

RECLAMATION

Managing Water in the West

Nebraska-Kansas Area Office

Report

To The

Republican River

Compact Administration

Burlington, CO



**U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region
Nebraska-Kansas Area Office**

August 24, 2016

REPUBLICAN RIVER COMPACT MEETING

August 24, 2016
Burlington, Colorado

2015 Operations

As shown on the attached Table 1, precipitation in the Republican River Basin varied from 101 percent of normal at Trenton Dam to 127 percent of normal at Harlan County and Lovewell Dams. Total precipitation at Reclamation project dams ranged from 20.21 inches at Trenton Dam to 34.91 inches at Lovewell Dam.

Inflows varied from 56 percent of the most probable forecast at Keith Sebelius Lake to 154 percent of the most probable forecast at Swanson Lake. Inflows into Keith Sebelius Lake totaled 4,252 AF while inflows at Harlan County Lake totaled 106,728 AF.

Average farm delivery values for total irrigable acres were as follows:

<u>District</u>	<u>Farm Delivery</u>
Frenchman Valley	0.6 inches
H&RW	0.0 inches
Frenchman-Cambridge	3.8 inches
Almena	0.0 inches
Bostwick in NE	4.8 inches
Kansas-Bostwick	7.2 inches

2015 Operation Notes

Bonny Reservoir – Remained empty at elevation 3638.00 feet, 34.0 feet below the top of conservation. The annual computed inflow totaled 5,571 AF. Reservoir inflows were bypassed the entire year as ordered by the State of Colorado. A total of 1,028 AF was bypassed into Hale Ditch from April 1st through October 20th.

Enders Reservoir – Started the year at elevation 3082.72 feet, 29.6 feet below the top of conservation. This was the lowest level ever recorded on the first of January since initial filling. The reservoir level increased gradually during the spring to a peak elevation of 3085.50 feet on June 7, 2015. Evaporation decreased the reservoir level from June through mid-October reaching elevation 3083.67 feet on October 22nd. The 2015 computed inflow totaled 5,554 AF. No water was released from Enders Reservoir for irrigation. This was the fourteenth consecutive year that H&RW Irrigation District did not divert water. It was also the twelfth consecutive year that storage releases were not made for Frenchman Valley Irrigation District. The end of the year reservoir level was 28.0 feet (3084.28 feet) below the top of conservation.

Swanson Lake – Started the year at elevation 2728.96 feet, 23.0 feet below the top of conservation. The annual computed inflow totaled 42,316 AF (includes water pumped from the Rock Creek Augmentation Project and Colorado’s Compact Compliance Pipeline). The lake gradually increased throughout the winter and spring. The peak elevation on June 24th was 2739.74 feet (12.3 feet below the top of conservation). The reservoir level decreased throughout the irrigation season and reached an elevation of 2733.77 feet on November 10th. The district diverted 15,350 AF into Meeker-Driftwood Canal from June 24th through September 3rd. At the end of the year, the reservoir level was 17.2 feet below the top of conservation at 2734.84 feet.

Hugh Butler Lake – Started the year at elevation 2556.88 feet, 24.9 feet below the top of conservation. The 2015 computed inflow was 9,064 AF. Late winter and spring inflows gradually increased the lake level to elevation 2562.60 feet by the end of June. Summer evaporation slowed reservoir gains and the lake level peaked at 2562.74 feet on August 10th. No irrigation releases were made from Hugh Butler Lake in 2015. The reservoir elevation at the end of year was 2562.97 feet, 18.8 feet below the top of conservation.

Harry Strunk Lake – Started the year at elevation 2367.85 feet, 1.8 feet above the top of conservation. The annual computed inflow totaled 58,086 AF (includes water pumped from the Nebraska Cooperative Republican Platte Enhancement Project). The reservoir level was maintained near this level through the end of June as all inflows were passed through the uncontrolled spillway notch. Additional releases were started from the river outlet works on June 29th to meet increasing irrigation demands. Irrigation releases continued through September 8th reducing the reservoir level to 2361.76 feet. The district diverted 29,156 AF into Cambridge Canal. Late fall and early winter inflows increased the level of Harry Strunk Lake to elevation 2365.60 feet on November 16th (0.5 foot below the top of conservation). Releases were started at this time to maintain this reservoir level.

