MISSOURI RIVER BASIN
WATER MANAGEMENT

SPRING 2019
PUBLIC MEETINGS

April 9  11:00 a.m.  Fort Peck, MT
April 9  6:00 p.m.  Bismarck, ND
April 10  10:00 a.m.  Pierre, SD
April 10  4:00 p.m.  Sioux City, IA
April 11  11:00 a.m.  Smithville, MO
April 11  5:00 p.m.  Nebraska City, NE
National Weather Service Issues two “Spring Flood Outlooks” every year
- 21 February 2019
- 06 March 2019

Outlooks consists of a text product, as well as graphics.

Two associated webinar briefings are provided to State and Local officials, congressional staff, FEMA, Coast Guard, USACE, USGS, Bureau of Reclamation, and the National Guard. (22 Feb and 07 March).

Covers entire Mississippi River drainage
- North Central River Forecast Center
- Missouri Basin River Forecast Center
- Ohio River Forecast Center
- Arkansas-Red River Forecast Center
- Lower Mississippi River Forecast Center

**21 February 2019** outlook indicated “enhanced” risk over eastern portion of Missouri River basin, and highlighted potential major flooding along the James, Vermillion, Little and Big Sioux Rivers. Model runs indicated risk for major at Brownville, St. Joseph, and Glasgow on the Missouri.

**06 March 2019** outlook indicated “greatly enhanced” risk over eastern portion of Missouri River basin, and highlighted potential major flooding along James, Vermillion, Little and Big Sioux, North Fork Elkhorn, Wood, Floyd, and Tarkio Rivers. Model runs indicated risk for major at Brownville, Rulo, St. Joseph, Atchison, Leavenworth, Sibley, Miami, and Glasgow on the Missouri River.
Rain-on-Snow Event of March 12\textsuperscript{th}-14\textsuperscript{th} 2019

NATIONAL WEATHER SERVICE

Precipitation
- 1
- 2
- 3

Snow Water Content
- less than 1 inch
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 8
- 8 - 12

Rain-Snow line

Building a Weather-Ready Nation
NATIONAL WEATHER SERVICE
Mid-March 2019 Event

Record Stages 3/14-3/27
National Weather Service
Estimated Tributary Peak Flows

- **Gavin’s Point**: 16,000 cfs, 3/16
- **Yankton**: 16,000 cfs, 3/16
- **Vermillion**: 16,000 cfs, 3/17
- **James**: 16,000 cfs, 3/16
- **Sioux City**: 30,000 cfs, 3/15
- **Decatur**: 60,000 cfs, 3/17
- **Blair**: 30,000 cfs, 3/15
- **Omaha**: 170,000 cfs, 3/17
- **Floyd**: 15,000 cfs, 3/16
- **Little Sioux**: 60,000 cfs, 3/15
- **SURF**: 60,000 cfs, 3/15
- **Nishnabotna**: 45,000 cfs, 3/16
- **Soldier**: 27,000 cfs, 3/14
- **Little Sioux**: 60,000 cfs, 3/15
- **Boyer**: 35,000 cfs, 3/14
- **Platte**: 170,000 cfs, 3/17
- **Weeping Water**: 15,000 cfs, 3/16
- **Little Nemaha**: 27,000 cfs, 3/14
- **Nemaha**: 37,000 cfs, 3/14
- **Nodaway**: 30,000 cfs, 3/15
- **Tarkio**: 10,000 cfs, 3/14
- **Rulo**: 30,000 cfs, 3/17
- **St. Joseph**: Over 100K cfs
- **Over 100K cfs**:
- **Over 50K cfs**:
- **Over 30K cfs**:
The Missouri Basin River Forecast Center issues daily forecasts for 22 locations on the Missouri and Kansas Rivers. Another 400 locations are monitored each day, with forecasts issued when flood conditions are expected or are occurring. The River Forecast Center is also capable of providing inflow forecasts for 81 reservoirs.

Short-term river and reservoir inflow forecasts utilize 48-hours of anticipated precipitation Oct 1- March 31. (From April 1- September 30  24-hours of anticipated precipitation is used).

Mid-March rain-on-snow event began overnight hours of Tuesday-Wednesday, March 12th-13th.

Initial forecasts:
- Missouri River (Nebraska City—Atchison) issued Saturday 9:56 AM
- Nishnabotna River issued Saturday 7:22 PM
- Platte River issued Sunday 12:04 PM
- Gavins Point inflow issued Tuesday 10:33 AM
- Niobrara River issued Wednesday 9:33 AM

River forecasts are updated at least twice per day during flooding.

