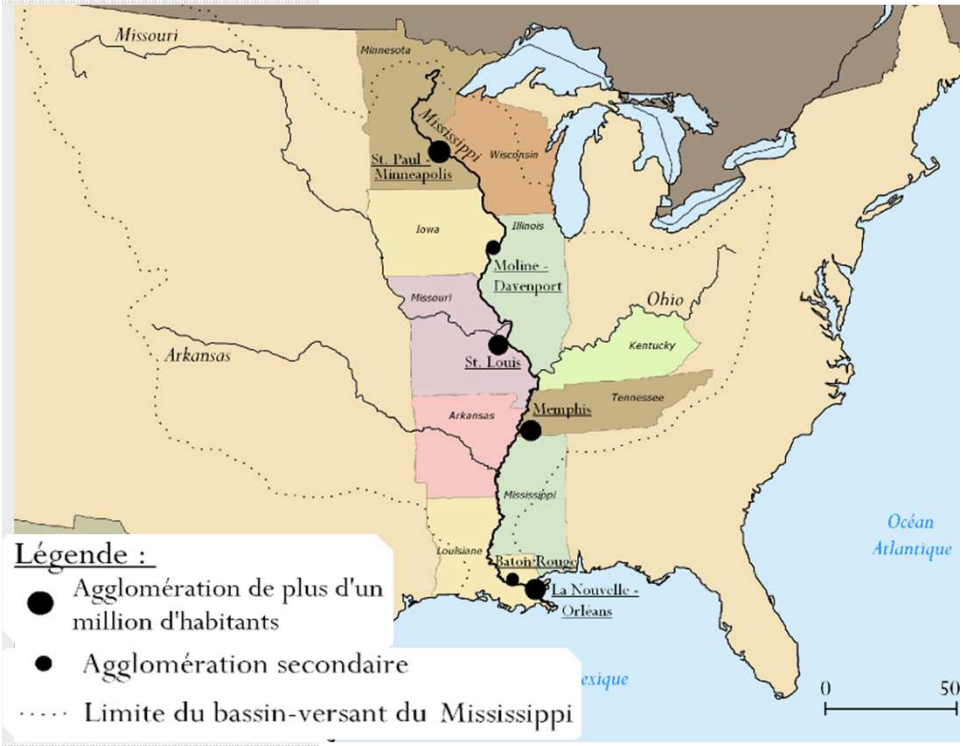
THE MISSISSIPPI

Initiatives pour l'Avenir des Grands Fleuves

The Mississippi

Counting its tributaries, the Mississippi watershed is the third largest in the world in surface area after those of the Amazon and the Congo. Its source is Lake Itasca (Minnesota) and the watershed covers 41% of the United States and part of two Canadian provinces. Long subject to development to aid the region's economic growth, the Mississippi's hydrological system permits the irrigation of a huge agricultural plain and considerable river traffic. However, it also leads to growing concerns (floods, water pollution).

The "father of waters"



The origins

The Mississippi, called the "father of waters" by the Ojibwas, an Indian tribe, has always occupied a central place in the economic and commercial activity of the United States. Thriving agricultural activity developed in the 18th and 19th centuries in the alluvial plain of the river while New Orleans became a hub for international trade. Confronted by regular floods, studies to confine the river with levees began in 1812-1815 under the supervision of the Army Corps of Engineers. Major works were carried out in the period 1875-1880 aimed at circumscribing the floods, facilitating navigation and combating the erosion of the banks. Following the severe floods of 1927 and 1933, works accelerated with the Mississippi River and Tributaries Project. The flood plain was developed with 37 dams and locks.

Alongside flood control, ensuring efficient irrigation and competitive river transport, new challenges emerged linked to managing the resource, giving rise to many concerns for the future.

Technical sheet

Discharge	17,545 m^3/s (mouth)
Length	3,780 km
Watershed	3,238,000 km^2
Countries crossed	United States(10 States crossed /31 States in the watershed) Canada (Alberta and Saaskatchewan - watershed)
Main tributaries	almost 250 - Ohio (left bank); Missouri, Arkansas, Red River, White River (right bank)

Sections	Characteristics
Upper Mississippi – confluence with the Ohio	Great plain, gentle slope and low discharges Snow-rain regime: predominantly rain, with high water in autumn-winter (rainfall) and maximum discharge in spring.
Lower Mississippi	Wet subtropical region; bayous, lakes, numerous meanders; plentiful rain and risk of cyclones. Maximum discharge in May and minimum in October.

