U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

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November 23, 2011

MEMORANDUM

TO: Members of the Subcommittee on Water Resources and Environment

FR: Bob Gibbs, Subcommittee Chairman

RE: The Missouri River Flood: An Assessment of the River Management in 2011 and Operational Plans for the Future

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PURPOSE OF HEARING

The Water Resources and Environment Subcommittee is scheduled to meet on Wednesday, November 30, 2011, at 11:00 a.m. in 2167 Rayburn House Office Building, to receive testimony from Members of Congress, the United States Army Corps of Engineers and Missouri River basin stakeholders on "The Missouri River Flood: An Assessment of the River Management in 2011 and Operational Plans for the Future."

BACKGROUND

The Missouri River Basin

The Missouri River is the longest river in the United States, extending 2,619 miles from it headwaters in southwestern Montana. The Missouri River flows generally east and south to join the Mississippi River just upstream from St. Louis, Missouri. The Missouri River basin has a total drainage area of 529,350 square miles, including 9,700 square miles in the Canadian provinces of Alberta and Saskatchewan. That part within the United States extends over onesixth of the nation's area, exclusive of Alaska and Hawaii. It includes all of Nebraska; most of Montana, Wyoming, North Dakota, and South Dakota; about half of Kansas and Missouri; and smaller parts of Iowa, Colorado, and Minnesota.

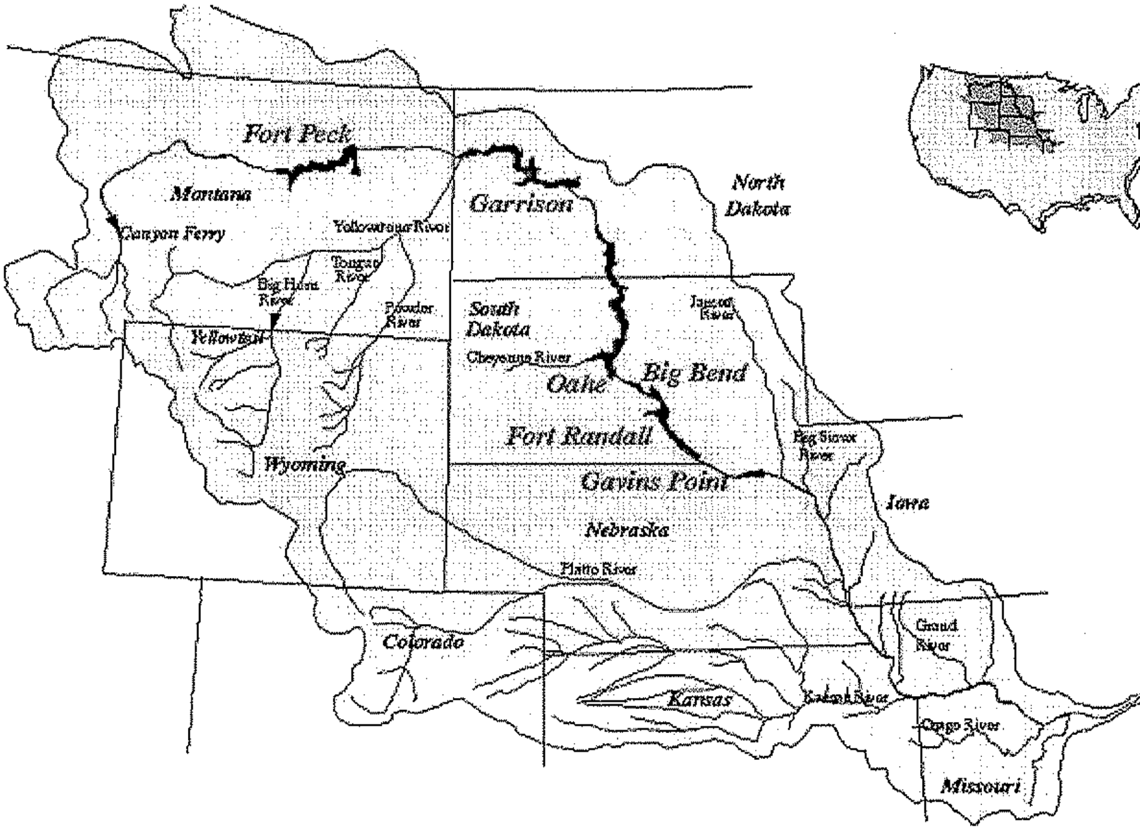
The broad range in latitude, longitude, and elevation of the Missouri River basin and its location near the geographical center of the North American continent, provide wide variations in climatic conditions. As is typical of a continental-interior plains area, the variations from normal climatic conditions, from season to season and from year to year, are very great. The outstanding climatic aberration in the basin during the 20th Century was the severe plains area drought of the 1930's when excessive summer temperatures and subnormal precipitation continued for more than a decade.

