BUREAU OF RECLAMATION

Niobrara, Lower Platte, and Kansas River Basins

Water Year 2021 Summary of Actual Operations
Water Year 2022 Annual Operating Plans

Annual Operating Plans

Norton Dam, Kansas

Nebraska Kansas Area Office
Missouri Basin Region

U.S. Department of the Interior

April 2022

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Table of Contents

List of Tables

Overview

General

This year is the 69th consecutive year that an Annual Operating Plan (AOP) has been prepared for the federally owned dams and reservoirs in the Niobrara, Lower Platte, and Kansas River Basins. The plan has been developed by the Water Operations Group in McCook, Nebraska for the 16 dams and reservoirs located in Colorado, Nebraska, and Kansas. These reservoirs, together with nine diversion dams, nine pumping plants, and 20 canal systems, serve approximately 271,382 acres of project lands in Nebraska and Kansas. In addition to irrigation and municipal water, these features serve flood control, recreation, and fish and wildlife purposes. A map at the end of this report shows the location of these features.

The reservoirs in the Niobrara and Lower Platte River Basins are operated by either irrigation or Reclamation districts. The reservoirs in the Kansas River Basin are operated by either Reclamation or the Army Corps of Engineers (Corps of Engineers). Kirwin Irrigation District provides operational and maintenance assistance for Kirwin Dam. The diversion dams, pumping plants, and canal systems are operated by either irrigation or Reclamation districts.

A Supervisory Control and Data Acquisition System (SCADA) located at McCook, Nebraska, is used to assist in operational management of all 11 dams, operated by Reclamation, that are located in the Kansas River Basin. A Hydromet system collects and stores near real-time data at selected stations in the Nebraska-Kansas projects. The data includes gate openings and the water levels in streams, canals, and reservoirs. This data is transmitted to a satellite and downloaded to a Reclamation receiver in Boise, Idaho. The data can then be accessed by anyone interested in monitoring water levels or water usage in an irrigation system. The Nebraska-Kansas Projects currently have 60 Hydromet stations that can be accessed. The Nebraska-Kansas Area Office (NKAO) has installed and maintains 41 of these Hydromet stations. These stations can be found on the Internet by accessing Reclamation's Missouri Basin Region Hydromet station codes page at the following address:
https://www.usbr.gov/gp/hydromet/station_codes_by_state.html.

2021 Summary

Climatic Conditions

Precipitation at the project dams during 2021 ranged from 67 percent of normal at Trenton Dam to 121 percent of normal at Harlan County Dam. Annual precipitation was below normal for 13 of the 16 project dams.

Temperatures in January were generally above normal, while temperatures in February were typically below normal throughout the project area. Precipitation in January varied from 265 percent of average to 45 percent of average. February precipitation was below average at 12 of the project dams. March temperature was typically above average, while precipitation was well above normal at all project dams and varied from 353 percent to 140 percent of average.

Temperatures in April were generally around normal while in May they were generally below normal. Precipitation during April was generally well below average with only one project dams above average. May precipitation was well above normal at twelve of the project dams.

Temperatures in June through August were much higher than normal throughout the project area. June through August precipitation was well below normal at almost all the project dams.

Precipitation recorded in October thru December was well below average at most project dams with many dams reporting zero precipitation during November and December while September varied between 248 percent of average to 64 percent of average. September thru December temperatures were generally above normal.

Storage Reservoirs

Conservation Operations: The 2021 inflows at Bonny were below the dry-year forecasts. Inflows for Davis Creek, Enders, Swanson, Hugh Butler, Harry Strunk, Keith Sebelius were between the dry-year and normal-year forecasts. The inflows for Merritt were above wet-year forecasts. The remaining reservoirs were between the normal-year and wet-year forecast

Ten of the sixteen reservoirs had below average carryover storage from the 2020 water year. Box Butte and Enders Reservoirs, along with Swanson, Hugh Butler, and Keith Sebelius Lakes did not have sufficient storage to provide water users with a full water supply. Webster, Kirwin, and Lovewell Reservoirs, and Harry Strunk, Harlan County and Waconda Lakes utilized some flood pool storage during the year. Irrigation demands greatly reduced the storage in several project reservoirs throughout the summer. Reservoir storage was below average at eleven of the sixteen reservoirs at the end of the 2020 water year.

On September 20, 2011, the State of Colorado ordered that Bonny Reservoir be drained for Republican River Compact compliance. Bonny Reservoir was completely evacuated by the end of May 2012 and no water has been collected to storage since. The State of Colorado order remains in effect and inflows continue to be bypassed.

Table 1 shows a comparison of 2020 and 2021 carry-over storage conditions for all reservoirs in the Niobrara, Lower Platte, and Kansas River Basins as of September 30, 2021.

Table 1 Summary of Carry-over Storage at NKAO Facilities.