Initiatives
pour l'Avenir des
Grands Fleuves

The Mississippi

Multiple uses

Agriculture

Agriculture has been the main activity in the Mississippi basin for nearly 200 years. Agricultural production covers 71% of the basin's surface area and the major agro-foodstuff industry that has sprung from it produces 92% of the country's agricultural exports and provides most of its cattle and pigs. In the lower basin (from Saint Louis to New Orleans), the farming sector is the third largest contributor to the regional economy, with driving forces like cereal production, livestock breeding and aquaculture. The dramatic floods in this region in 2011 led to losses for the sector estimated at $600 million.

Intensive irrigated agriculture is the second biggest consumer of the Mississippi's water after the hydroelectricity industry. It causes considerable losses of water due to inefficient irrigation systems (open channels, leaks and evaporation), despite the use of certain advanced techniques such as drop-by-drop irrigation, and uncontrolled water use, since the farmers pay little for water supplies.

Water supply for cities and plants

The river also serves the daily lives of the population and the many industrial sectors in the basin. More than 50 cities and 18 million people depend on the river and its tributaries.

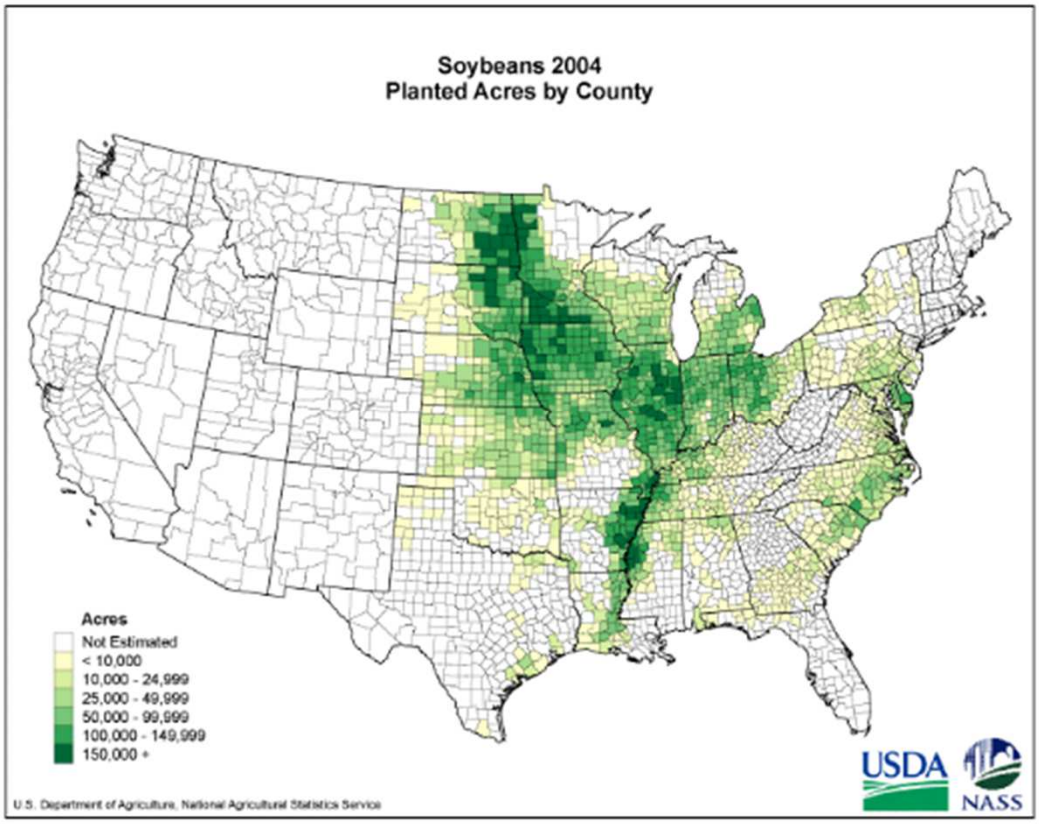
The river water is used for the operation of many coal and oil-fired power plants (92), biomass plants (14) and nuclear power plants (3). Furthermore, the paper industry and oil refineries in the regions of Memphis and Baton Rouge, as well as chemicals, agro-foodstuffs, oil processing and transport on the lower reaches of the river are highly dependent on the region's hydrological regime. Clay extraction (Louisiana, Missouri) is also an important activity in the region as is the extraction of sand, gravel and iron ore (Minnesota), and veins of bituminous coal and anthracite are exploited (Illinois).

