

MISSOURI LEVEE AND DRAINAGE DISTRICT ASSOCIATION

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www.MLDDA.org

TOM WATERS, CHAIRMAN
36257 HIGHWAY Z
ORRICK, MISSOURI 64077
(816) 770-5562

LANNY FRAKES, VICE-PRESIDENT
13371 SW ST., RT. KK
RUSHVILLE, MISSOURI 64484
(816) 668-7820

CARL LENSING
CHAIRMAN EMERITUS
447 HIGHWAY 94
RHINELAND, MISSOURI 65049
(573) 236-4577

PAUL SEIGFREID, ATTORNEY
108 NORTH JEFFERSON
MEXICO, MISSOURI 65265
(573) 581-8888

“Working to Preserve our Heritage and Agronomic Resources in America’s Heartland”

Glossary of River Management Terminology (2015)

• The following discussion covers basic items that government agencies consider for the operation of the Missouri River. Landowners need to be familiar with these items to recognize agency proposals and policies about future river operation, in order to understand how they will affect landowners’ interests and to take action in their own interests.

- 1) The “Master Manual” is the official guideline for operation of the river. The present “Master Manual” was implemented in March 2004 and was amended again in 2006 to allow for Adaptive Management. Adaptive Management gives government scientists the power to change the Master Manual and/or implement “*corrective action*” if tested hypotheses and sound science are the basis for the changes. The Master Manual and the following have been the bases for discussion, concern, lawsuits, legislation, etc., and the like, and will continue to affect the operation of the river. The web site for the Master Manual (*.pdf file 432 pages) is <www.nwd.usace.army.mil>
- 2) The “Annual Operating Plan” (AOP) is an annual plan developed by the US Army Corps of Engineers (USACE) Reservoir Control Center (RCC) in Omaha for operation of the Missouri River system of dams and reservoirs. Of concern to Missourians are the proposed water depths in the river. The AOP is proposed in October for the following year. The final AOP is usually stated as a Record of Decision (ROD) in February or March. Hearings for the AOP can be held in cities from Montana to Missouri along the river basin. Here in Missouri the hearings are usually held in Kansas City, Jefferson City and St. Louis. Because of budgetary constraints, most recently AOP meetings are held via Webinars and phone conferences. With an Internet connection participants can view presenter’s slides and can hear conversations real-time via the companion phone connection. The AOP takes into account water presently stored in the upstream reservoirs and how it will be released up to July. This includes proposed spring rise releases. In early July, the USACE takes stock of the amount of water in storage and announces via additional meetings or Webinars how the river will be operated for the rest of the year. Search for the AOP in www.nwk.usace.army.mil
- 3) The average runoff from the upper river basin is 25 million-acre feet per year. The reservoirs holding the lion’s share of this runoff are Lake and Dam Oahe at Pierre, South Dakota; Lake Sakakawea (Garrison Dam) in Western North Dakota; and Fort Peck Lake and Dam in East central Montana. Water levels in

these reservoirs are designed to vary greatly (30 feet+). The Fort Randall Dam reservoir downstream from Oahe is operated as a flood control reservoir too. The water levels in the two remaining reservoirs (Big Bend and Lewis and Clark Lake (Gavin's Point Dam)) downstream from Lake Oahe are kept relatively constant and are operated basically to allow for a flow through of waters from the upper reservoirs. All of the dams have hydroelectric power stations. The six reservoirs together are known as the "Mainstem Reservoir System." The three most upstream Missouri River reservoirs formed by Fort Peck Dam, Garrison Dam, and Oahe Dam are called the "Upper Reservoirs" or the "Upper River." The segment of the Missouri River that extends from Gavins Point Dam to the mouth of the river near St. Louis is called the "Lower River." Additional reservoirs other than these are operated by the USACE and the Bureau of Reclamation (BOR) for power generation, recreation, and water level and flood control.

- 4) Pick-Sloan Missouri Basin Program (P-S MBP) of 1944; a program implemented to combine the water resource programs in the Missouri River Basin of the BOR and the USACE. The features the program provides are multiple uses of the river. A majority of them are:
 - a. Flood control
 - b. Navigation
 - c. Water outtakes (1,600) for potable water for cities and cooling water for coal and nuclear power plants
 - d. Hydroelectric power (10,000,000 Megawatt Hours)
 - e. Drainage (primarily downstream from Gavins Point)
 - f. Irrigation (primarily upper basin states)
 - g. Recreation (boating and fishing)
 - h. Environmental activities (fish and wildlife habitat, Endangered Species Act (ESA))
- 5) The "Missouri River Authorized Purposes Study" (MRAPS), has been defunded. It is unknown if Congressional funding will be reinstated in future years.
- 6) Principles and Guidelines (P & G) are criteria for agency development and implementation of water and land related studies and/or projects (levees, locks and dams, reclamation projects, etc.). P & G are set at the national level in Washington DC by the President and the Congress. Present trends in Washington DC reverse past guidelines whereby wildlife conservation and environmental concerns are placed ahead of importance of human and economic concerns.
- 7) The Water Resources Development Act (WRDA) is Federal legislation that 'authorizes' new programs or projects nationwide. Separate legislation is needed to fund individual steps of the projects. The Act spells out the scope of the projects. This includes the land areas affected by the Act as well as language and authorities for implementation for the different parts of the Act. WRDA legislation is not enacted every year but is usually passed once every two years. WRDA 2007 was passed in the fall of 2007. Significant programs and projects of interest in the midwest include reconstruction of the locks and dams on the upper Mississippi River, in Section 5018 the setting up and authorization and operation of the Missouri River Recovery Implementation Committee (MRRIC, pronounced Mister Ric), and in Title IX Section 9000 the setting up of a plenary committee to meet and report to Congress by mid-2009 recommendations for a national levee safety law to be enacted by Congress.