Gavins Point inflow forecasts issued 2X day beginning Tuesday, March 12th
- Oahe, Big Bend, and Ft. Randall inflow forecasts began Tuesday, March 19th

MBRFC in daily communications with USACE Missouri Basin Water Management regarding reservoir plans, and the 2 USACE Districts regarding levee status. USACE engineer embed 20-23 March.
RIVER OUTLOOKS

- Mountain snowpack nearing accumulating peak; significant flooding due to snowmelt not likely.
- Plains snowpack all but gone.
- River ice conditions improving.
- Yellowstone River Basin cresting early June.
- Milk River Basin has already experienced its seasonal crest.
- James River: North Dakota cresting now; South Dakota crest mid-to-late April. Mouth will remain steady-to-falling.
- Little and Big Sioux have already experienced seasonal crest. Lower Big Sioux now experiencing second, much lower crest.
- Platte River system cresting mid June.
- Plains soils are wet; plains are vulnerable to renewed flooding.
- Eastern portion of basin remains at enhanced risk for flooding next 3 months, including the Missouri River below Nebraska City.
OUR MISSION

Regulate Missouri River Mainstem Reservoirs to Support Congressionally Authorized Purposes

- Flood Control
- Navigation
- Hydropower
- Water Supply
- Fish & Wildlife (T&E)
- Irrigation
- Water Quality Control
- Recreation
### Mainstem Projects - Storage

<table>
<thead>
<tr>
<th>Project</th>
<th>Exclusive Flood</th>
<th>Annual Flood</th>
<th>Carryover</th>
<th>Permanent</th>
<th>Gross Storage in MAF</th>
<th>72.4 MAF System Storage</th>
<th>Accumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Peck</td>
<td>0.971</td>
<td>2.704</td>
<td>10.7</td>
<td>4.088</td>
<td>18.463</td>
<td>25%</td>
<td>25</td>
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<tr>
<td>Garrison</td>
<td>1.495</td>
<td>4.211</td>
<td>12.951</td>
<td>4.794</td>
<td>23.451</td>
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<tr>
<td>Oahe</td>
<td>1.107</td>
<td>3.208</td>
<td>13.353</td>
<td>5.315</td>
<td>22.983</td>
<td>31%</td>
<td>88</td>
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<tr>
<td>Big Bend</td>
<td>0.061</td>
<td>0.118</td>
<td>0.118</td>
<td>1.631</td>
<td>1.81</td>
<td>3%</td>
<td>91</td>
</tr>
<tr>
<td>Fort Randall</td>
<td>0.986</td>
<td>1.306</td>
<td>1.532</td>
<td>1.469</td>
<td>5.293</td>
<td>8%</td>
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<tr>
<td>Gavins Point</td>
<td>0.054</td>
<td>0.079</td>
<td>0.295</td>
<td>0.295</td>
<td>0.428</td>
<td>1%</td>
<td>100</td>
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</tbody>
</table>
MISSOURI RIVER MAINSTEM SYSTEM
STORAGE ZONES AND ALLOCATIONS

EXCLUSIVE FLOOD CONTROL 7%

ANNUAL FLOOD CONTROL & MULTIPLE USE 16%

CARRYOVER MULTIPLE USE 53%

PERMANENT POOL 24%

Historic max - 2011

Historic min – 2007

WE ARE HERE

April 8, 2019 – 63.9

STORAGE IN MILLION ACRE FEET (MAF)
CURRENT RESERVOIR LEVELS – APRIL 8, 2019

**FORT PECK**
4.6 feet above base of Annual Flood Control Zone.

**GARRISON**
7.1 feet above base of Annual Flood Control Zone.

**OAHE**
8.8 feet above base of Annual Flood Control Zone.

**FORT RANDALL**
0.7 foot above the base of Exclusive Flood Control Zone.
RUNOFF COMPONENTS

PLAINS SNOWPACK  MOUNTAIN SNOWPACK  RAINFALL

2019 FORECAST* = 38.2 MILLION ACRE FEET (MAF)

*APRIL 1 FORECAST – 151% OF AVERAGE
Heavy to very heavy snowpack

All plains snow melted as of April 7

Seasonal Maximum

March 10, 2019

Source: NWS National Operational Hydrologic Remote Sensing Center (NOHRSC)
The Missouri River basin mountain snowpack normally peaks near April 15.

Source: USDA, Natural Resources Conservation Service
OBSERVED PRECIPITATION

Previous 90 Days

Previous 30 Days

Source: National Weather Service - Advanced Hydrologic Prediction Service
PRECIPIТАTION OUTLOOKS

Source: NOAA Climate Prediction Center
ANNUAL RUNOFF ABOVE SIOUX CITY, IA

MILLION ACRE FEET (MAF)

YEARS

Actual
Drought Periods

Median

Historic Drought Periods


2019
MONTHLY RUNOFF ABOVE SIOUX CITY, IA

2019 CALENDAR YEAR FORECAST – 38.2 MAF

MONTHLY RUNOFF ABOVE SIOUX CITY, IA

MILLION ACRE FEET (MAF)

MONTHS

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

Forecast  Average  Observed

2019 CALENDAR YEAR FORECAST – 38.2 MAF
Largest March runoff volume (11.0 MAF) since record-keeping began in 1898. Previous record was 7.3 MAF in 1952.