Water shortages are increasingly frequent; the river and many of its tributaries are over-exploited, especially in the southeast and in the regions of Arkansas, Tennessee and the lower Mississippi. The problem of supplying water is the main difficulty for many municipalities and will remain so for the years to come.

Initiatives
pour l'Avenir des
Grands Fleuves

The Mississippi

Multiple uses



Distribution of Soy bean crops in the United States
(*Source*: USDA, 2004)

The Mississippi

Multiple uses

Navigation

10% of all goods in the United States transit along the Mississippi and 60% of cereal exports are transported on the river via the ports of New Orleans and south Louisiana. The latter is the world's 16th largest port in terms of tons transported (almost 308 million short tons in 2017).

According to the Port of New Orleans, 500 million tons of goods transit every year on the Mississippi. In the lower part of the river, the traffic primarily comprises oil products, iron and steel, cereals, wood, coffee, coal, chemical products and food grade oils. The main river-maritime terminals are the ports of New Orleans and Baton Rouge.

Hydroelectricity production

Historically dedicated to navigation due to its topography, and poorly suited to hydroelectricity production, the Mississippi has a large number of dams and locks that were not developed to harness the water for energy. The largest plant, Keokuk, in Iowa, was built in 1913. However, one of the Mississippi's main tributaries, the Tennessee, was developed in the 1930s by **the Tennessee Vallee Authority** with three objectives: navigation, irrigation and hydroelectricity production. There are now 29 hydropower plants on the Tennessee and its tributaries.

The Mississippi and its tributaries are the country's most accessible remaining potential resources. In these regions where energy comes mostly from fossil fuels, the development of renewable energy now appears to be a real opportunity that a growing number of politicians and private companies are grasping.

Hydroelectricity still lags far behind fossil fuels, the main energy source, and also behind solar and wind power. In 2013, it only represented 1.35% of the electricity produced in Iowa versus 62.3% for coal-fired plants and 25% for wind energy.

New federal and State regulations have come into force in recent years to promote the development of hydroelectricity in the same way as solar and wind power, both of which have benefitted from longer political backing. Technologies are also being developed to adapt to the demands of a river already heavily equipped (cf. hydroelectricity projects).

Tourism

The picturesque landscapes of the Mississippi also attract tourism, especially with the creation of the Great River Road, composed of different roads that follow the course of the Mississippi through 10 American States crossed by the river.

The Mississippi

Governance and international cooperation

Bodies of governance

1- The Mississippi River Commission

The MRC is the Federal Commission responsible for developing and monitoring the Mississippi. When founded in 1879, it reported to the War Department, though it now falls under the responsibility of the United States Army Corps of Engineers - USACE.

Missions

At the outset, the missions of the Mississippi River Commission were to:
- Channel the river
- Promote navigation and strengthen security
- Prevent floods
- Promote trade.

Starting from 1928, with the Flood Control Act that followed the flood of 1927, the Commission was given the task of implementing an important programme of major works, the **Mississippi River and Tributaries Project.** An integrated river management programme, the Mississippi River and Tributaries (MR&T) project is based on four main principles:
- The construction of levees to confine floods;
- The construction of diversion channels;
- The improvement and stabilisation of the main channel to facilitate navigation and protect the levees;
- Improvements on the Mississippi's tributaries and the construction of dams, reservoirs, pumping stations, side channels, etc.

The return on investment of this project has been estimated at $45 for every $1 invested since it was started.

The Commission is still responsible for the management and sustainable development of water resources. In particular, it issues public policy recommendations on flood control, navigation, and environment projects on the Mississippi, and it carries out programmes and studies, and issues reports on river management.

Organisation

Its headquarters are located at Vicksburg, on the Mississippi.

The members are appointed by the President of the United States of America and include three USACE officers, a member of the National Oceanic and Atmospheric Administration, and three members from civil society (including two engineers).

The Mississippi

Governance and international cooperation

Cooperation

An MoU was signed between the Mississippi River Commission and the Mekong River Commission in 2010 to study the opportunities for exchanges, in particular regarding the following common interests: adaptation to climate change, integrated water resource management, drought management, flood prevention, hydroelectricity development and the evaluation of its impacts, demand for water and its uses, agriculture and food security, improving navigation, fish passes, water quality, and wetlands.

Potential exchanges of experiences were identified, notably through technical assistance from the Mississippi River Commission in setting up a process for building dams that involves greater participation from the population living in the Mekong basin.