MRRIC The MRRIC is a totally federally funded process and program except for covering the travel and meeting expenses of North American Tribe and non-governmental stakeholder committee members. The purpose of this committee is to provide a mouthpiece for the stakeholders in the river basin wherein they may, either as a MRRIC member or through their locally appointed representatives to the MRRIC,

make recommendations about the operation of the river and recommendations about agency recovery activities involving the ecosystem, wildlife conservation and the environment. *The recommendations of the MRRIC are not binding on the affected Federal government agencies empowered with operation and recovery activities on the river.* The Federal agencies can receive and adopt recommendations from other individuals, organizations and sources. In addition to representation on the MRRIC, the Tribes can enter into consultations to formulate agreements with the Federal agencies outside of the recommendations of the MRRIC. The Federal agencies involved are the Department of Agriculture (USDA), the Department of Defense (DOD), the Department of Energy (DOE), Department of Interior (DOI), and the Environmental Protection Agency (EPA). The most heavily represented department is the Department of the Interior with its agencies that include the US Fish and Wildlife Service (FWS); the Bureau of Reclamation (BOR); the U.S. Geological Survey (USGS); The National Park Service (NPS); and the Bureau of Indian Affairs (BIA). Other departments and agencies are invited to participate in the roundtable. Significant provisions in the MRRIC Charter include: a) Recommendations of the MRRIC must be by consensus, i.e., 100% agreement through a two-meeting process. This prevents majority rule against one or two states' interests; b) The two lead agencies with a position among the committee stakeholders are the USACE and the US-FWS. Representatives of these agencies must be persons with a Senior Executive Service (SES) level in government. It is hoped that, given this level of representation, when consensus is reached with these individuals, the MRRIC recommendations will be carried out; c) The size of the MRRIC is made up with one governor-appointed representative from each State (8 States), one tribal appointed representative from each Tribe (28 North American Tribes), and a maximum of twenty-eight (28) stakeholder members, broken down into the interests listed below. Each interest may have a maximum of two (2) representatives and two (2) alternates. The MRRIC web site is www.mrric.org.

Navigation, Irrigation, Flood Control, Fish and Wildlife, Recreation, Water Quality, Water Supply, Agriculture, Conservation Districts, Waterway Industries, Major Tributaries, Thermal power, Hydro power, At large/other interests, e.g. cultural and historic preservation, Local Government; and, Environmental/conservation organizations

MRERP-EIS All work on this Plan has been halted since the year 2012 and no work on this plan will take place until Congressional funding is restored.

MRRP The Missouri River Recovery Program (MRRP) is often stated as the “Recovery Program”. The MRRP allows the USACE to meet the 2003 BiOp requirements, thus forestalling a finding of the USFWS that mainstream project operations “jeopardize the continued existence of listed species” or result in the “destruction or adverse modification of critical habitat of threatened and endangered species”. The MRRP enables the USACE to meet the Nation’s laws while continuing to meet all the authorized functions of the Missouri River system. This program is presently underway in the form of land purchases and construction of shallow water habitat, chutes, wetlands, sandbar development, the intake project on the Yellowstone River and other recovery projects. The USACE receives and administers the funding for this program. Continuing authorization funding for this program is \$55 million per year and has been funded as high as \$75 Million per year. The capability of this program is \$113 Million per year. The MRRIC reviews the components of this program, (annual project work requests and annual work plans) and makes recommendations on an annual basis. *The recommendations of the MRRIC are not binding on the affected Federal government agencies empowered with the operation of this “Program”.* This program can proceed either with or without recommendations from the MRRIC. Projects are approved and implemented by various Federal and State government agencies through the Agency Coordination Team (ACT). The MRRP web site is www.moriverrecovery.org

MRRMP-EIS Missouri River Recovery Management Program - EIS This is a 3 year planning effort due May 2016, for evaluating and updating the MRRP. Updating and revisions will include an Adaptive Management (AM) plan, an updated EIS for species recovery, incorporation of the actions, studies, Conceptual Ecological Models (CEM)'s and recommendations of the MRAPS, MRRIC, and the ISAP, compliance with NEPA and the 8 authorized uses of the river. NOTE: The MRRP allows the USACE to meet any BiOp requirements. The “*Consequences*” of proposed Corrective Actions (CA) are due May 2014, and the “*Tradeoffs*” impacting Human Considerations (HC) are due May 2015. See <http://moriverrecovery.usace.army.mil>

ISAP Independent Science Advisory Panel is an advisory panel of 13 member scientists appointed by the Third Party Science Neutral (TPSN) to review various ‘*management or corrective actions*’ under way in the MRRP and provide recommendations to the USACE, USFWS and MRRIC on potential refinements. The actions of the TPSN and the ISAP are to provide external scientific review and oversight of existing recovery activities. Through collaborative action between the USACE, USFWS and the MRRIC, acting on the findings and recommendations of the ISAP, Adaptive Management (AM) plans are intended to be developed. The first charge to the ISAP was review of the spring rise / pulse. Their report pointed out several scientific deficiencies in the pallid sturgeon recovery actions. As for the spring rise / pulse, their conclusion was that the spring rise / pulse as it is presently being implemented is ineffective in the recovery of the pallid sturgeon. Among some of their solutions for recovery were experimentation with alternative river flows like base flows (low summer flows) and a development of a CEM for the pallid sturgeon recovery. At this time the MRRIC and the various agencies are well along in developing a CEM and incorporating cultural, economic and social considerations into the recovery of the pallid.