Keith Sebelius Lake – Started the year at elevation 2288.02 feet, 16.3 feet below the top of conservation. The total 2015 computed inflow was 4,252 AF. The reservoir level slowly increased to elevation 2288.81 feet on June 19th. No irrigation releases were made from Keith Sebelius Lake in 2015. The reservoir level gradually decreased during the summer and fall reaching elevation 2287.24 feet on November 10th. Keith Sebelius Lake ended the year at elevation 2287.74 feet (16.6 feet below the top of conservation).

Harlan County Lake – Started the year at elevation 1930.81 feet, 14.9 feet below the top of conservation. The 2015 computed inflow totaled 106,728 AF (includes augmentation water that passed through Harry Strunk Lake). The lake level peaked at elevation 1936.45 feet on June 22nd. Irrigation releases began on June 21st and continued through September 11th decreasing the pool level to elevation 1931.56 feet. Bostwick in Nebraska Irrigation District diverted 24,133 AF in 2015. Kansas Bostwick Irrigation District entered into an Excess Capacity Contract (Warren Act Authority) with Reclamation for the use of compact compliance water stored in Harlan County Lake in 2014. An amendment to this contract in December 2014 provided for 14,100 AF of water to be carried over into 2015. No water was released under this contract during the 2015 irrigation season. Irrigation releases from Harlan County Lake totaled 70,554 AF in 2015. The reservoir elevation was 1932.86 feet (12.9 feet below the top of conservation) on December 31st. A ten year summary of Harlan County

Lake operations is shown on Table 3.

Lovewell Reservoir – Started the year at elevation 1580.46 feet, 2.1 feet below the top of conservation. The annual computed inflow total for 2015 was 71,888 AF. Republican River diversions were made via the Courtland Canal into Lovewell Reservoir from early January through late April. The pool level gradually increased to elevation 1583.88 feet on May 6th.

Lovewell Dam recorded 7.78 inches of rainfall overnight on May 6th. Runoff from the storm event increased the level of Lovewell Reservoir to 7.2 feet into the flood pool with 50 percent of the flood pool storage occupied. Flood releases were staged up to 1,250 cfs by May 9th and maintained through May 18th when Lovewell Reservoir reached the desired target level. Approximately 23,000 AF was released from the reservoir. Lovewell Dam recorded 11.41 inches of precipitation during May.

Releases to the canal began on May 19th and continued through September 12th. The reservoir elevation at the end of the irrigation season was 1578.80 feet. Republican River diversions continued through mid-December. The Kansas Bostwick Irrigation District diverted a total of 51,980 AF in 2015, including 31,544 AF from Lovewell Reservoir. The reservoir level at the end of the year was 1582.13 feet (0.5 feet below top of conservation).

Current Operations (As of 7/31/16)

Bonny Reservoir – The reservoir is currently empty. Inflows continue to be bypassed through the reservoir as ordered by the State of Colorado. Approximately 673 AF has been released into Hale Ditch in 2016. Bonny Dam has recorded 14.58 inches of precipitation during the first seven months of the year (125% of average).

Enders Reservoir - The reservoir level is currently 27.0 feet below full and 0.6 feet above last year at this time. Enders Dam recorded 17.00 inches of precipitation during the first seven months of the year (132% of normal). Due to the water supply shortage, H&RW Irrigation District is not irrigating for the fifteenth year in a row. This is also the thirteenth consecutive year that Frenchman Valley Irrigation District has not received storage water for irrigation.

Swanson Lake – The lake level is currently 13.7 feet from full and is 1.3 feet above last year at this time. Precipitation for the year is at 116% of normal (15.72 inches). Irrigation releases began on June 20th.