2- The Mississippi Valley Division (MVD)

The Mississippi Valley Division of the Army Corps of Engineers (MVD) is responsible for developing the river, enforcing the laws and regulations relating to it, managing land ownership, and managing emergency operations. It is supervised by the Chairman of the MRC.

3- The Lower Mississippi River Conservation Committee and the Upper Mississippi River Conservation Committee

The Upper Mississippi River Conservation Committee was founded in 1943 to promote cooperation between the agencies responsible for conserving the natural resources of the upper part of the river. It groups the environmental agencies of the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

The Lower Mississippi River Conservation Committee was founded in 1990 following a resolution addressed by the American Fisheries Society to the States of Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee, which encouraged them to set up an inter-agency commission to develop a collaborative approach for managing fishing and leisure resources in the lower part of the Mississippi.

4- Other bodies

The local elected representatives of the Mississippi watershed meet in the Mississippi River Cities and Towns Initiative, whose role is to make heard at federal level the interests of the inhabitants and actors dependent on the river.

The Mississippi River Forum also produces integrated data on the river by coordinating multidisciplinary groups of professionals and public decision-makers. It organises events, mainly related to the river and the quality of its water.

Initiatives
pour l'Avenir des
Grands Fleuves

The Mississippi

Structures

Developments dedicated to navigation

River developments

There are 50 dams on the river and its main tributaries managed by the US Army Corps of Engineers in the Mississippi Valley Division.

Furthermore, a 2.50 m deep navigation channel makes it possible to sail upstream from New Orleans and Baton Rouge to Minneapolis on the Mississippi, Pittsburgh on the Ohio, Sioux City on the Missouri and Knoxville on the Tennessee. The Corps of Engineers has built 29 discharge regulation dams on the upper valley between Minneapolis and Saint Louis. The channel downstream of the confluence with the Ohio had to be built artificially to cut through the meanders.

In Louisiana, New Orleans is protected from floodwaters by a system of diversion channels that divert the water to Lake Pontchartrain and the Atchafalaya River.

Example of a structure: the purpose of the Old River is to maintain the discharge of the Mississippi and preserve the distribution of the water at 70% for the Mississippi and 30% for the Atchafalaya. The latter river takes a shorter course to reach the Gulf of Mexico and its slope is steeper, thus diverting the main discharge of the Mississippi away from Baton-Rouge and New Orleans.