NATIONAL LEVEE SAFETY PROGRAM, REVIEW AND LEGISLATION

The provisions for national levee review and a safety law in WRDA 2007 came about as the result of hurricane Katrina. The intent of the government is to reduce the financial exposure of the government and taxpayers to flood damage losses. The first draft of the National Committee on Levee Safety (NCLS) report to Congress (104 pages) is on file at <<http://www.iwr.usace.army.mil/ncls/reviews.cfm>> The web site for the NCLS is < www.iwr.usace.army.mil/ncls/ > Items of concern in the draft and those that will need to be addressed are: a) Levee safety requirements will no longer be based on the levee height alone. Safety requirements will be based upon ‘*flood risk*’ and will now include structural integrity of the levee and to what degree it meets USACE standards for levee construction, provisions for ditch and pump drainage of the flood protected lands and means for protecting and for moving people away from danger; b) Under certain circumstances, operators of levees will at their own expense have to have their levees, drainage and population protection systems inspected and certified by an independent Registered Engineer; c) The States will have to enact laws to administer the levee safety program; and, d) There are provisions for exempting certain levee systems from the levee safety program.

For this the program, all federal levee systems are to have a “periodic” inspection by 2011 and repeat inspections every 5 years. Of interest to a majority of districts is the inspection program for non-federal levee districts. They are to have a “periodic” inspection by 2012. It is still unknown if repeat “periodic” inspections every 5 years for systems substantially providing less than 100 years of protection will need to be conducted. These inspections may or may not be fully paid for by the federal government. Availability of funding for these inspections varies widely throughout the various USACE districts. “Periodic” inspections are to occur every 5 years interspersed with “routine” annual or semi-annual inspections. Compliance for remaining eligible for Public Law 84-99 levee repair funds is provided in the “LEVEE OWNER’S MANUAL FOR NON-FEDERAL FLOOD CONTROL WORKS”,

dated March 2006 (118 pages) Call Jud Kneuvean at (816) 389-3281 for copies of the manual. On the lower part of the page the manual can be viewed or downloaded at <http://www.usace.army.mil/Missions/CivilWorks/LeveeSafetyProgram/LeveeInspections.aspx>

Initially, the greatest attention was directed toward levee systems, generally in urban areas, providing 100 years or more of protection (1 percent chance or less of flooding) and areas depending on FEMA flood insurance. In January 2015 a Federal Flood Risk Management Standard (FFRMS) was issued to build upon the existing Executive Order 11988. Several legislators in Washington DC have asked the President to allow input from stakeholders before implementation of the FFRMS in the spring of 2015. In this Standard new federally funded projects must be constructed to the 500 year flood level plus 3 feet of freeboard instead of the 100 year level. A study of old flood profiles on the Missouri river indicates that the difference between the 100 and 500 year flood is in the 1.00 to 3.00 foot range. With the 3 feet of freeboard, new levee and other new flood control works using Federal funds will have to be built higher in the 4 to 6 foot range. This applies to improving a levee already at the 100 year level. For an existing 50 year levee the additional height is in the 7.5 foot range and for an existing 10 year levee the additional height is in the 10 foot range. Going to the 500 foot level will expand the width of the regulatory floodplain. Proposed too is the inclusion of consideration of non-structural and environmental practices in the design of flood control projects. Additionally, "climate change" specs are now added to the regulatory mix.

What is unclear as of this writing is how this program will affect levee systems providing less than 100 years of protection and to what extent they will still be able to receive Federal Title 84-99 levee repair funds. The FFRMS states that the work is for new flood control works and for "damage and improvements" where the damage exceeds 50 percent of the value of the structure and wherein repairs and improvements have to be built to the new heights. This raises some questions: a) where do existing non-federal levee districts with mostly AG levees fit in? b) where do existing Federal levee districts fit in? c) how does this affect availability of 84-99 funds for repairs for existing levees well below the 100 year and 500 year level? d) will Federal 84-99 funds be denied in favor of environment projects? and, e) will Federal 84-99 funds still be available to return levees of any flood level height to their pre flood heights as the 84-99 program is now administered; or, will they have to be raised to the new level?

- 8) The following are definitions of terms about operation of the river:
- a. Reservoir water storage levels:

Carryover and Multiple Use water storage levels are for average runoff years. Waters from this storage sustains water levels in the lower river during periods of below normal precipitation in the basin.