Prolonged droughts of several years' duration and frequent shorter periods of deficient moisture, interspersed with periods of abundant to excessive precipitation, are characteristic of the Great Plains. The Missouri River basin experiences large temperature fluctuations and extremes. Winters are relatively cloudy and cold over much of the basin, while summers are fair and hot.

Most floods experienced in the upper basin have occurred in the March-July season, with snowmelt as an important flood component. In the lower Missouri River basin, floods have tended to follow the same seasonal pattern observed in the upper basin; however, damaging floods have occasionally occurred prior to or following the normal March-July flood season, due mainly to rainfall over the downstream drainage areas.

Average flows, in general, increase from January to June and then gradually decrease through December. Although the general pattern of summer flows being higher than winter flows still prevails, System regulation serves to reduce summer flows in most years and to use the water stored to increase flows during the low-water periods of fall and winter.

The Missouri River basin's total land area in the United States totals about 328 million acres. Agriculture accounts for 95 percent of this area, while the remainder is devoted to recreation, fish and wildlife, transportation, and urban uses. Well over half of the total, 180 million acres, is pasture and range grassland devoted primarily to grazing. Cropland comprises nearly 104 million acres, or 32 percent of all lands basin wide, but the proportion ranges from as high as 71 percent in eastern Nebraska and western Iowa to as low as 7 percent in the Yellowstone River basin. Irrigated lands in the basin comprise 7.4 million acres, with about 6.9 million acres intensively cropped and about ½ million acres in irrigated pasture. Forest and woodland areas, most of which are grazed, total about 28 million acres, which is about 9 percent of the basin area. Transportation, urban development, and related uses now consist of 8 million acres of land. Water areas cover 3.9 million acres. Although they represent only 1.2 percent of the total basin area, the rivers, lakes, reservoirs, farm ponds, and other bodies of water are extremely important to the basin's overall economy.



Development of the System

History of water resources development in the Missouri River Basin dates back to approximately 1650 when irrigation is thought to have been started by the Taos Tribe along Ladder Creek in northern Scott County, Kansas.

The United States acquired the land that forms the Missouri River basin by a treaty signed on April 30, 1803. At more than 800,000 square miles in size, the Louisiana Territory was purchased for $15,000,000 from France and is commonly called the Louisiana Purchase.

The first federal exploration of the Missouri River basin was made in 1804-1806 by two Army officers, Captains Meriwether Lewis and William Clark. The first steamboat entered the river in 1819, and traffic developed rapidly to meet the needs of the expanding West. The first federal development was initiated when Congress appropriated funds to the United States Army Corps of Engineers to begin a program of snag removal to enhance navigation in 1824. Navigation of the Missouri River by steamboat reached a peak in about 1880 but had severely dwindled by about 1890 because of the coming of the railroads.

In 1912, Congress authorized a 6-foot navigation channel for the Missouri River from the mouth of the Missouri River near St. Louis to Kansas City, Missouri. Several subsequent Congressional acts modified this navigation project, the latest being the Rivers and Harbors Act 1945, which provided for works to secure a 9-foot-deep by 300-foot-wide channel from the mouth to Sioux City, Iowa.