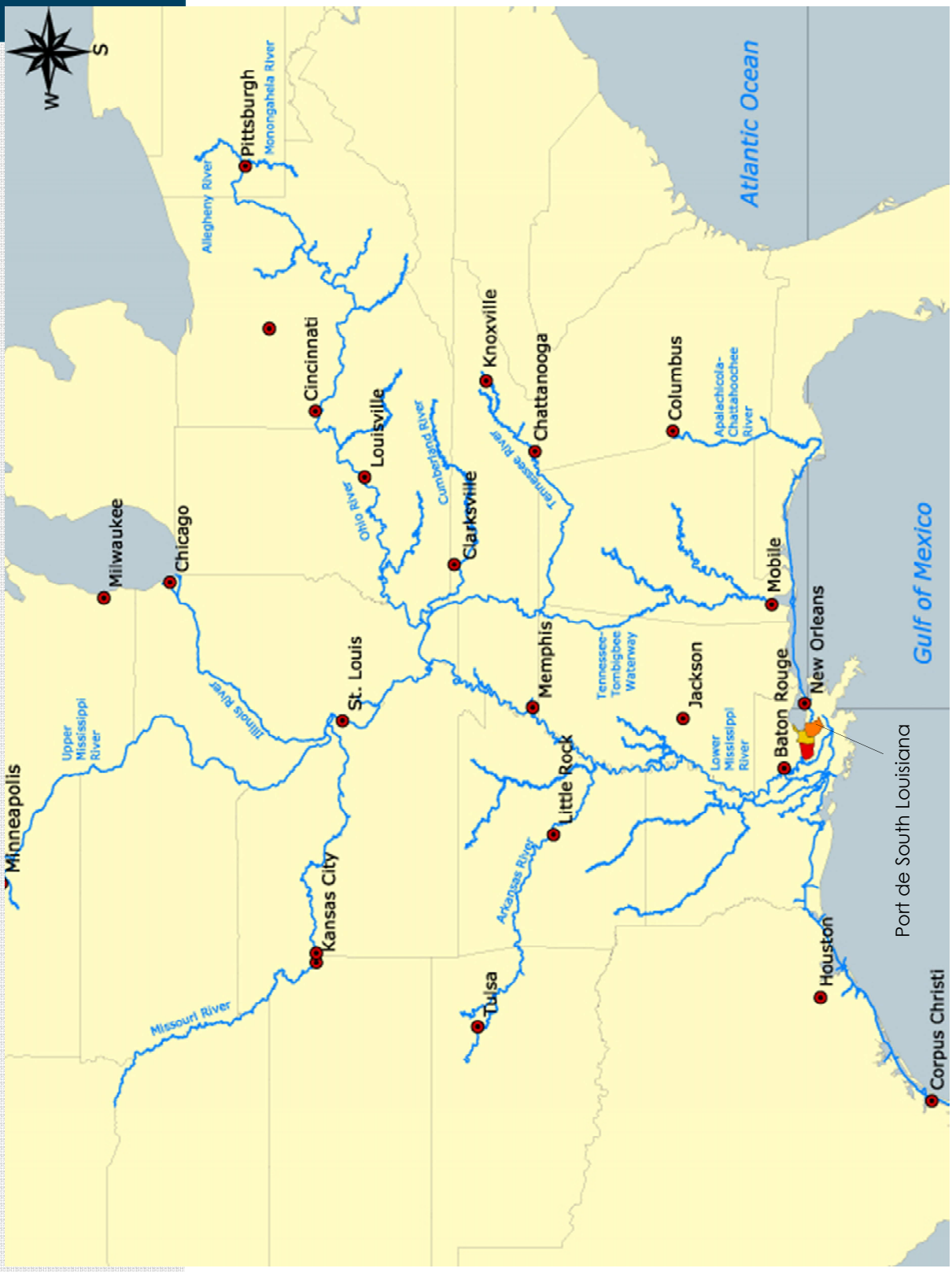
Major ports

Port of New Orleans
Tonnage (2016): 45 million tons
Number of passengers (2016): 1,070,695

Port of South Lousiana
Tonnage (2017): 308 million short tons
50% of the American agricultural exports per year

Initiatives
pour l'Avenir des
Grands Fleuves

The Mississippi



Main ports on the Mississippi and its tributaries.

The Mississippi

Structures

Hydropower projects

To date, less than 3% of dams in the United States (around 84,000) are equipped for hydroelectricity production. A report written in 2012 for the U.S. Department of Energy, estimated a potential of 12,000 MW of hydroelectricity capacity could be developed in the United States using existing dams.

1- Developing the potential of existing installations

Projects

Energy producers are increasingly focusing on integrating hydropower structures in existing locks and dams, mainly in the northern part of the Mississippi.

A USACE study (see below) estimates the potential of 50 identified projects in the Mississippi valley at 1,568 MW, of which 60% appears feasible (940 MW).

Actors

US. Army Corps of Engineers (USACE) is the largest owner and operates hydropower plants in the United States, with 75 plants on the scale of the country and a total installed capacity of 21,000 MW, i.e. 24% of the hydroelectricity capacity of the United States. The USACE owns most of the dams and locks located on the Mississippi and its tributaries.

The **Federal Energy Regulatory Commission (FRE)** is the organisation responsible for regulating hydropower plants.

Private hydroelectricity producers are showing increasing interest in the Mississippi's potential.

The localisation of USACE sites and potential installed capacity (June 2013):

Division	Total Projects Identified	FERC Preliminary or Pending Preliminary Permit		No FERC Permits	
		Total Number	Percentage of Total	Total Number	Percent of Total
Great Lakes & Ohio River (LRD)	71	40	56%	31	44%
Mississippi Valley (MVD)	50	28	56%	22	44%
Southwestern (SWD)	39	7	18%	32	82%
North Atlantic (NAD)	21	2	10%	19	90%
South Atlantic (SAD)	19	8	42%	11	58%
Northwestern (NWD)	12	5	42%	7	58%
South Pacific (SPD)	11	2	18%	9	82%
USACE Total	223	92	41%	131	59%

http://www.hydro.org/wp-content/uploads/2014/01/Army-Corps-NPD-Assessment.pdf

The FERC is studying more than half of the projects identified on the USACE's installations in the Mississippi valley.