Annual Flood Control & Multiple Use water storage levels are for annual flood control water level management and support of other authorized uses of the water. Flood Control water levels are to be completely evacuated from this zone by March 1st of each year to make room for the annual snow melt, etc. The flood control portion of the system was design on runoff measured in 1881. In 2011, the runoff exceeded the design runoff amount by more than 20 percent thereby leading to widespread flooding in the upper and lower basin. The only way to provide more flood water runoff storage is to lower the Multiple Use pool in the system. In the Missouri River basin, the USACE manages flood control operations with the 6 main stem reservoirs and 45 other reservoirs on tributaries of the Missouri River. Among the reservoirs on the tributaries of the Missouri River operated by the BOR, 22 of their reservoirs have "annual flood control and multiple use zones" and "exclusive flood control zones". When water levels rise into these zones, water releases from these reservoirs come under

control of the USACE for controlling flooding throughout the basin. Irrespective of flooding conditions in the basin, normal water releases from 2 main stem dams to support authorized uses in the Missouri River channel between the reservoirs are as follows: 1) Releases from Fort Peck Dam are in the range of 5,000 to 6,000 cfs to provide water levels for irrigation, municipal water supply and fisheries between Fort Peck and Garrison Dam. Of this discharge, water uses for irrigation are in the range of 100 to 200 cfs. 2) Releases from Garrison Dam are in the range of 14,500 to 16,500 cfs to provide water levels for irrigation, municipal water supply and power plants between Garrison and Oahe. Water releases from the 4 remaining dams, Oahe, Big Bend, Fort Randall and Gavins Point are based upon reservoir and downstream conditions.

Exclusive Flood Control water storage levels is a range of storage for above normal runoff and is the zone where water releases from reservoirs are mandatory to protect the reservoir system. Water releases are mandatory from this zone even when lower reaches of the river, like those in Missouri, are experiencing floods. The reason for this is to create room for the next season's expected average runoff. These water releases are called **Evacuations**.

Permanent Pool The minimum water level necessary to allow the hydropower plants to operate and provide minimum service to recreation and fish and wildlife. The permanent pool also provides reserved space for sediment storage.

Mountain Snowpack provides 50 percent of the runoff to the reservoirs. Snow fall peaks around the middle of April. Runoff begins around the first of May. Approximately 40 percent of this runoff flows into Fort Peck Lake and approximately 60 percent of this runoff flows into Lake Sakakawea.

Plains Snowpack provides 25 percent of runoff to the reservoirs and directly to the Missouri River upstream from Sioux City, Iowa. Runoff begins in late March with some being regulated by the reservoirs and some flowing directly to the Missouri River. Eastern most areas of South Dakota, southwestern most areas of Minnesota, Western Iowa, northern Missouri, eastern Kansas and most of Nebraska constitute the Plains Snowpack area whose runoff is unregulated by the reservoirs.

Rainfall provides 25 percent of the runoff to the reservoirs and directly to the Missouri River upstream from Sioux City, Iowa.

Runoff from approximately 10.7 percent of the basin area upstream from Sioux City, Iowa does not flow through the mainstem reservoirs.

Preclude The total System storage in MAF below which the release of water to support a specific use would be suspended or precluded. For example, the Navigation Preclude is 31 MAF, so when the total System storage drops below 31 MAF releases for navigation are suspended. The Spring Rise Preclude has yet to be determined, but can be no higher than 40 MAF to ensure sufficient conservation benefits for the pallid sturgeon.

Sediment Load In an ongoing basis, sediment from erosion accumulates in the reservoirs. The size of other water storage and management zones, like the permanent pool, are adjusted so that the "Exclusive Flood Control" and "Annual Flood Control and Multiple Use" zones are preserved and maintained at their original design capacity.

Flood Control Constraints – The Missouri River Master Water Control Manual (refer to Tables VII-7 and VII-8) contains more detailed information on Flood Control Constraints in the paragraphs that

address “Flood Target Flows”. As a flood control measure, the normal relationship between navigation service levels and target flow levels may be modified when large amounts of tributary inflow are forecasted between Gavins Point Dam and the downstream flow target control points at Kansas City. One level of flood target flows reduces flows to those consistent with full navigation service support and the second level of flood target flows reduces flows to those consistent with minimum navigation service support. The “Flood Control Constraints” are increased by 10,000 cfs at Kansas City during periods of “Evacuation” for waters in the “Exclusive Pool.” The spring rise flows proposed by agencies and environmental interest groups require that the flood control constraints be adjusted upward. This will permit increased flows at Kansas City irrespective of flooding conditions across the State of Missouri.

Unbalanced Reservoirs A proposed method of operating the water levels either higher or lower in the three uppermost reservoirs to meet goals peculiar to an individual reservoir. This operating plan would apply to a specific time of the year after which water levels would be operated normally. This is proposed to be done to provide for environmental, recreational and/or water supply reasons. Such a plan could not adversely affect desired goals and operations of any of the other reservoirs.

b. Navigation terminology:

Navigation Preclude is a condition where, because of insufficient water stored in the upper basin reservoirs in the annual flood control and multiple use pools, there will be no water releases from the reservoirs to support navigation on the Missouri River. This will adversely affect barge traffic on the Missouri River and, during periods of drought in the lower Midwest, adversely affect barge traffic on the Mississippi River.

Navigation Season is that period usually between April and December that the USACE supports navigation on the river from Sioux City, Iowa, to St. Louis, Missouri. When the season is shortened it usually comes at the end of the season. It takes 8 to 9 days for water levels in St. Louis to adjust to altered discharge rates from Gavin's Point Dam.