The Corps of Engineers undertook the first comprehensive investigation and study ever made of the water resources and associated challenges of the Missouri River basin starting in 1927. The entire river system was examined to determine the water resources and the prospects of its development for flood control, navigation, irrigation, and power. This comprehensive investigation and its reports identified many projects that did not appear to be feasible at that time or within the scope of national policy for federal development but were subsequently adopted by the Corps and the Bureau of Reclamation (USBR) as integral parts of the Missouri Basin Plan.

The construction of Fort Peck Dam was commenced under Executive Order in October 1933 with funds provided by Congress for the relief of unemployment. The Fort Peck project was unique in that it did not go through the typical Congressional authorization process. Rather, it was begun in 1933 under the authority of President Franklin D. Roosevelt and the National Industrial Recovery Act to provide jobs in an area of high unemployment and severe economic depression.

Fort Peck was the first large dam across the mainstem Missouri River and was located far upstream in the headwaters of Montana, 1,878 miles from the mouth of the river. While the immediate purpose of the project was to provide jobs, its long-term purpose was to assure navigation in the 795 miles of river channel below Sioux City, Iowa. At the time of construction, irrigation was not a purpose of the project, even though the region was suffering from a prolonged drought. The Fort Peck Power Act of 1938 authorized construction of the power facilities.

Subsequent to construction of Fort Peck, both the Corps and the USBR prepared plans for the multiple-purpose water resource management throughout the Missouri River basin.

The Corps' then Missouri River Division Engineer, Colonel Lewis A. Pick, developed the Pick Plan, emphasizing navigation and flood control purposes. Three types of projects were proposed in the Pick Plan. These were 1,500 miles of levees along both sides of the Missouri River from Sioux City to the mouth, many small reservoirs located on the tributaries, and five additional mainstem dams.

William G. Sloan, Assistant Regional Director of the USBR's Upper Missouri Region, developed the Sloan Plan, emphasizing irrigation for economic stability and hydroelectric power for economic growth. Rivalry existed between the Corps and USBR over which of the two plans should be followed. A coordinated plan, developed by the Corps and USBR, was part of the Flood Control Act of 1944, which approved the coordinated plan and authorized appropriations to each of the two agencies for initial construction.

Much of the current system today finds its origins in the Flood Control Act of 1944. Under this Act, the Corps was given the responsibility for development of projects on the mainstem of the Missouri River. Under the 1944 Act, approximately 100 tributary reservoirs were authorized in addition to the Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point projects on the main stem of the Missouri River. The Act incorporated the Fort Peck project into the multi-purpose mainstem reservoir system.

The Missouri River Basin Project envisioned a comprehensive system of flood control, navigation improvement, irrigation, municipal and industrial water supply, and hydroelectric generation facilities for the 10 States in the Missouri River basin. As originally planned, the project was to include 213 single and multiple-use projects, providing 1.1 million kilowatts of hydroelectric capacity and irrigation for 5.3 million acres of farmland. While the Pick-Sloan Plan was only partially completed, it completely changed land and water resources development in the basin.

In its natural state, the Missouri River transported a large sediment load. With the construction of each of the System and tributary dams, the reservoirs have acted as catchments for the tremendous load of sediment carried by the Missouri River and its tributaries.

Due to this sediment, the loss of reservoir storage capacity is currently approaching 5 percent of the original total System storage. All six System reservoirs have large deltas that have formed in their headwaters. These large sediment deposits continue to grow, although they are confined to the upper reaches of each reservoir and its major tributary arms.

Regulation of flows provided by the System, augmented by upstream tributary reservoir storage, has virtually eliminated significant flood flows on the Missouri River in this reach. Still, the System has not created a flood-free zone along the Missouri River for all conditions.