Hugh Butler Lake – The lake level is currently 16.1 feet below full and is 3.2 feet above last year at this time. The precipitation total so far this year is 13.19 inches (103% of normal). Irrigation releases are not being made from Hugh Butler Lake this season.

Harry Strunk Lake – The lake level is currently 3.6 feet below the top of conservation. Precipitation at the dam during the first seven months of the year was 18.19 inches (132% of normal). Irrigation releases began on June 17th. The lake level is currently 2.1 feet below last

year at this time.

Keith Sebelius Lake – Currently 15.9 feet below full. Lake level is .2 foot above last year at this time. Due to a short water supply, irrigation releases are not being made in 2016. Precipitation at the dam during the first seven months of the year was 14.42 inches (89% of normal).

Harlan County Lake – The current water surface level is approximately 8.3 feet below full. The lake level is 3.7 feet above last year at this time. Harlan County Dam has recorded 19.06 inches of precipitation so far this year (128% of normal). Irrigation releases began on June 10th. The available irrigation supply from Harlan County Lake on June 30, 2016 was 103,500 AF, indicating that “Water-Short Year Administration” would be in effect.

Lovewell Reservoir – The reservoir level is currently 1.2 foot below the top of conservation and approximately 0.6 feet below last year’s elevation at this time. Lovewell Dam recorded 21.94 inches of precipitation during the first seven months of the year (128% of average). Irrigation releases began on May 2nd.

A summary of data for the first seven months of 2016 is shown on Table 2.

Other Items

Excess Capacity Contract – Harlan County Lake – An Excess Capacity Contract (Contract) was executed with Kansas Bostwick Irrigation District (KBID) to temporarily store inflows into Harlan County Lake under the State of Nebraska’s Compact Call water right administration. This Contract allowed water to be temporarily stored for KBID’s use during the 2014 irrigation season. The contract was extended and amended into 2015 and 2016 to allow for carryover of the temporary storage.

WaterSMART Basin Study Program - The States of Colorado, Nebraska, and Kansas and the U.S. Department of the Interior, Bureau of Reclamation completed the Republican River Basin Study in early 2016. The Republican River Basin Study area covers the entire Republican River Basin in eastern Colorado, southern Nebraska, and northern Kansas down to the Clay Center gauging station in Kansas. The Basin Study represented an extensive collaborative effort among the states of Colorado, Kansas, and Nebraska to identify adaptation strategies that address current and future water management challenges in the basin.

The Basin Study found that climate change may have a pronounced impact on future supplies and demands across the basin. The modeling tools developed under the study were used to evaluate alternatives to improve the supply reliability at the Frenchman-Cambridge Irrigation District in Nebraska, as well as the Bostwick Irrigation Districts in Nebraska and Kansas.

Nebraska focused on augmenting the supply of Swanson Lake and creating new surface water storage on Thompson Creek, a tributary of the Republican River. Kansas evaluated alternatives that increase the storage volume at Lovewell Reservoir.

The newly developed ground and surface water modeling tools will help inform future water management decisions that help build resiliency against future climate change, while also maintaining compliance with the Republican River Compact.

The Republican River Basin Study is a part of Reclamation's WaterSMART Program. The report is available online at www.usbr.gov/watersmart/bsp.

TABLE 1
NEBRASKA-KANSAS PROJECTS
Summary of Precipitation, Reservoir Storage and Inflows
CALENDAR YEAR 2015