Navigation Service / Support is the minimum design and release levels of water to allow navigation. The USACE releases or monitors water levels to maintain an 8 to 9 foot deep channel for barges. The minimum flow or discharge maintained at Kansas City is 25, 000 to 28,000 cubic feet per second (cfs). In the 25,000 cfs down to 18,000 cfs range of flow, barges are not supported upstream of Kansas City. Anything below 18,000 cfs at Kansas City will not support navigation downstream from Kansas City.

Split Navigation Season is a proposal to stop support of navigation during August into September. Flows at Kansas City would fall below 18,000 cfs. This threatens water outtakes as well as navigation on the Missouri and Mississippi Rivers. Barge industry spokespersons state that they will not operate on the Missouri River with a “split” season because it requires them to gather up barges twice per navigation season. Additionally, low summer flows would lower water levels in some of the shallow water habitat and render it useless to the pallid sturgeon.

c. Environmental terminology:

BiOp US Fish and Wildlife Service 2000 Biological Opinion as amended in 2003. The pallid sturgeon and least tern are listed as endangered, and the piping plover is listed as threatened under the Endangered Species Act (ESA) because their populations are low. Since 1944, the U.S. Army Corps

of Engineers (Corps) have changed the river to provide for flood control and navigation on the Missouri River, but these changes affected the habitat for the fish and birds to the point that the population numbers decreased significantly along the river. The construction of the 6 reservoirs alone destroyed 32 percent of the natural habitat for these species. Since all three of these species use the Missouri River for part or all of their lives, the U.S. Fish and Wildlife Service (Service) determined the Corps needed to change how it operates the dams and maintains the channel and banks to protect the three species and provide more habitat. Under the Endangered Species Act, the Service wrote the 2003 Amended Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System (BiOp) which contains a Reasonable and Prudent Alternative (RPA). The RPA includes recommendations to the Corps to protect and provide more habitat for the birds and pallid sturgeon while still providing for flood control, navigation, and other authorized purposes. The BiOp also provides the science of why the populations of the three species are declining. It is the Service's opinion that the Corps can change the river flows to mimic the flows prior to construction of the dams at important times during the year to provide more habitat for the birds to nest and the fish to spawn. The Service also recommended in the BiOp that the Corps build more habitat for the three species.

The major elements of the Reasonable and Prudent Alternative (RPA) are:

- Adaptive Management (a method for evaluating and adjusting operations to improve conditions for the species)
- Fort Peck Flow Changes (Intake Dam restoration activities have taken priority)
- Gavin's Point Flow Changes
- Unbalancing water levels of the upper three reservoirs
- Pallid Sturgeon population augmentation (growing sturgeon in a hatchery and placing them in the river to increase population)
- Aquatic and Terrestrial Habitat Restoration
- Science program including research, monitoring, and evaluation components

Endangered A plant or animal species that is in danger of extinction throughout all, or a significant portion of, its range. The U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) designates endangered species.

Floodplain Connectivity Flooding of flood plains adjacent to the river to flush nutrients and aquatic food sources into the river. Before channelization of the river with straightening and rock revetments and dikes, annual over-bank flood flows in the spring happened on a fairly regular basis. It is well understood among environmental government agencies and activist groups that controlled releases from the reservoirs and that the barge channel and its rock structures keep river flows at elevations well below the levels of the adjoining floodplain. They know that the lack of maintenance and abandonment of the barge channel will cause the present channel to fill with sediment that in turn will raise normal water levels. My study of flood levels on a river reach through Boonville indicates that abandonment of the barge channel will cause fills of sediment from 7 to 19 feet to occur. This will cause flood levels presently seen once every 50 years to occur once every 10 years.

Jeopardy A situation for an endangered species resulting from an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. The consequences of jeopardy are potential legal prosecutorial action against the agencies, private and public entities and individuals that are identified as causing the jeopardy situation to come about.

Mitigation An activity usually involving construction or management practices to create or enhance habitat for wildlife in general or for an endangered species. Construction would involve construction of a wetlands. A management practice may involve a flow like a spring rise. It is done to counteract current or past activities or land uses that have made areas unusable for pre-existing wildlife. It is either done on or off site. If it is done off site, it is usually done on an acre for acre basis or at an acreage greater than the original acreage.

Management or Corrective Actions; Corrective Measures Activities composed of the regulation of land use and construction projects of the final MRERP to take place to meet recovery and restoration objectives. Until further notice, the area for these actions is the “restoration area”.

National Environmental Policy Act (NEPA) This act includes a procedure for involving stakeholders and the public with environmental programs.

Restoration Area The “area” in the FNR of the final MRERP plan where “management actions (regulation of land use and construction projects) will take place to meet recovery and restoration objectives”. Until further notice from this date (October 1, 2010), the “area” may be all or part of the area of “bottom of bluff to bottom of bluff” and some reaches of tributaries of the Missouri River. This includes forested and non-forested “bench or terrace” areas that may have been inundated in ancient times yet have not experienced flooding in more recent times (decades, centuries, etc.). Areas outside of this “restoration area” will be merely considered as “contributing areas” where some “management actions” may or may not take place. A GIS map of the proposed “bottom of bluff to bottom of bluff” area is available at < www.moriverrecovery.com > . NOTE: On the web site, use magnifying glass with “+” to zoom in. Agency, public and private lands owned, regulated or operated for the purposes of wildlife conservation in the lower basin presently exceed 450,000 acres.