The Mississippi

Dams in the Mississippi Valley Division (MVD):

ID	NAME	WATERWAY
MVD-1	ARKABUTLA DAM	COLDWATER RIVER
MVD-2	BALDHILL	SHEYENNE RIVER
MVD-3	BAYOU BODCAU DAM	BAYOU BODCAU
MVD-4	BRANDON ROAD LOCK & DAM	DES PLAINES
MVD-5	CADDO DAM	CYPRESS BAYOU
MVD-6	COLUMBIA LOCK & DAM	OUACHITA RIVER
MVD-7	CORALVILLE DAM	IOWA RIVER
MVD-8	DRESDEN ISLAND LOCK & DAM	ILLINOIS RIVER
MVD-9	DUBUQUE NUMBER 11	MISSISSIPPI
MVD-10	ENID DAM	YOCONA RIVER
MVD-11	FELSENTHAL LOCK & DAM	OUACHITA
MVD-12	GRENADA DAM	YALOBUSHA RIVER
MVD-13	JOE D. WAGGONNER, JR. LOCK & DAM	RED RIVER
MVD-14	JOHN OVERTON LOCK AND DAM	RED RIVER
MVD-15	JONESVILLE LOCK & DAM	BLACK RIVER
MVD-16	KASKASKIA LOCK & DAM	KASKASKIA RIVER
MVD-17	LA GRANGE LOCK & DAM	ILLINOIS RIVER
MVD-18	LAC QUI PARLE DAM	MINNESOTA
MVD-19	LAKE SHELBYVILLE DAM	KASKASKIA RIVER
MVD-21	LOCK & DAM #10	MISSISSIPPI RIVER
MVD-22	LOCK & DAM #3	MISSISSIPPI
MVD-23	LOCK & DAM #4	MISSISSIPPI
MVD-24	LOCK & DAM #5A	MISSISSIPPI
MVD-25	LOCK & DAM #6	MISSISSIPPI RIVER
MVD-26	LOCK & DAM #7	MISSISSIPPI
MVD-27	LOCK & DAM #8	MISSISSIPPI RIVER
MVD-28	LOCK & DAM #9	MISSISSIPPI RIVER
MVD-29	LOCK & DAM 24	MISSISSIPPI RIVER
MVD-30	LOCK & DAM 25	MISSISSIPPI RIVER
MVD-31	LOCK & DAM NO 5	MISSISSIPPI
MVD-32	LOCK AND DAM 15	MISSISSIPPI RIVER
MVD-33	LOCK AND DAM 18	MISSISSIPPI RIVER
MVD-34	MELVIN PRICE LOCKS & DAM	MISSISSIPPI RIVER
MVD-37	MISSISSIPPI RIVER DAM 14	MISSISSIPPI RIVER
MVD-38	MISSISSIPPI RIVER DAM 16	MISSISSIPPI RIVER
MVD-39	MISSISSIPPI RIVER DAM 17	MISSISSIPPI RIVER
MVD-40	MISSISSIPPI RIVER DAM 20	MISSISSIPPI RIVER
MVD-41	MISSISSIPPI RIVER DAM 21	MISSISSIPPI RIVER
MVD-42	MISSISSIPPI RIVER DAM 22	MISSISSIPPI RIVER
MVD-43	ORWELL RESERVOIR & DAM	OTTER TAIL RIVER
MVD-45	PEORIA LOCK & DAM	ILLINOIS RIVER
MVD-46	POKEGAMA LAKE DAM	MISSISSIPPI
MVD-47	RED RIVER W.W. LOCK & DAM #3	RED RIVER
MVD-49	RUSSELL B. LONG LOCK & DAM	RED RIVER
MVD-50	SARDIS DAM	TLE TALLAHATCHIE RI\
MVD-51	SAYLORVILLE DAM	DES MOINES RIVER
MVD-52	WALLACE LAKE DAM	CYPRESS BAYOU
MVD-53	WINNIBIGOSHISH DAM	MISSISSIPPI RIVER
MVD-20	LITTLE RIVER CLOSURE DAM	LITTLE RIVER
MVD-44	PEARL RIVER LOCK #1 & SPILLWAY	PEARL RIVER CANAL

http://www.hydro.org/wp-content/uploads/2014/01/Army-Corps-NPD-Assessment.pdf

The Mississippi

Structures

Hydropower projects

2- The Red Rock plant project

The Red Rock plant is a project to build a hydropower plant near an existing dam on the Des Moines River, a tributary of the Mississippi. It is driven by Missouri River Energy Services, a consortium composed of 61 municipal companies in four States of the north Midwest grouped together to purchase energy.

The installation will be the company's first project to build a hydropower plant. It is seeking to diversify its activities due to more severe regulations linked to the construction of coal and oil-fired power plants.

Locality: Des Moines River, Iowa.
Installed capacity: 36 MW. It is the second largest installation in terms of installed capacity after that of Keokuk (135 MW). The plant's output should cover the needs of the neighbouring town of Pella (18,000 inhabitants).
Start of works: August 2014
Commissioning scheduled in 2020.
The plant is built along an existing dam of the Corps of Engineers.