Reservoir/Lake	September 30, 2021 Storage (AF)	September 30, 2020 Storage (AF)	Change (AF)
Bonny	0	0	0
Swanson	48,324	55,847	-7,523
Enders	8,148	8,681	-533
Hugh Butler	15,298	17,937	-2,639
Harry Strunk	21,522	18,016	3,506
Keith Sebelius	18,270	21,564	-3,294
Harlan County	277,143	278,630	-1,487
Lovewell	26,008	28,229	-2,221
Kirwin	84,301	87,855	-3,554
Webster	61,192	66,539	-5,347
Cedar Bluff	102,663	109,924	-7,261
Waconda	215,657	229,249	-13,592
Box Butte	8,022	11,782	-3,760
Merritt	59,797	53,629	6168
Calamus	63,908	71,102	-7,194
Davis Creek	14,083	13,508	575

Flood Control Operations: Lovewell, Kirwin, and Webster Reservoirs, and Waconda, Harry Strunk, and Harlan County Lakes utilized flood pool storage in 2021. Flood releases from Lovewell Reservoir totaled approximately 8,000 acre-feet (AF) in late-March until mid-April and approximately 3,000 AF in early June. Flood releases from Webster Reservoir totaled nearly 17,000 AF and occurred throughout the spring until irrigation releases started in June. Waconda Lake flood releases totaled nearly 189,400 AF and occurred throughout the year. Flood releases from Kirwin Reservoir during late-March until late-April totaled 4,400 AF. All flood pool storage at Medicine Creek Dam was used for irrigation and no flood releases were made. Harlan County Dam flood releases totaled nearly 23,200 AF and occurred throughout the spring until irrigation releases started in June.

The water year 2021 flood damages prevented by the operation of Reclamation's Nebraska-Kansas Projects facilities was $2,734,200 as determined by the Corps of Engineers. An additional benefit of $69,900 was credited to Harlan County Lake. The cumulative total of flood control benefits for the years 1951 through 2021 by facilities in this report total $3,004,641,200. Box Butte, Merritt, Calamus, and Davis Creek Reservoirs do not have a designated flood pool and have not accrued any flood benefits to date. Flood control benefits attributed to each project are shown in Table 2 on the following page.

Table 2 Flood damages prevented by Nebraska-Kansas Project Reservoirs.

Reservoir	During FY 2021	Prior to 2021	Accumulated Total
Bonny	$0	$2,870,900	$2,870,900
Enders	$0	$3,618,500	$3,618,500
Swanson	$24,700	$51,526,900	$51,551,600
Hugh Butler	$0	$13,489,900	$13,489,900
Harry Strunk	$23,900	$26,968,600	$26,992,500
Keith Sebelius	$0	$11,597,600	$11,597,600
Harlan County	$69,900	$396,473,100	$396,543,000
Lovewell	$35,400	$237,417,700	$237,453,100
Kirwin	$119,400	$196,053,900	$196,173,300
Webster	$81,400	$164,662,200	$164,743,600
Waconda	$276,300	$1,711,016,400	$1,711,292,700
Cedar Bluff	$2,173,100	$186,141,400	$188,314,500
Total	**$2,804,100**	**$3,001,837,100**	**$3,004,641,200**

Note: Accumulated totals from 1951 through 2021. The reservoirs upstream of Harlan County Lake did not receive credit for damages prevented from 1972 to 1993. Total construction costs of storage dams were $208,954,130.

A summary of precipitation, reservoir storage and inflows at the facilities of the Nebraska-Kansas Projects during 2021 can be found in Table 4.

Water Service

There was 376,672 AF of water diverted to irrigate approximately 220,390 acres of project lands in the 12 irrigation districts. The water requirements of three municipalities, one rural water district, and two fish hatchery facilities were met in 2021. Both storage releases and natural flows are utilized in meeting these demands.

Fish and Wildlife and Recreation Benefits

The National Recreational Fisheries Policy declares that the Government's vested stewardship responsibilities must work in concert with the state managing agency's recreational fisheries constituency and the general public to conserve, restore, and enhance recreational fisheries and their habitats. The NKAO is available for meetings if requested with Nebraska, Colorado, and Kansas state management agencies to discuss the AOP. Information is solicited from the agencies to enhance fisheries resources within the flexibility allowed while still meeting contractual obligations with the various irrigation districts.

Reservoir operations were favorable for recreation and fish and wildlife uses in 2021 at those project reservoirs with full or nearly full conservation pools prior to the irrigation season. The higher water levels experienced early in the year submerged existing shoreline vegetation. Normal irrigation demands and the lack of precipitation during the summer greatly reduced the pool levels at several reservoirs allowing for late summer shoreline revegetation. The draining of Bonny Reservoir diminished recreation benefits at the facility.

2022 Outlook

Three forecast conditions have been developed for each of the reservoirs in the Niobrara, Lower Platte, and Kansas River Basins conforming to an established operating criteria under various reservoir inflow conditions. These operation studies are included starting in Table 24. The municipal and rural water district water supply requirements will be met under all three inflow forecast conditions for all units.

Under reasonable minimum inflow forecast conditions, irrigation districts receiving storage water from the following lakes and reservoirs are expected to receive less than a full supply: Box Butte, Enders, Swanson, Harry Strunk, and Keith Sebelius. The irrigation districts affected are Mirage Flats; Frenchman Valley and H&RW; Frenchman-Cambridge; and Almena; respectively.