Facilities of the System

Fort Peck Dam – Fort Peck Lake. Fort Peck Dam is located on the Missouri River in northeastern Montana, 17 miles southeast of Glasgow, Montana and 9 miles south of Nashua. Construction of the Fort Peck project was initiated in 1933, and the embankment closure was completed in 1937. The project was regulated for the authorized purposes of navigation and flood control in 1938. The Fort Peck Dam embankment is nearly 4 miles long (excluding the spillway) and rises over 250 feet above the original streambed. Fort Peck Dam remains the largest dam embankment in the United States (126 million cubic yards of fill), the second largest volume embankment in the world, and the largest "hydraulic fill" dam in the world. Fort Peck Lake is the third largest Corps reservoir in the United States. When full, the reservoir is 134 miles long. The concrete spillway is over 1 mile long. Completion of the first powerplant occurred in 1951. Construction of a second powerplant began in the late 1950's and the two units of this plant became operational in 1961. Generally, it has remained filled from that time with the exception of the droughts of 1987 to 1993 and 1999 to date. Exclusive flood control storage space was first used in 1969, and then again in 1970, 1975, 1976, 1979, 1996, and 1997.

Garrison Dam – Lake Sakakawea. Garrison Dam is located in central North Dakota on the Missouri River about 75 river miles northwest of Bismarck, North Dakota and 11 miles south of the town of Garrison, North Dakota. Construction of the project was initiated in 1946, closure was made in April 1953, and the navigation and flood control functions of the project were placed in operation in 1955. Garrison Dam is currently the fifth largest earthen dam in the world. The first power unit of the project went on the line in January 1956, followed by the second and third units in March and August of the same year. Power units 4 and 5 were placed in operation in October 1960. Generally, it remained filled from that time through 2002, except for the two drought periods to date. Exclusive flood control storage space was used in 1969, 1975, 1995 and 1997. Lake Sakakawea is the largest Corps reservoir. When full, the reservoir is 178 miles long and up to 6 miles wide. The reservoir contains almost a third of the total storage capacity of the System, nearly 24 million acre feet, which is enough water to cover the State of North Dakota to a depth of 6 inches.

Oahe Dam – Lake Oahe. The Oahe Dam is located on the Missouri River 6 miles northwest of Pierre, South Dakota. Construction of Oahe Dam was initiated in September 1948. Closure of the dam was completed in 1958, and deliberate accumulation of storage was begun in late 1961, just before the first power unit came on line in April 1962. The last of the seven power units became operational in July 1966. The Exclusive Flood Control Zone in Lake Oahe was used in 1975, 1984, 1986, 1995, 1996, 1997, and 1999. Lake Oahe is the second largest Corps reservoir, with just over 23 MAF of storage capability. When full, the reservoir is 231 miles long, with 2,250 miles of shoreline.

Big Bend Dam - Lake Sharp. Big Bend Dam is located on the Missouri River near Fort Thompson, South Dakota and about 20 miles upstream from Chamberlain, South Dakota. Lake Sharpe extends 80 miles upstream to the vicinity of the Oahe Dam. The project is basically a run-of-the-river power development with regulation of flows limited almost entirely to daily and weekly power pondage operations. Construction began in 1959, with closure in July 1963. The first power unit was placed on line in October 1964, and the last of the eight units began operation during July 1966.

Fort Randall Dam – Lake Francis Case. Fort Randall Dam is located on the Missouri River about 6 miles south of Lake Andes, South Dakota. Lake Frances Case extends to Big Bend Dam. Construction of the project was initiated in August 1946, closure was made in July 1952, initial power generation began in March 1954, and the project was completed in January 1956.

Gavins Point Dam – Lewis and Clark Lake. Gavins Point Dam is located on the Missouri River on the Nebraska-South Dakota border, 4 miles west of Yankton, South Dakota. Lewis and Clark Lake extends 37 miles to the vicinity of Niobrara, Nebraska. Construction was initiated in 1952, and closure was made in July 1955, with initial power generation beginning in September 1956. The third and final unit of the installation came into service in January 1957.