Riparian Habitat The area adjacent to a stream channel, a reservoir, or wetland that supports the growth of woody vegetation that is not adapted for life in saturated soil conditions.

Reference Hydrograph A hydrograph is a graph containing plotted data consisting of observed runoff, usually expressed in cubic-feet-per-second (cfs), at the lowest downstream point of an entire watershed consisting of the “outlet in common” of all of the tributaries in a watershed. The flow data is plotted along the vertical axis in relation to time intervals of measurement plotted along the horizontal axis. The Reference Hydrograph is the “run-of-river” hydrograph. Data from the Corps’ simulation of “run-of-river” was used to develop the reference hydrograph.

Restoration Restoration, as it is presently being proposed, includes restoration projects and policies to recover “...federally protected species in the Missouri River basin and the ecosystem upon which they depend...”. This includes not only the species but also the lands of *the entire land mass of the basin*. Heretofore, only the river channel and the floodplain were being considered in the scope of the recovery effort. This would amount to more than 1,000,000 acres of private property which is mostly farmland. Now the entire watershed area is being proposed by the agencies. This amounts to an area of about 273,850 square miles. For that portion of this area south of Pierre, South Dakota, in the States of South Dakota, Nebraska, Kansas, Iowa and Missouri, a super majority of it is private property. The nature and the extent of the regulation of land use over the lands involved are not known at this time. However, it is being proposed by the agencies that regulations and requirements will be forthcoming based upon conclusions and perceived necessary adjustments resulting from “adaptive management.” It is presently proposed that the *adaptive management process and the conclusions and adjustments derived there from be implemented at the pleasure of the agencies*

without the advice and consent and control of those being affected by the regulations and policies, namely, the private landowners.

Run of River Flows that are basically uncontrolled, as was experienced before the construction of the dams.

Shallow Water Habitat (SWH) In streams like the Missouri River whose meanderings are controlled (with stone works, piling, etc.), the areas in the navigation channel and the dike fields are considered to be SWH when less than 5 feet deep and flowing at no more than 2.0 feet per second (1.36 mph). In streams whose meanderings are not controlled like constructed or naturally occurring chutes, the entire water surface area in the chute is considered to be SWH no matter how deep the water may be or how fast it is moving. Inlet structures in the constructed chutes are now narrow and deep to allow the believed easier entry of drifting larval pallid sturgeon into the chutes.

Spawning Cue Either a natural or man-made condition that may prompt fish to spawn. Many environmentalists and some biologists believe that for the pallid sturgeon and other native river fish, a spring rise on the Lower River may prompt spawning although there is no sound science to prove this theory. Monitoring of spawning sturgeon in the river in 2007 indicated that other factors like water temperature and length of day may affect the spawning cue to a greater degree than a spring rise. Other data indicates that spawning takes place over a longer period of time not previously realized. Scientists agree that more data needs to be collected to give a clearer picture of spawning conditions.

Tail waters The river reach immediately downstream from a dam.

Threatened Legal status afforded to a plant or animal species likely to become endangered within the foreseeable future throughout all or a significant portion of its range, as determined by the USFWS or the NMFS Master Manual.

Total Maximum Daily Load (TMDL) The maximum 24 hour allowable load (concentration) of a pollutant in a stream (sediment, chemicals, etc.) expressed as a unit of measure per volume of water (mg per liter, parts per million (ppm), etc)

Wetland Habitat Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support vegetation adapted for life in saturated soil conditions.

d. Flow terminology:

Steady State or Constant Discharge Rate is a discharge rate from Gavin's Point Dam, May through July, to maintain water levels upstream from Omaha at constant levels on sandbars for endangered nesting birds. The purpose is to prevent drowning of the nests. These discharges remain steady even when flooding or natural drainage of fields is threatened downstream. The USACE states that this form of discharge wastes water that is not needed downstream to support navigation.

Flow to Target applies to varying discharges from Gavin's Point Dam to satisfy support of navigation downstream from Kansas City. When water flows needs are low the bird's nests are not threatened; however, when more water flow is needed, increased flows drown out nests near the water's edge. To prevent this, the USACE moves the nests to higher ground. The Department of the Interior (DOI) Fish and Wildlife Service (FWS) prevents the USACE from moving the nests during some years and the "Steady State Discharge Rate" is the rule. For the USACE, however, "Flow to

Target” is the preferred method of releasing water since it conserves water by releasing only what is needed for navigation. This flow regime keeps water levels as low as possible during the spring months to provide natural drainage from farm fields and maximum channel capacity for conveyance of flood waters.

Spiking is water releases from Gavins Point with a sharp rise/flow increase producing a peak flow of short duration (2 to 3 days \pm) followed by a sharp fall/flow decreasing to usual flows. The time period for a rise or a fall would take place in 2 to 3 days instead of weeks. These releases would be part of a spring rise plan and have been used in the past to help control the location of plover nesting on sand bars.

Bi-modal release of flows of a few days or weeks from Gavins Point Dam for two spring pulses or rises. The first occurs around the 1st of April and the 2nd occurs around the end of May.

Base Flow Base flows in a stream are those from seep and spring waters for prolonged periods of time and are not directly from runoff.