Under most probable inflow conditions, it is expected that Mirage Flats, Frenchman Valley, H&RW, Frenchman–Cambridge, and Almena Irrigation Districts would experience some shortages to irrigation demands from Box Butte Reservoir, Enders Reservoir, Hugh Butler Lake, Swanson Lake and Keith Sebelius Lake. Most irrigators in these districts plan to use water from private wells to supplement the project water supply.

Even under reasonable maximum inflow conditions, Frenchman Valley and H&RW Irrigation Districts are expected to experience irrigation demand shortages from Enders Reservoir.

Under reasonable minimum inflow conditions, the conservation pools at Merritt, Calamus, Davis Creek, and Lovewell Reservoirs, and Waconda and Harry Strunk Lakes are expected to fill during 2022.

Water is not expected to be stored in Bonny Reservoir during 2022 as the State of Colorado's order to bypass all inflows remains in effect. Bonny Reservoir was drained in 2012 by order of the State of Colorado to assist in meeting Republican River Compact compliance.

Chapter I – Introduction

Purpose of This Report

This AOP advises water users, cooperating agencies, and other interested groups or persons of the actual operations during 2021 and serves as a guideline for the 2022 operations. This report also describes the responsibilities of Reclamation, the Army Corps of Engineers (Corps of Engineers), and the irrigation and Reclamation districts in the Niobrara, Lower Platte, and Kansas River Basins.

Operational Responsibilities

Reclamation is responsible for irrigation operations at all federal reservoirs in the Nebraska-Kansas Projects. Reclamation is also responsible for the operation and maintenance (O&M), safety of the structure, and reservoir operations not specifically associated with regulation of the flood control storage at the reservoirs constructed by Reclamation. Regulation of the flood control storage is the responsibility of the Corps of Engineers. In addition to irrigation and flood control, these reservoirs provide recreation, fish and wildlife, and municipal water supply benefits.

By contractual arrangements with Reclamation, the irrigation or Reclamation districts in the Niobrara, Lower Platte, and Kansas River Basins are responsible for the O&M of the canals and irrigation distribution facilities constructed or rehabilitated by Reclamation. In addition, the appropriate irrigation or Reclamation districts are responsible for operating and maintaining Box Butte, Merritt, Virginia Smith, and Davis Creek Dams. The Corps of Engineers operates and maintains Harlan County Dam and Lake. The State of Colorado provides operational guidelines for Bonny Reservoir. Operational guidelines for Cedar Bluff Reservoir are provided by the State of Kansas. Reclamation operates and maintains eleven dams and reservoirs in the Republican, Solomon, and Smoky Hill River Basins. Under a contract with Reclamation, Kirwin Irrigation District performs certain operational and maintenance functions at Kirwin Dam.

An updated Field Working Agreement was executed on July 17, 2001, between the Corps of Engineers and Reclamation regarding operation of Harlan County Dam and Lake. The agreement provides for a sharing of the decreasing water supply into Harlan County Lake. Storage capacity allocations were redefined based on the 2000 sediment survey and a procedure was established for sharing the reduced inflow and summer evaporation among the various lake uses.

The States of Nebraska, Colorado, and Kansas are responsible for the administration and enforcement of their state laws pertaining to the water rights and priorities of all parties concerned with the use of water. As provided by the lease agreement between Reclamation and the states, the states are responsible for administering the water surface activities and the federal lands around the reservoirs. The U.S. Fish and Wildlife Service administer the water surface activities and most of the federal lands at Kirwin Reservoir.

Reclamation cooperates with all state agencies and compact commissions to ensure that all operations are in compliance with state laws and compact requirements.

Water Supply

For forecasting purposes, values of annual inflows were selected that statistically should be met or exceeded 10, 50, and 90 percent of the time to represent the reasonable maximum (wet-year), most probable (normal-year), and reasonable minimum (dry-year) inflow conditions, respectively.

Inflow records from 2002 through 2021 were used for the analysis of reservoirs in the Niobrara, Lower Platte, and Kansas River Basins.

Reservoir Operations

All operations are scheduled for optimum benefits of the authorized project functions. Monthly, or as often as runoff and weather conditions dictate, Reclamation evaluates the carry-over storage and estimated inflow at each reservoir to determine whether excess water is anticipated. If excess inflow is apparent, controlled releases will be made to maximize the downstream benefits.

Major Features

The Mirage Flats Project was constructed under the Water Conservation and Utilization Act and includes an irrigation storage reservoir, diversion dam, and canal system. The other features discussed in this report are all a part of the Pick-Sloan Missouri Basin Program and include single and multipurpose reservoirs, diversion dams, pump stations and canal systems. The sixteen storage facilities now in operation are listed below.

Constructed by Reclamation

Operated by irrigation or Reclamation districts: Box Butte and Merritt Dams in the Niobrara River Basin and Virginia Smith and Davis Creek Dams in the Lower Platte River Basin.

Operated by Reclamation: Bonny, Trenton, Enders, Red Willow, Medicine Creek, Norton, Lovewell, Kirwin, Webster, Glen Elder, and Cedar Bluff Dams in the Kansas River Basin. A contract provides for Kirwin Irrigation District to perform certain operational and maintenance functions at Kirwin Dam.