Master Manual for a Complex System with Competing Purposes

The Missouri River Mainstem Reservoir System Master Water Control Manual is based on the Flood Control Act of 1944 and outlines priorities for water use within the basin and the operating requirements for the mainstem dams and reservoirs. A Master Manual is required, not just because of the sheer size of the System, but also because the System consists of integrated operation of multiple projects, each of which also has its own water control manual. Runoff varies in terms of the geographic distribution and seasonal fluctuation of the inflows. The distribution of streamflow in combination with extreme seasonal variation results in significant change. This variability requires a System water control plan that is very flexible to allow the

Corps to meet the water resources mission and regulate this large and complex System to meet the operational objectives.

The Master Manual provides guidance for developing annual operating plans and for making daily operations decisions. The Master Manual was first prepared in 1960 through Corps of Engineers coordination with other federal agencies and basin States. The most recent update of the Master Manual was initially requested by basin governors in 1989 but these revisions were not completed until 2006. The Corps of Engineers is responsible for operating the System for 8 different, and sometimes competing, purposes.

Flood control

Periodic floods are a regular occurrence throughout the Missouri River Basin. Resulting from storms, snowmelt and even ice jams, floods significantly impact the people, communities, infrastructure, farms and businesses in the Basin. Periodic floods are a regular occurrence throughout the Missouri River Basin. Resulting from storms, snowmelt and even ice jams, floods significantly impact the people, communities, infrastructure, farms and businesses in the Basin. Historically, the Missouri River overflowed its banks nearly every year, and major floods were recorded in 1844, 1881, 1903, 1915, 1926 and 1934.

In 1943, floods in the Midwest were unusually severe. America was at war and flood waters impeded the military effort. Federal projects, such as dams and levees, were built to protect flood-prone areas. While the 1993 flood ranks among the nation's most costly, flood control measures resulting from the Flood Control Act of 1944 prevented even more damage. Measures now in place are estimated to have prevented billions of dollars in damages to homes, businesses, public facilities, farms, and infrastructure.

Water supply

The Missouri River has long been a source of drinking water and water for industrial, domestic, and farm uses for the people living along its banks. The drought of the 1930s was a reminder of the importance, and potential scarcity, of water resources.

Today, the Missouri River continues to be a major source of water for cities, towns, rural water systems, industry, agriculture and domestic use. Missouri River water is withdrawn through intakes at about 25 power plant facilities and nearly 60 municipal water supply facilities. Millions of people rely on the municipal facilities along the Missouri River for their drinking water.

Water level is a critical factor for these intakes. In the past decade, multi-year droughts in the Missouri River Basin have reduced water levels to the point that some intakes have had to be lowered. At times, water suppliers on the Missouri River have had difficulty accessing water and some have modified their intakes, installed emergency pumps, or have taken other emergency measures to meet their needs.

Navigation

The Missouri River supports navigation from Sioux City, Iowa to the confluence with the Mississippi River, near St. Louis, Missouri. Flows from the Missouri River also contribute to navigation on the Mississippi River from St. Louis to New Orleans, Louisiana. Drought and low water on the Missouri River have limited barge traffic in recent years.

Today, the Corps maintains the Missouri River channel. Its smooth bends are set in place by navigation structures which concentrate the Missouri River so that the water flow helps maintain the channel. The navigation project and it associated bank stabilization activities has safeguarded numerous cities and communities from destructive river erosion and channel migration for many decades.

The navigation channel provides an economical system of moving products, primarily agricultural products, to market.

Water Quality

Today, Tribal, local, State and federal stakeholders monitor water quality in the Missouri River for numerous physical, chemical, and biological constituents. The Missouri River provides water to many rural communities and cities that are relying less on local aquifers with water quality issues. The reliability and importance of Missouri River water quality is essential to the future of many communities in the Basin.

Numerous power plants draw cooling water from the Missouri River. Low river flows affect power plants' ability to withdraw and discharge heated water into the Missouri River while staying within water quality standards.