The number of jobs created annually to build the plant is estimated at 448 for three years, whereas its automated operation will only require 2 employees.

Missouri River Energy Services has also obtained preliminary permits to build two other plants in Iowa, on the dams of the Corps of Engineers located on the Mississippi. In addition, it is awaiting a permit to build a plant on the Saylorville dam on the Des Moines River.

3- Promoting hydrokinetic energy

Hydrokinetic energy projects that permit harnessing the energy of moving water are also starting up in the southern Mississippi, since it is better adapted to this type of project due to the depth of the water, the speed of the currents and the absence of dams.

Free Flow Power and Hydro Green Energy are the main actors in this market on the Mississippi River. According to Jon Guidroz, the Business Project Development Manager of Free Flow Power, "No river is better adapted for harnessing hydrokinetic energy than the Mississippi". However, obstacles remain. Free Flow Power has successively abandoned other projects, due to lower water levels than predicted and the lack of financial profitability. Hydro Green Energy is studying the potential for developing this technology though for the time being has decided to focus on developing hydropower using existing installations on the river.

The Mississippi

What river for tomorrow?

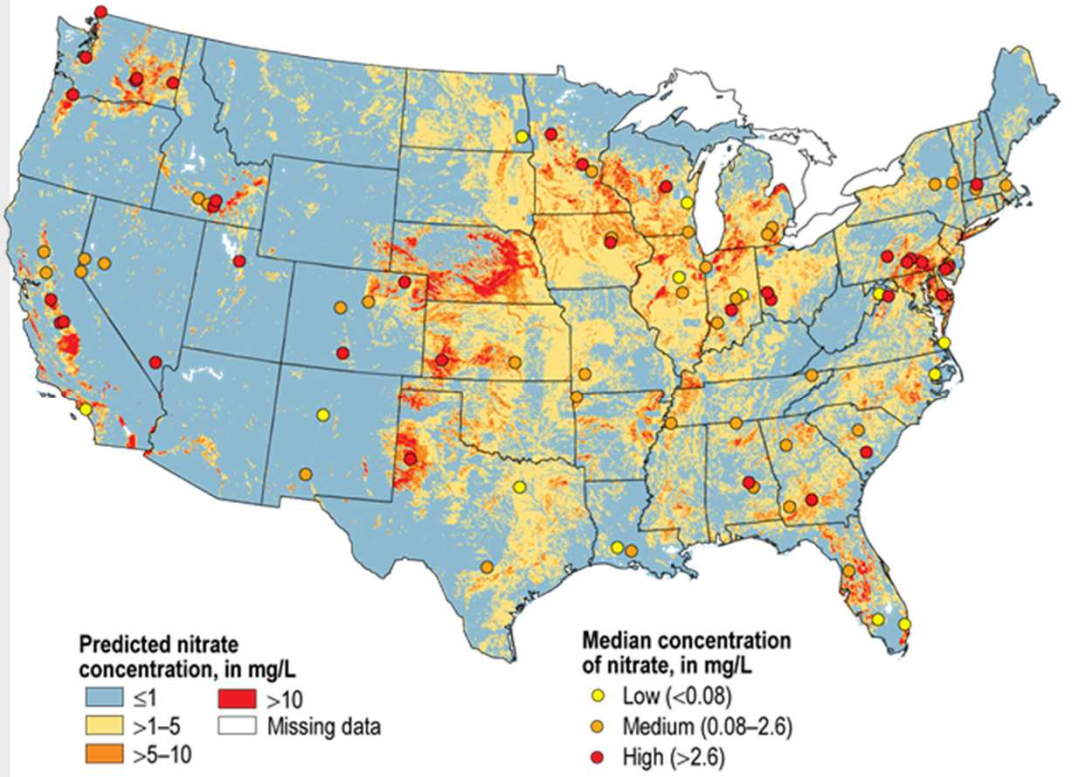
The increase in temperatures in the Great Plains has accentuated their vulnerability to drought and dependence on a resource whose exploitation has already reached its limits. The survival of the agricultural economy, vital for the entire United States, the competitiveness of river transport, the development of the river's potential as a source of renewable energy and the preservation of a remarkably rich ecosystem, directly depend on the capacity of the different political and economic actors of the watershed to define an integrated plan for the future of the Mississippi.