Constructed and Operated by the Corps of Engineers

Harlan County Dam in the Kansas River Basin.

Irrigation and Reclamation Districts

Twelve irrigation districts and one Reclamation district in the Niobrara, Lower Platte, and Kansas River Basins have contracted with Reclamation for water supply and irrigation facilities. The Twin Loups Irrigation District has contracted their O&M responsibilities to the Twin Loups Reclamation District. Bostwick Irrigation District in Nebraska has contracted their O&M responsibilities for Superior-Courtland Diversion Dam and the Courtland Canal between the head gates and the Nebraska-Kansas state line to Kansas Bostwick Irrigation District.

The contracted irrigation season for Mirage Flats Irrigation District is April through September. The contracted irrigation season for Frenchman-Cambridge Irrigation District is April 15 through October 15 or such additional period from April 1 to April 15 of each year as may be agreed upon between the District and Reclamation. The contracted irrigation season for Frenchman Valley Irrigation District is from May 1 through October 15 or such additional period from April 1 through May 1 of each year as determined between the district and Reclamation. The contracted irrigation season for Twin Loups Reclamation District, Bostwick in Nebraska, and Kansas Bostwick Irrigation Districts is May 1 through September 30 or such additional period from April 1 through November 15 of each year as determined between the district and Reclamation. For Ainsworth, Kirwin and Webster Irrigation Districts, the contracted irrigation season is from May 1 through September 30. For Almena Irrigation District the contracted irrigation season is from February 1 through September 30.

Municipal Water

Three municipalities in Kansas (Norton, Russell, and Beloit) and one rural water district in Kansas (Mitchell County Rural Water District No. 2) have executed water service contracts or repayment contracts for full or supplemental water supplies.

Fish and Wildlife

The Calamus Fish Hatchery is located below Virginia Smith Dam and Calamus Reservoir. The hatchery is operated and maintained by the Nebraska Game and Parks Commission (Commission). The water supply is provided by natural flows passed through Virginia Smith Dam and from Calamus Reservoir storage through an agreement dated July 28, 1988, between the Commission and the Twin Loups Reclamation District.

The State of Kansas operates and maintains the fish hatchery facility below Cedar Bluff Reservoir.

State of Colorado Division of Wildlife

The State of Colorado provides operational guidelines for Bonny Reservoir. The entire conservation pool storage was purchased by the State of Colorado on June 24, 1982. This contract expires in July 2022.

State of Kansas Department of Wildlife and Parks (KDWP)

The State of Kansas acquired the use and control of portions of the conservation capacity at Cedar Bluff Reservoir following the reformulation of the Cedar Bluff Unit in October of 1992. The City of Russell's existing water storage right and contract with the United States remained unchanged.

Power Interference Considerations

A Power Interference Agreement existed between Reclamation, the Twin Loups Reclamation District, and the Loup River Public Power District. This agreement expired in 2020. Subordination Agreements also exist between Reclamation, the Ainsworth Irrigation District, and the Nebraska Public Power District and between Reclamation, the Mirage Flats Irrigation District, and the Nebraska Public Power District. Provisions of these agreements will be incorporated into the 2022 operations.

Environmental Considerations

A "Statement of Operational Objectives" for Harlan County Lake sets forth the general operational objectives and the specific reservoir uses that are desirable. The operational objectives indicate that fish and wildlife interests are best served by high reservoir levels with minimum fluctuations, and regulation of the outflow in excess of the minimum desired flows. Although the statement recognizes flood control and irrigation as primary purposes, it indicates that comprehensive operational plans should be developed for maximum integration of the secondary uses.

These operational objectives are also considered in the operation of all Reclamation reservoirs in the Kansas River Basin, Niobrara River Basin, and the Lower Platte River Basin. The regulated outflow can also benefit farmers, ranchers, cities, and other interests below the reservoirs.

Republican River Compact – Kansas v. Nebraska

On May 26, 1998, Kansas filed a petition with the U.S. Supreme Court stating that Nebraska had violated the Republican River Compact by using more than its share of the Republican River water supply. The three original parties to the Compact; Kansas, Nebraska, and Colorado, became parties to the case. Because the major water development structures in the Republican River Basin were constructed by Reclamation and the Corps of Engineers, the United States was allowed to participate as *amicus curiae.* After seventeen months of negotiations, the Final Settlement Stipulation (Stipulation) was signed by each respective governor and attorney general and was filed with the Special Master on December 16, 2002. The United States Supreme Court approved the settlement and dismissed the case on May 19, 2003.

In the dry period 2005-2006, Nebraska overused its Compact-allotted share of the Republican River. In 2010, Kansas again filed suit in the U.S. Supreme Court. In 2015 the Supreme Court found that Nebraska had violated the Compact and required it to pay Kansas $5.5 Million in damages and to take additional action to ensure compliance.

After Kansas's 2010 filing, Nebraska took additional actions to achieve compliance including developing two augmentation projects to enhance flows in the River, offsetting overuse. Colorado also developed an augmentation project during this period to offset its overuse.