Irrigation

Millions of acres in the arid and semi-arid portions of the Missouri River Basin were planned to be irrigated by the Pick-Sloan Plan. Irrigated lands were envisioned to help settle those parts of the Basin and provide increased agricultural production. Planners also hoped to provide homesteads and employment for returning World War II veterans. As time passed, changing national economic and environmental priorities substantially altered the original plans for irrigation.

Today, water from the System irrigates approximately 550,000 acres throughout the arid and semi-arid portions of the Missouri River Basin. Around 400,000 of those irrigated acres receive water from gravity-fed ditches from water impounded for irrigation in the tributaries of the Missouri River. The remaining 150,000 acres receive water pumped with hydroelectric power from the Missouri River and its tributaries. The duration of the irrigation season and amount of water needed depends on rainfall and snowmelt.

Recent extended drought experience has occasionally forced difficult decisions on irrigation water use and alternatives. However, irrigation has benefited rural communities in the arid portions of the Missouri River Basin by providing a stable supply of water for a variety of irrigated crops.

Recreation

The approximately 2,600 miles of the Missouri River can be divided into three "reaches;" a free-flowing upper reach, a middle reach with multiple dams, and a channelized lower reach. The Missouri River is fed by many tributaries, some of which are free flowing, and others like the Missouri River, are dammed. Recreational users in all three reaches and on the tributaries share many water-based outdoor experiences, though the recreational activities may look different based on the reach or tributary they are using.

Impounding and channelizing the Missouri River brought dramatic changes to the ways people used the River for both industry and enjoyment. People adjusted to these changes, and many Missouri River users and local and regional economies came to depend on stable and predictable recreational access. Today's Missouri River affords fishing, boating, floating, hunting, hiking, camping, sightseeing, swimming, and many other outdoor activities.

Sport fishing is a primary component of recreation on the main stem reservoir system, lower river, and tributaries. A diverse community of coldwater, coolwater, and warmwater sport fish inhabit the Missouri River Basin. The main stem reservoirs have been stocked with coolwater and coldwater game and forage species to take advantage of the cold water retained in the deeper water of the reservoirs. Fishing for walleye and salmon is particularly popular on the main stem reservoirs.

Hydropower

The six mainstem dams of the Missouri River support 36 hydropower units capable of using the force of moving water to generate approximately 2,500 megawatts, enough power to serve millions of households. Hydropower generation returns significant revenues to the Federal Treasury.

Power generation output is generally dependent upon seasonal patterns of water flow in the Missouri River. If possible, adjustments are made to provide more energy during winter and summer when demand is higher. Once the power is generated, it is turned over to Western Area Power Administration that sells power to customers including Tribes, communities, rural electric cooperatives, public utility and irrigation districts, Federal and State agencies, investor-owned utilities, and power marketers. They, in turn, provide electric services to millions of consumers in Iowa, Minnesota, Wyoming, North Dakota, South Dakota, Colorado, Kansas, Montana and Nebraska.

Fish and Wildlife

Fish and wildlife are important components of the Missouri River ecosystem. Historically, the shape of the lower river was very different than what we see today, with a shifting, braided channel and abundant sandbars, islands, wetlands and bottomland forests.

These habitats supported many birds, mammals, amphibians and reptiles. Flocks of ducks, geese, pelicans, and cranes used the Missouri River during the spring and fall migrations. Birds like the piping plover and the least tern relied on exposed sandbars for nesting and raising young.

The creation of the reservoirs and the regulation of flows have substantially changed water depth, sediment loads, temperature, and nutrients in the Missouri River. Islands and sandbars have been lost or reduced. Many of the chutes, backwaters and wetlands, important breeding and nursery grounds for fish, have been eliminated or were cut off from the main channel.