The Mississippi River Commission has identified three main challenges for the future:
- **adapting the navigable waterways to competition** in a framework of a globalised and competitive economy;
- **Identifying integrated solutions to flooding**;
- **Developing and setting up programmes** based on objective and scientific data, and that respect the environment while acknowledging the economic realities of the population's vital needs.

Restoring and preserving water quality

Covering a surface area of nearly 650,000 km², the swamps of the Mississippi form the largest continuous system of wetlands on the North American continent. The Upper Mississippi River Floodplain Wetlands, which cover 122,357 ha between Minnesota, Wisconsin, Iowa and Illinois is the largest national nature reserve in the Midwest. The Mississippi has at least 260 species of fish, i.e. a quarter of all the species living in North America. The river is a migration corridor for many species of birds.

The state of water resources in the United States



Initiatives
pour l'Avenir des
Grands Fleuves

The Mississippi

What river for tomorrow?

According to a report by the Environmental protection Agency (EPA) in 2013, most of the rivers and streams in United States are harmful to aquatic life, a trend that is worsening. The report says that 55% of rivers are in poor condition and that 23% are in threshold condition. Only 21% are considered to be in good condition.

One of the major concerns for the Mississippi is its level of pollution. The main culprits are **the phosphates and nitrogen contained in the fertilisers and wastewater stemming from the region's agricultural and industrial production**. They prevent plant growth and exacerbate soil erosion and floods. Although the river provides 90% of the freshwater flowing into the Gulf of Mexico, the impacts of this pollution go beyond the watershed as demonstrated by the "Dead zone" estimated to cover 22,000 km² in the Gulf of Mexico. This zone suffers from a shortage of dissolved oxygen, thereby suffocating the animal species present in these waters.

Also to be taken into account are the recent ecological disasters that have left lasting scars on the ecosystem, such as the wildfire of April 2010 that led to the spilling of fuel into the marshes close to the Mississippi delta.

The States and the government have progressively adopted measures to protect the region. In May 2012, the government of Louisiana approved the Coastal Master Plan, listing 109 projects intended to restore the delta and protect New Orleans. Its aim is to restore ecosystems, ensure the ecological management of the structures in place, and it includes a section dedicated to educating local communities.

In March 2015, the Ministry of the Interior devised an interactive tool to estimate concentrations in atrazine (a herbicide) in the rivers of the United States. Intended for use by political decision-makers, river managers and scientists, the tool is aimed at :

- providing better understanding of the localisation and reasons for pesticide concentrations;
- evaluating trends in terms of concentrations at different scales;
- building efficient control programmes;
- identifying rivers liable to have excessive concentrations.

The tool can be accessed on: http://cida.usgs.gov/warp/home/

In parallel, a large number of non-governmental organisations are seeking to influence public policies to take more account of the dangers that threaten the Mississippi, in the image of the association "Restore the Mississippi River Delta".

The Mississippi

What river for tomorrow?

Negative political backing for hydroelectricity

At both federal and State level, governments have shown willingness in recent years to develop the hydroelectric energy of the river and its tributaries. In April 2014, the Secretary of State for Energy, Ernest Moniz, announced that he wanted to double the country's hydroelectric capacity by 2030.

In the framework of his Action Plan for the Climate, Barack Obama referred in 2012 to the Red Rock project as a model of what the federal government should encourage. In 2013, the United States President signed a law to speed up the process of granting licences for hydropower plants with a capacity of less than 10 MW, and asked the FERC to develop strategies to limit the waiting time for licences to two years for larger plants located on dams not yet equipped.

Also in 2013, the Parliament of Iowa passed a law to allow hydropower projects to benefit from the same tax credits as those granted to wind power projects. At Federal scale, in 2005 Congress voted a law to grant hydropower projects with the same tax credits for their production, similar to that for wind farms.

But the Trump administration has made a brutal turnaround by putting back coal at the heart of the American energy mix. It has signed a decree on energy independence challenging several measures of the Clean Power Plan of its predecessor.

Regulatory and financial barriers remain too. In the case of hydrokinetic energy, the technology is still in the test phase and no project is being implemented at present. The main brakes to change come from the actors themselves. Certain proponents of hydropower development projects criticise the reluctance of the USACE, the owner and operator of most of the structures on which the future hydropower plants are to be installed.

Louisiana threatened by climate change

In Louisiana, between land and water, the bayous disappear and the coast loses up to 41 km2 of land each year, due to rising sea levels, coastal erosion but also infrastructure built by men.

The United States is ranked 11th in the countries most exposed to the rising waters. It's the entire model of development that is to be reviewed ...