After more than two years of negotiations among the States, the Republican River Compact Administration (RRCA) approved two resolutions on August 24, 2016, establishing long-term agreements among Kansas, Colorado, and Nebraska related to Colorado's and Nebraska's compliance activities in the Republican River basin.

Water-Short Year Administration will be in effect in those years in which the projected or actual irrigation supply is less than 119,000 AF of storage available for use from Harlan County Lake as determined by Reclamation. It was determined that Water Short Year Administration would not be in effect in 2022.

Chapter II - Niobrara and Lower Platte River Basins

Mirage Flats Project in Nebraska

General

Flows in the Niobrara River along with Box Butte Reservoir storage provide a water supply for the 11,662-acre Mirage Flats Project. Many irrigators supplement their water supply with private wells.

A data collection platform was installed in May of 1992 to monitor the reservoir elevation and outflow at Box Butte Dam. A telephone (primary communication system) and a radio (backup communication system) have been installed at the outlet works for contacting the Region 23 Emergency Management Agency.

2021 Summary

The flows of the Niobrara River plus the carry-over storage in Box Butte Reservoir were not adequate to provide a full water supply for the project lands. Precipitation in the Mirage Flats Irrigation District totaled 12.37 inches, which is 72 percent of normal. The 2021 total inflow of 21,968 AF was between the most-probable and wet-year forecast.

The reservoir level began the year at elevation 3,996.45 feet (10.6 feet below the top of conservation). Irrigation releases began on June 27 and ended on September 2. The reservoir peaked at elevation 4,002.60 (4.4 feet below top of conservation) on May 4. Diversions of 14,926 AF to the Mirage Flats Canal provided irrigation water for approximately 9,340 acres. The farm deliveries from the project water supply totaled 7,147 AF (0.80 acre-foot per irrigated acre), which is a delivery efficiency of 48 percent. Total reservoir storage was 7,557 AF at the end of the irrigation season. Privately owned irrigation wells supplemented the project water supply. The reservoir level at the end of the year was 3,993.39 feet (13.6 feet below the top of conservation).

2022 Outlook

The project water supply is expected to be inadequate in 2022 as it has been since the early 1960's, but based on reasonable maximum inflow supplies will be adequate. In the spring, the district will inform their water users of the amount of water that will be available from storage in Box Butte Reservoir. It is anticipated that district irrigators will continue to use their privately-owned irrigation wells as a supplemental supply.

Ainsworth Unit, Sandhills Division in Nebraska

General

Within the Ainsworth Irrigation District, there are approximately 35,000 acres with available service. The project water supply is provided by Snake River flows and Merritt Reservoir storage. The

reservoir is filled to elevation 2,944.0 feet each fall after the irrigation season. This level is approximately two feet below the top of conservation capacity and within the repaired area of soil cement on the upstream face of the dam. The reservoir is regulated to maintain this level until the ice clears each spring. Maintaining the reservoir at this elevation during the winter will help avoid ice damage to the older existing soil cement at lower elevations. Upon ice-out, the outlet pipe is drained, inspected, and repaired as necessary. The reservoir is then rapidly filled to elevation 2,946.0 feet to reduce shoreline erosion around the reservoir and minimize sand accumulations on the face of the dam. This filling process generally takes place in April. The reservoir level is maintained until irrigation releases begin to draw on the pool around mid-May. Seepage, pickup, and toe drain flow normally result in flows of up to 15 cubic feet per second (cfs) below Merritt Dam.

Reclamation has executed a Memorandum of Agreement (MOA) between Reclamation, the Commission, and the Ainsworth Irrigation District for Snake River releases below Merritt Dam. The purpose of this MOA is to establish the protocol that will be used to make future releases of water from Merritt Dam to the lower Snake River. The development of the MOA was an environmental commitment outlined in the Ainsworth Irrigation District Final Environmental Assessment for the conversion of a Long-Term Water Service Contract to a Repayment Contract (December 2006). Release criteria will be based on the best available scientific data to determine when local conditions warrant releases to the Snake River. When it becomes necessary to release water from Merritt Reservoir, Reclamation will direct the Ainsworth Irrigation District to make the necessary releases to the river. Changes to the river will be staged to allow fish and other aquatic organisms time to acclimate to the changing environment.

2021 Summary

Precipitation, as recorded near Merritt Dam, totaled 19.21 inches, which was 90 percent of normal. The total yearly inflow of 223,085 AF was above the wet-year forecast. The reservoir level at the beginning of the year was at elevation 2,944.00 feet. The water supply was more than adequate to meet the project's irrigation requirement. There were 68,609 AF diverted from Merritt Reservoir into Ainsworth Canal, with 32,661 AF delivered to the farm head gates (delivery efficiency of 48 percent). There were 34,626 acres of land irrigated in 2021. The reservoir elevation at the end of 2021 was 2,944.00 feet. The district also provided a total of 473 AF of irrigation water from holding ponds located within the district's service area.