Reservoir	Total Precip.	Percent Of Average	Storage 12-31-14	Storage 12-31-15	Gain or Loss	Maximum Content	Storage Date	Minimum Content	Storage Date	Total Inflow	Percent Of Most Probable
	Inches	%	AF	AF	AF	AF		AF		AF	%
Box Butte	25.10	148	10,846	17,339	6,493	23,473	JUL 10	10,883	JAN 1	20,980	136
Merritt	28.99	142	61,100	61,100	0	68,191	MAY 16	39,120	SEP 16	202,465	109
Calamus	22.61	94	97,906	102,456	4,550	121,355	APR 13	65,268	SEP 13	250,588	91
Davis Creek	26.48	107	9,751	9,849	98	31,340	JUL 1	8,955	APR 16	52,348	116
Bonny	20.78	121	0	0	0	0	N/A	0	N/A	5,571	61
Enders	20.23	106	9,150	10,178	1,028	11,024	JUN 7	9,150	JAN 1	5,554	68
Swanson	20.21	101	27,688	43,591	15,903	59,359	JUN 26	27,736	JAN 1	42,316	154
Hugh Butler	21.80	111	8,141	12,879	4,738	12,879	DEC 31	8,155	JAN 1	9,064	69
Harry Strunk	23.74	115	37,984	33,773	-4,211	38,860	FEB 11	27,545	SEP 8	58,086	105
Keith Sebelius	27.25	111	9,676	9,422	-254	10,425	JUN 19	8,979	NOV 10	4,252	56
Harlan County	28.85	127	148,842	167,416	18,574	203,262	JUN 22	148,842	JAN 1	106,728	91
Lovewell	34.91	127	29,620	34,279	4,659	61,018	MAY 8	25,397	SEP 10	71,888	123
Kirwin	23.36	99	41,266	35,389	-5,877	44,752	JUN 15	34,199	OCT 30	17,802	65
Webster	21.84	92	18,680	17,305	-1,375	19,697	JUL 28	17,042	NOV 15	5,057	26
Waconda	25.66	101	191,097	213,417	22,320	241,452	AUG 10	190,868	APR 23	103,844	76
Cedar Bluff	25.47	121	61,117	55,681	-5,436	61,494	JUN 6	55,184	NOV 15	7,763	46

TABLE 2
NEBRASKA-KANSAS AREA OFFICE
Summary of Precipitation, Reservoir Storage and Inflows

JANUARY - JULY 2016

Reservoir	Precip. Inches	Percent Of Average %	Storage 7/31/2015 AF	Storage 7/31/2016 AF	Gain or Loss AF	Inflow AF	Percent Of Most Probable %
Bonny	14.58	125	0	0	0	3,781	61
Enders	17.00	132	10,435	10,861	426	3,406	76
Swanson	15.72	116	50,540	54,645	4,105	27,887	128
Hugh Butler	13.19	103	12,501	15,384	2,883	5,383	65
Harry Strunk	18.19	132	32,025	28,661	(3,364)	45,697	176
Keith Sebelius	14.42	89	9,797	10,040	243	3,470	67
Harlan County	19.06	128	176,493	214,164	37,671	106,636	132
Lovewell	21.94	128	34,075	32,246	(1,829)	30,678	122

Inflow at Swanson Lake and Harry Strunk Lake includes water from augmentation (pumping) projects.

**TABLE 3
HARLAN COUNTY LAKE**

Year	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	Precipitation		End of Year Content (AF)	Projected Irrig. Water Supply On June 30th (AF)
					Harlan County Dam* (% of Average)	Rep. Basin Dams (% of Average)		
2006	30,077	12,280	29,609	20.62	91%	101%	116,299	14,400
2007	198,528	21,237	38,197	26.92	118%	114%	255,393	111,700
2008	224,841	114,938	45,985	30.31	133%	131%	319,311	175,900
2009	136,747	94,079	41,721	24.50	108%	128%	320,258	156,000
2010	239,054	194,055	46,893	31.66	139%	119%	318,364	147,800
2011	174,830	120,989	49,241	30.69	135%	115%	322,964	157,700
2012	78,581	160,221	50,199	18.14	80%	64%	191,125	132,900
2013	48,794	75,355	40,042	17.46	77%	83%	124,522	81,400
2014	92,209	35,502	32,387	18.53	81%	105%	148,842	59,000
2015	106,728	54,502	33,652	28.85	127%	115%	167,416	79,600

NOTE: On June 30, 2016 Projected Irrig. Water Supply was 103,500 AF.

* Average Annual Precipitation at Harlan County Dam is 22.76 inches