Nearly 4 times the average monthly runoff.

Record highest volume in the Oahe to Fort Randall reach. More than the average annual runoff for this reach.

Record highest volume in the Fort Randall to Gavins Point reach. More than doubled the previous record.

Record highest volume in the Gavins Point to Sioux City reach. More than the average annual runoff for this reach.
MARCH 2019 - GAVINS POINT OPERATIONS

- Peak of 1212.3 feet
- Top of Exclusive FC Zone
- Base of Exclusive FC Zone
- Base of Annual FC and Multiple Use Zone

Max Inflow = 182,000 cfs
Max Release = 100,000 cfs
SYSTEM STORAGE - APRIL 1 FORECAST

Top of Exclusive Flood Control – 72.4 MAF
Base of Exclusive Flood Control – 67.7 MAF
Base of Annual Flood Control – 56.1 MAF

System Storage Check
Median

Upper Basic and Lower Basic

System Storage Check

Years
2018
2019
2020

System Storage (MAF)
FORT PECK - APRIL 1 FORECAST

ELEVATION IN FEET

Top of Exclusive Flood Control – 2250 feet
Base of Exclusive Flood Control – 2246 feet
Base of Annual Flood Control – 2234 feet

Median
Upper Basic and Lower Basic
GARRISON - APRIL 1 FORECAST

Top of Exclusive Flood Control – 1854 feet
Base of Exclusive Flood Control – 1850 feet
Base of Annual Flood Control – 1837.5 feet

ELEVATION IN FEET

Median
Upper Basic and Lower Basic

YEARS

2018
2019
2020
OAHE - APRIL 1 FORECAST

- **Top of Exclusive Flood Control** – 1620 feet
- **Base of Exclusive Flood Control** – 1617 feet
- **Base of Annual Flood Control** – 1607.5 feet

**Graph Notes:**
- Median
- Upper Basic and Lower Basic

**Years:**
- 2018
- 2019
- 2020

**Elevation in Feet:**
- 1590
- 1595
- 1600
- 1605
- 1610
- 1615
- 1620

**X-Axis:**
- J F M A M J J A S O N D J F

**Y-Axis:**
- Elevation in feet
• All 2018 flood water evacuated from reservoir system by mid-January

• Releases increased to evacuate water from Exclusive Flood Control Zones
  
  ➢ Higher-than-average releases to restore flexibility to respond to spring and summer rainfall events

• Storage space available in Fort Peck and Garrison to capture mountain snowmelt

• Flooding can still occur – our ability to reduce downstream stages diminishes the farther downstream – due to increased travel times and uncontrolled drainage area
NAVIGATION

• Flow support from April 1 – July 1
  ➢ 15,000 cfs above full service (expanded service level)
    • April 1 service level check
    • Additional adjustments may be made during spring and summer
  ➢ Revised target flows
    • Sioux City = 46,000 cfs  Nebraska City = 52,000 cfs
    • Omaha = 46,000 cfs      Kansas City = 56,000 cfs

• Flow support from July 1 – December 1
  ➢ July 1 storage check
  ➢ Expanded service level likely
  ➢ 10-day flow support extension likely
• Above average elevations and releases

• No impacts expected to irrigation and recreation

• Water supply (April 1 Forecast)
  ➢ Gavins Point winter releases - 20,000 cfs and 22,000 cfs for basic and upper basic, respectively
  
  ➢ Winter releases - 15,500 cfs for lower basic runoff

  ➢ No access issues expected
• Goal: steady-to-rising pool levels at upper three reservoirs during forage fish spawn (April-May)

- Rising reservoirs likely at Fort Peck and Garrison
- Oahe – Not likely, we need to evacuate storage to restore flexibility in spring and summer

• Minimize periods of zero releases at Fort Randall, to the extent reasonably possible
THREATENED AND ENDANGERED SPECIES
PIPING PLOVER AND LEAST TERN

• Gavins Point releases
  ➢ Steady release – flow to target
  ➢ Daily release cycle
  ➢ Expanded service level will drive releases

• Intra-day peaking patterns – Garrison

• Measures to minimize take
Missouri River Recovery Management Plan and EIS completed in November 2018

- Analyzed impacts of deleting current spring pulse criteria

- Following the MRRMP-EIS Record of Decision the Gavins Point bi-modal spring pulse was removed from the revised Master Manual

- Reservoir unbalancing removed from revised Master Manual
SUMMARY

• Above average runoff forecast

• Reservoir levels higher than average

• Reservoir releases higher than average
THANK YOU!

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