In early 2018, the Missouri Basin Regional Drill crew, the Technical Service Center, and NKAO personnel completed grouting of the spillway and river outlet works underdrain systems. The post grouting monitoring of the facility noted sand emanating from the right drain outfall for the spillway chute drain system. Weir plates were installed on both outfalls to monitor the sand accumulation. Six well points were also installed around the basin to provide additional ground water level monitoring. A Risk Reduction Verification Decision Document was completed and indicated that there is justification for enhancements to monitoring movement of material through the right spillway chute drain outfall. After identifying a preferred solution, a project plan will be prepared for implementing these monitoring enhancements.

A risk analysis is scheduled for May 2022 to evaluate the risk of dam failure associated with internal erosion given the ongoing sand migration, groundwater flow regime, and seismic events.

2022 Outlook

During the winter months, the reservoir will be regulated to maintain elevation 2,944.0 feet (2.0 feet below the top of conservation capacity). To alleviate erosive action to the lands around the reservoir and to maximize all benefits associated with the reservoir, releases from Merritt Reservoir are typically regulated to fill the conservation capacity during the early spring. This filling generally takes place during April. In 2022, the reservoir elevation will be held half a foot below conservation due to the ongoing Safety of Dams project. If weather conditions or irrigation demands dictate, it may be necessary to begin filling the reservoir prior to this time. This reservoir level will be maintained until irrigation releases begin dropping the pool level. Following the irrigation season the reservoir will begin to refill to elevation 2,944.0 feet. A release of 50 cfs will be made to the Snake River beginning around the second week of October and will continue until the reservoir reaches the desired winter elevation. The water supply is expected to be adequate in 2022 for the irrigation of 35,000 acres.

North Loup Division in Nebraska

General

The North Loup Division is located within the Loup River drainage basin. Water is diverted from both the Calamus and North Loup Rivers for the irrigation of approximately 56,053 acres of project lands. Operation of the division also provides a sustained groundwater supply for an additional 17,000 acres. Principal features of the division include Virginia Smith Dam and Calamus Reservoir, Calamus Fish Hatchery, Kent Diversion Dam, Davis Creek Dam and Reservoir, five principal canals, one major and one small pumping plant and numerous open ditch and buried pipe laterals.

Calamus Reservoir is normally regulated at three to four feet below the top of conservation capacity during the winter months. Maintaining the reservoir at this elevation during the winter helps avoid ice damage to the soil cement on the upstream face of the dam. After the ice clears in the spring, the reservoir is filled to conservation capacity. The North Loup Division project operation is restricted to zero water diversions from the Calamus and North Loup Rivers during the months of July and August, and during the month of September whenever insufficient water is available in the storage reservoirs to deliver full water demands. During this time, inflows to Calamus Reservoir are required to be bypassed under the Power Interference Agreement between Reclamation, the Twin Loups Reclamation District, and the Loup River Public Power District and as required in the authorizing legislation. This contract expired October 31, 2020.

Davis Creek Reservoir level is typically maintained at an average elevation of 2,048.0 feet from the end of the irrigation season through the winter months. Off season seepage and evaporation has historically resulted in a reservoir drawdown of 2.5 to 3.0 feet requiring an end of September reservoir level of 2050.0 feet or less. This carry-over elevation provides a minimal recreational pool while reducing increases in groundwater storage due to reservoir seepage. The reservoir is filled by the Mirdan Canal starting in April and will generally reach full content by the end of June. A 160-acre recreation area adjoining the reservoir continues to be managed by the Lower Loup Natural Resources District. The area includes a boat ramp, a handicapped accessible fishing pier, a day-use area, a primitive camping area, shelter, and a hiking path. Public lands adjoining Kent Diversion Dam are managed by the Commission and are also open to day-use fishing with handicapped accessibility provided.

2021 Summary

Precipitation at Virginia Smith Dam was 19.90 inches which is 79 percent of normal for the year. The inflow totaled 313,821 AF which was between the normal and wet-year forecast. The reservoir level at the first of the year was elevation 2,239.17 feet (4.8 feet below the top of conservation). The conservation pool filled on April 30. The water supply was more than adequate for the district's needs. There were 115,663 AF of water released into Mirdan Canal for district use and 2,425 AF diverted through Kent Canal from the North Loup River. A total of 49,248 AF was diverted for district use above Davis Creek Reservoir. The farm head gate delivery was 29,561 AF which is a delivery efficiency of 60 percent. Land irrigated in 2021 totaled 34,110 acres above Davis Creek Reservoir. The Calamus Fish Hatchery used bypassed natural flows and storage from the reservoir totaling 1,797 AF. Calamus Reservoir inflows were bypassed during July, August, and September as required. The elevation at the end of the year was 2,238.19 feet.

The precipitation total of 23.52 inches near Davis Creek Dam was 90 percent of normal. Inflow to Davis Creek Reservoir totaled 57,974 AF during 2021. The reservoir elevation at the first of the year was 2,054.57 feet. Beginning in mid-April, Davis Creek Reservoir was filled to a peak elevation of 2,073.25 feet on June 16 using diversions from Calamus Reservoir and the North Loup River. A release of 48,215 AF was made from Davis Creek Dam into Fullerton Canal, with 22,164 AF delivered to the farm head gates which is a 46 percent delivery efficiency. There were 21,016 acres irrigated below Davis Creek Reservoir. Following the irrigation season, the reservoir level was maintained and wintered approximately eight feet higher than normal at the request of the district for a three-year study period. The reservoir elevation at the end of 2021 was 2,055.20 feet, 20.8 feet below the top of conservation.