Spring Rise or Pulse and/or Flow Enhancement is a proposal to increase water levels in the river channel from April to July. This is the most flood prone period of the year in Missouri. Proposals include increasing presently prescribed discharges by 10,000 cfs to as high as 64,000 cfs. Below “flood level,” an increase of 10,000 cfs increases the water level by 1.0 foot at Jefferson City, Missouri. This holds true above “flood stage” for many reaches where bluffs and/or levees are near the banks on both sides of the river. Extra water heights cause bank scouring above existing revetments and dikes, close flap gates affecting natural drainage, and cause overtopping of existing levees during high river stages. With respect to the Spring Rise releases, the “Magnitude” is the amount that the release is above the normal release for that time. The “Frequency” is how often this increase would occur, and the “Duration” is the length of time that the release would be above normal releases. With “Proration,” the magnitude of the Spring Rise release is proportionally adjusted based on the amount of water in total system storage. A higher total system storage amount would provide a proportionally higher Spring Rise release.

Water Neutral Release Rates are water release plans where there is no net loss of water stored after the end of the calendar year. This water release plan is proposed for spring rise releases before it is known how much water is available for total annual releases from Gavin’s Point in July. Shortfalls in projected year-end carryover amounts of water are made up for by shortening the navigation season. This helps assure some water availability for the following year’s spring rise.

e. Characteristics of the river in Missouri:

Construction Reference Plane A profile of the water surface of the river designated by the USACE. It is used as a design reference for construction of channel stabilization and rock structures in the river and public and private improvements on the banks and in the floodplain of the river. From the Construction Reference Plane (CRP), the elevation of the water’s surface can be determined at any point along the river.

The River For environmental regulation purposes it is now defined as the area between the bluffs instead of the river’s water surface. This was mandated by our elected representatives and agencies with neither the consent nor input of the landowners.

Bank Stabilization and Channelization Act or Bank Stabilization and Navigation Project (BSNP)

The work accomplished with this project straightened the channel and stabilized the banks of the Missouri River with rock blankets on the banks (revetments) and piling and rock wing dikes in the channel. These structures provide a self scoured channel of design depth and a large deep channel for high rates of flow that hold down high flood levels. The river will not naturally maintain the present channel without these rock and piling structures. The two funds originally set up for maintenance of the rock structures have been combined into one fund. Funding for maintenance is now primarily spent on stone structures that deal directly with maintaining the navigation channel. The loss or lack of maintenance of these structures will result in shallow, wide and meandering multiple channels (braided stream). Along with higher flood levels, the meandering channels will undercut existing levees. Additionally, such structures on tributaries were included in the 1944 Flood Control Act. These were authorized but have yet to be funded as well as many Pick-Sloan levees that have never been funded nor built.

- 9) Several additional and alternative proposals for the operation of the river have been put forward that amount to changes in the original Master Manual. Some of them are:
- a. **Split Navigation Season** is a proposal to stop support of navigation during August into September. Flows at Kansas City would fall below 18,000 cfs. This threatens water outtakes as well as navigation on the Missouri and Mississippi Rivers. Barge industry spokespersons state that they will not operate on the Missouri River with a “split” season because it requires them to gather up barges twice per navigation season. Additionally, low summer flows would lower water levels in some of the shallow water habitat and render it useless to the pallid sturgeon.
 - b. **Adaptive Management** is a flexible decision-making process that promotes collaboration, flexible decision-making and learning from the outcome of management actions that ultimately leads to more effective decisions and enhanced benefits from projects. It is a process that integrates elements of planning, implementation (build and operate), monitoring, analysis (assessment) and decision making (adjustment step or strategy) for the MRRP and the BiOp. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders. MRRIC is set up to “monitor” management of the river and recommend flow and operational adjustments from year to year based upon tested hypotheses and changes based upon sound scientific data.
 - c. **Conservation Alternatives** for water level management involve increasing the “Permanent Pool Level” in the upstream reservoirs in the 10 to 30 million-acre foot range. This provides for increased water levels in the upper large reservoirs for recreational purposes. It also restricts water available for navigation during periods of drought in Missouri and decreases the amount of storage for runoff waters for flood protection in Missouri. Under the “Current Water Control Plan” (CWCP), required water releases from the “Exclusive Pool”, based upon historical runoff records, will occur approximately 17 times in 100 years. With any of the “Conservation Alternatives,” required water releases from the “Exclusive Pool” increase to 35 times in 100 years. These releases occur during heavy spring snow melt and runoff periods. This amounts to a doubling of the number of times that water will be released from the reservoirs during springtime flood periods in the lower basin states of Missouri, Iowa, Kansas and Nebraska.
 - d. **Water Neutral Release Rates** are water release plans where there is no net loss of water stored after the end of the calendar year. This water release plan is proposed for spring rise releases before it is known how much water is available for total annual releases from Gavins Point in July. Shortfalls in

projected year-end carryover amounts of water are made up for by shortening the navigation season. This helps assure some water availability for the following year's spring rise.

- e. **Missouri River Water Diversions** Long standing proposals exist to divert Missouri River waters to water deficient areas. One proposal actively being pursued is to divert water from the Missouri River northeastward ultimately into the Red River flowing through Fargo, North Dakota. This would be accomplished by pumping and a pipeline and open channel flow to enhance flows in the Cheyenne and Red Rivers channels that flow through Canada into Hudson Bay. Canada does not support moving water from the Missouri River watershed into their streams because of environmental concerns. With increased tax revenues to North Dakota coming from oil and gas fracking, the state is able to fund ongoing activity on the this project.