These changes to the Missouri River have impacted native fish and wildlife. For example, the numbers of individuals for many species have declined, including aquatic insects, a key link in the food chain. Most of the main channel native fish species are listed as rare, uncommon or decreasing in their native range. Still, the overall diversity of species remains stable and migratory birds continue to use the Missouri River.

Several Corps of Engineers efforts are addressing the need for improving habitat for fish and wildlife. The Missouri River Ecosystem Restoration Plan and the Missouri River Recovery Program are working to restore aquatic and terrestrial habitat and to recover populations of three threatened and endangered species negatively affected by the changes to the Missouri River. The three species are the piping plover, least tern and the pallid sturgeon. The Corps is working in partnership with the U.S. Fish and Wildlife Service and many other agencies and organizations to restore some of the Missouri River's natural form and function, creating an ecosystem in which native river species will thrive in conjunction with human needs and uses.

2011 Flood Event

2011 was an extraordinary year regarding flooding in the Missouri River Basin. Between plains snowpack, mountain snowpack, and precipitation, it is estimated as of September 2011 the Basin will receive 61.8 million acre feet of water into a System that has a storage capacity of 73 million acre feet. Since records were kept beginning in approximately 1887, this runoff into the System easily exceeded the previous record of approximately 49 million acre feet set in the 1997.

Unprecedented runoff occurred in the Basin in the months of May, June, and July 2011. May was the third wettest single month on record, with 10.5 million acre feet of runoff, surpassing the previous May record of 7.2 million acre feet set in 1995. June was the single wettest month on record with 13.8 million acre feet of runoff, surpassing the previous record of 13.2 million acre feet set in 1952. And July was the fifth wettest single month on record with 10 million acre feet of runoff. The combined three months of 34.3 million acre feet of runoff in 2011 is higher than the total annual runoff in 102 of 113 years in the period of record.

The full economic impact of the 2011 Missouri River flood event has not yet been realized, but preliminary estimates put the costs at well over $2 billion. According to the National Climate Data Center (NCDC), an estimated 11,000 people were forced to evacuate Minot, North Dakota where 4,000 homes were flooded. The flooding also stretched into part of

Canada, where property and agriculture losses were expected to surpass $1 billion. The NCDC has found 5 confirmed instances of loss of life due to the flood.

Some have expressed concern with the Corps of Engineers and other federal agencies regarding their response to the 2011 flood event. For instance, in some areas inundation maps were inadequate or non-existent. In some cases, the only tool municipalities had to use were 100-year floodplain maps, many of which were inaccurate.

Many residents in the Missouri River basin have suggested the Corps of Engineers provide more space in the reservoirs for flood waters. But, this would impact most of the other authorized purposes of the Missouri River system and likely impact other flood damage reduction efforts throughout the system, especially further downstream.

The Corps of Engineers annual operating plans for the Missouri River system begins each new runoff year at a normal or average starting point. But, the Missouri River basin is subjected to extreme droughts or extreme wet cycles, making predictions difficult. In addition, when the Corps of Engineers develops its annual operating plans, it is not a forecast for the coming year. The annual operating plan provides a range of alternatives of potential runoff scenarios which cover 80% of the historical record. There is still a 10% chance that runoff could be above this range and a 10% chance that runoff could be below this range.

Starting on October 24, 2011 and ending on November 3, 2011, the Corps of Engineers hosted of public meetings throughout the Missouri River basin to discuss its development of the draft 2012 annual operating plan. The Corps expects to release a final 2012 annual operating plan by mid-December 2011 based on the feedback it has received at those public meetings.

Witnesses

Members of Congress

Brigadier General John McMahon
Commander and Division Engineer
United States Army Corps of Engineers
Northwestern Division

The Honorable Jim Suttle
Mayor
City of Omaha, Nebraska

Mr. Tom Waters
President
Missouri Levee and Drainage District Association

Brad Lawrence
Director of Public Works
City of Fort Pierre, South Dakota

Ms. Kathy Kunkel
County Clerk
Holt County, Missouri

Richard Oswald
Langdon, Missouri