2022 Outlook

Filling of Calamus Reservoir will continue through late winter and early spring. The reservoir will be allowed to fill to an elevation of 2,244.0 feet (top of conservation capacity) in late March or April. This reservoir level will be maintained to minimize shoreline erosion until demands begin to draw on the reservoir. In the fall the reservoir will be filled to an elevation of approximately 2,240.0 feet, if possible.

Water will be available for all irrigable acres with service from the Mirdan, Geranium and Scotia Canals and Lateral Systems. It is estimated that approximately 34,000 acres will be irrigated from these canals. Water supplies will be sufficient to meet the full dry-year requirements.

Filling of Davis Creek Reservoir will take place this spring with flows diverted from the North Loup River at Kent Division Dam and transported through Kent and Mirdan Canals. Storage water can also be transferred from Calamus Reservoir into Davis Creek Reservoir during the summer months through the Mirdan Canal. Water will be sufficient to irrigate an estimated 21,000 acres from Elba and Fullerton Canals under all inflow forecast conditions. The reservoir level will be regulated to eight feet above normal winter levels as part of an ongoing groundwater study.

Requirements for the fish hatchery will be met in full in 2022.

Chapter III - Republican River Basin

Armel Unit, Upper Republican Division in Colorado

General

Normal reservoir operations for Bonny Reservoir have historically been for recreation and fish and wildlife support, although water has been available for water right administration and irrigation purposes.

Bonny Reservoir inflows from the South Fork of the Republican River and Landsman Creek have historically been released into Hale Ditch as requested by the Colorado State Engineer. Hale Ditch water rights were purchased in 2019 by the Republican River Water Conservation District for compact compliance.

The historic operation pattern of Bonny Reservoir enhanced the spring fish spawn and provided excellent fishing opportunities during the summer and hunting conditions each fall. In September of 2011, the State of Colorado ordered all storage water evacuated from Bonny Reservoir for Republican River Compact compliance. As a result, the reservoir fishery was decimated, and future operations are unlikely to provide fishing opportunities unless water is returned to the reservoir.

2021 Summary

The annual precipitation total of 17.93 inches at Bonny Dam was 101 percent of average. The annual computed inflow of 2,295 AF to Bonny Reservoir was below the dry-year forecast. Bonny Reservoir remains drained, and inflows continue to be bypassed for the purpose of compact compliance in 2019.

As directed by the Colorado State Water Commissioner, water was bypassed through the reservoir into the South Fork Republican River as ordered by the Colorado State Engineer for compact compliance. No water was diverted into Hale Ditch in 2021.

2022 Outlook

The State of Colorado's order to evacuate the storage in Bonny Reservoir for Republican River Compact compliance remains in effect. If the order continues throughout 2022, water will not be available in the reservoir for irrigation or fishery purposes.

The Colorado State Water Commissioner is expected to direct that water be bypassed into the South Fork Republican River again in 2022.

Frenchman Unit, Frenchman-Cambridge Division in Nebraska

General

The Culbertson Canal and the Culbertson Extension Canal systems serve 9,292 acres in the Frenchman Valley Irrigation District and 11,915 acres in the H&RW Irrigation District. The contract with H&RW Irrigation District expired December 31, 2021. The district is requesting to negotiate a short-term contact in 2022. The water supply for these lands is furnished by flows from Frenchman and Stinking Water Creeks and off-season storage in Enders Reservoir located on Frenchman Creek, a tributary of the Republican River in southwest Nebraska. Irrigation releases are conveyed via Frenchman Creek from Enders Reservoir to Culbertson Diversion Dam.

The normal operation of Enders Reservoir, with the gradual rise in water surface during the spring months, provides desirable fish spawning conditions. Irrigation releases normally deplete the conservation storage by late summer, thereby limiting the fishing and recreational usage. Due to extremely low storage levels, irrigation releases have not been made from Enders Reservoir since 2003.

Annual reservoir inflows have steadily declined from around 61,000 AF when Enders Dam was constructed to only 4,000 AF in recent years. Extensive groundwater pumping from upstream well development along with various conservation practices have resulted in the depletion of inflows. The conservation pool has not filled since 1968.

2021 Summary

The annual precipitation total of 16.09 inches at Enders Dam was 83 percent of normal. The 2021 inflow into Enders Reservoir of 4,001 AF was between the dry-year and normal-year forecasts. The reservoir level began the year at a level of 3,081.93 feet (30.4 feet below the top of conservation). This was the second 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 3,083.65 feet on June 2.

Evaporation decreased the reservoir level from June through mid-November reaching elevation 3,080.69 feet on November 18. This was the lowest elevation observed since 67 days after initial closure. Due to the extremely low water supply available, no water was released from Enders Reservoir during the irrigation season. The end of the year reservoir level was 3,080.81 feet (31.5 feet below the top of conservation). This was the lowest end of year level recorded since initial filling. A daily plot of the reservoir elevation is shown in Figure 1.