A second proposal actively being pursued is in updating a 1982, \$4.4 billion USACE plan to divert water from the Missouri River into Kansas southwestward via a 360 mile long aqueduct and pumping facilities to southwestern Kansas to sustain farm crop production in the state. A late 2014 preliminary report on this proposal indicates the cost of this diversion to be \$18 billion with an annual operating cost of \$1 billion. Present farming operations via wells withdraw irrigation waters from the Ogallala Aquifer at a rate greater than what the aquifer is being naturally recharge. As much as 4 million acre feet diverted to the area would offset the shortfall. This would be accomplished by pumping and a pipeline and open channel flow. Availability of additional water to western Kansas would attract interest of Colorado waters users in that water deficient state. Waters taken from the Missouri River basin would threaten navigation and water supply users all along the Missouri River.

- f. **Water Reallocation** study by the USACE (**Missouri River Municipal & Industrial Water Storage Reallocation Study**) is underway in tandem with the surplus water issue. The water reallocation study is to analyze water usage from the reservoirs and rivers from the rise of the Missouri River in Montana to St. Louis. At this point discussion concerns would be: KC, MO water supply; the different state water rights laws in the basin; the Tribes should be paid for the surplus water amounts; the State of Missouri cannot have a productive law suit right now because the surplus water issue does not affect changes in flows from below Gavins point; the political pressure to supply water for fracking in N. Dakota; and, the effect the issues may have on flood control, navigation flows in the Missouri and Mississippi Rivers and other items. The study is authorized by Section 216 of the 1970 Flood Control Act. Preliminary reports indicate that some excess waters exist due to the non-development of the originally planned irrigation projects in the upper basin. The study will also examine the effects of such a reallocation on the authorized purposes and operations of the mainstem reservoirs. Water reallocation may mean moving water out of the basin. The site for more information is <http://www.nwo.usace.army.mil/>

- 10) No moneys are planned to be available for damages arising from the proposed manmade spring rise either now or in the future. This includes the following: Flood damage to crops either from internal drainage due to seepage or flap gates being closed or levees being overtopped; damages to drainage systems and other earthworks either private or sponsored by the USACE; additional costs related to longer periods of pump operation at greater heads; repairs to public infrastructure, including stone, to maintain the river channel, public roads, and other public works. This is contrary to the Government's compensation to landowners and drainage districts on the upper Mississippi River when the locks and dams were constructed. As for damages to levees, 84-99 funds would not be available unless a disaster type event over a large area is declared. The flood damage in a few widely separated levee districts in all likelihood would not be declared a disaster type event, thereby making 84-99 funds unavailable for repairs.

ACRONYMS

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| <p>AGO Attorney General’s Office AOP Annual Operating Plan BA Biological Assessment BIA Bureau of Indian Affairs BiOp Biological Opinion BOR Bureau of Reclamation Corps/COE/USACE U.S. Army Corps of Engineers CPR Coalition to Protect the River CRP Construction Reference Plane CWCP Current Water Control Plan DEIS Draft Environmental Impact Statement DOD Department of Defense DOE Department of Energy DOI Department of Interior EPA Environmental Protection Agency ESA Endangered Species Act FCA Flood Control Act FEIS Final Environmental Impact Statement FWG Federal Working Group GIS Geographic Information System kcfs thousand cubic feet per second MAF million acre-feet MARC 2000 Mid-West Area River Coalition 2000 Master Manual Missouri River Master Water Control Manual MLDDA Missouri Levee and Drainage District Association MO-ARK Missouri-Arkansas River Basins Association MCP Modified Conservation Plan MORAST Missouri River Association of States and Tribes MRAPS Missouri River Authorized Purposes Study FFRMS Federal Flood Risk Management Standard</p> | <p>MRBA Missouri River Basin Association (disbanded 2006) MRBIR Missouri River Basin Interagency Roundtable MRERP Missouri River Ecosystem Restoration Plan MRNRC Missouri River Natural Resources Committee MRRIC Missouri River Recovery Implementation Committee MRRP Missouri River Recovery Program MRRIP Missouri River Recovery Implementation Program MW megawatt MWh megawatt-hours NGO Non-Governmental Organization NPS National Park Service NEPA National Environmental Policy Act NWD Northwest Division of USACE in Portland, Oregon PA Preferred Alternative PDEIS Preliminary Draft Environmental Impact Statement PRDEIS Preliminary Revised Draft Environmental Impact Statement RCC Reservoir Control Center, Located in Omaha, Neb RDEIS Revised Draft Environmental Impact Statement RHM Reservoir Habitat Model ROD Record of Decision ROR run of river Study Master Water Control Manual Review and Update System Missouri River Mainstem Reservoir System UMIMRA Upper Mississippi, Illinois, Missouri River Assoc. USFWS U.S. Fish and Wildlife Service USGS U.S. Geological Survey WAPA Western Area Power Administration WRDA Water Resources Development Act</p> |
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Prepared by Joseph B. Gibbs, PE, Board Member, Missouri Levee and Drainage District Association (MLDDA)
1115 Club Meadows Drive, Columbia, Missouri 65203 (573) 815-0347 JBG6267@aol.com