The Frenchman Valley Irrigation District diverted 5,988 AF of natural flow from Frenchman Creek in 2021. The district reports that approximately 360 acres received 176 AF of water. Farm delivery averaged about 6 inches per irrigated acre in the irrigation district. Several farmers supplemented their water supply with private irrigation wells. The H&RW Irrigation District did not divert water into Culbertson Extension Canal in 2021. This was the nineteenth consecutive year that the district did not deliver water.

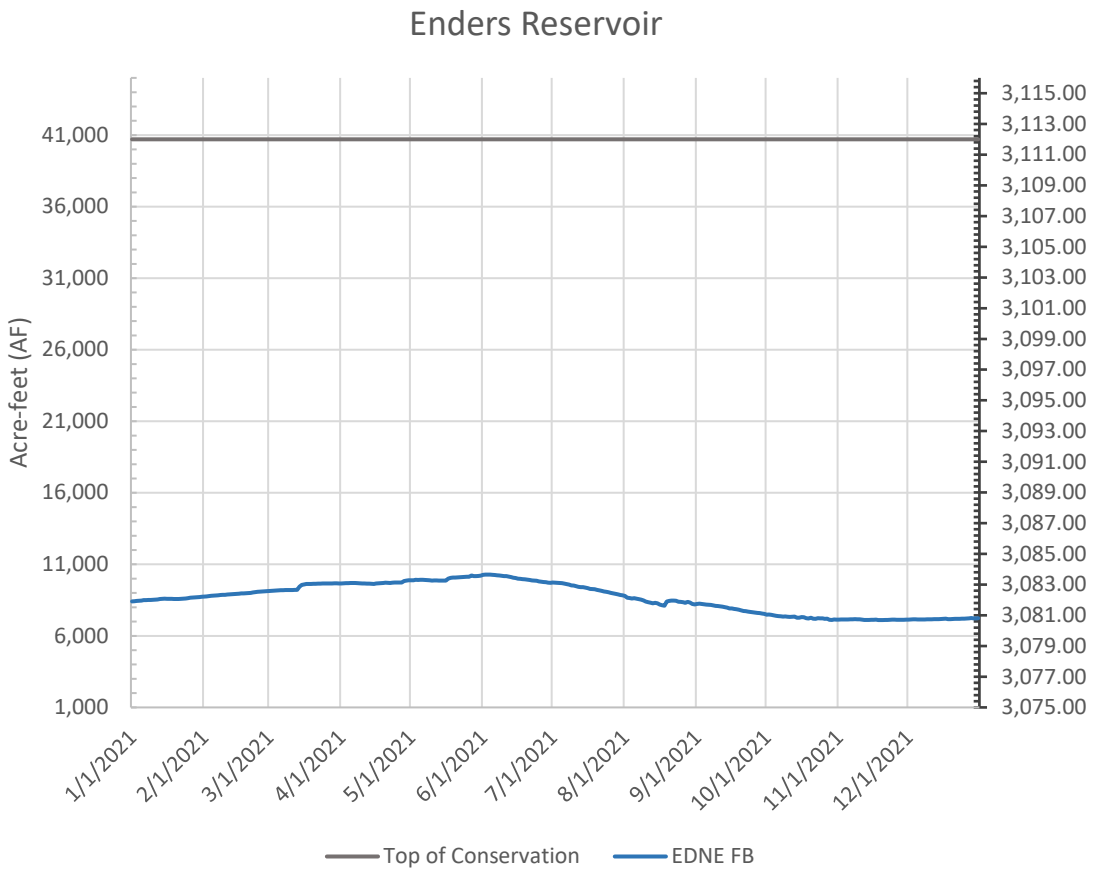


Figure 1 Enders Reservoir Elevation and Content.

2022 Outlook

The fall and early winter inflows into Enders Reservoir were near the dry-year forecast. If dry-year conditions prevail, the project water supply is expected to experience a shortage of about 78,100 AF. Normal-year conditions are expected to be inadequate by 62,300 AF and wet-year conditions by 32,500 AF, to irrigate the 9,292 acres in the Frenchman Valley Irrigation District and 11,915 acres in the H&RW Irrigation District.

The Frenchman Valley Irrigation District and the H&RW Irrigation District are investigating possible alternatives for the most efficient use of the declining water supply in the basin.

Meeker-Driftwood, Red Willow, and Cambridge Units, Frenchman-Cambridge Division in Nebraska

General

Service is provided for Frenchman-Cambridge Irrigation District by Meeker-Driftwood Canal to 16,691 acres; Red Willow Canal to 4,643 acres; Bartley Canal to 6,130 acres; and Cambridge Canal to 18,205 acres. The water supply for these lands is provided by storage in Swanson, Hugh Butler, and Harry Strunk Lakes, and inflows of the Republican River and Red Willow and Medicine Creeks. The Frenchman-Cambridge Irrigation District has replaced all open ditch laterals that were economically feasible with buried pipe which has significantly increased both system and on-farm efficiencies.

2021 Summary

The annual precipitation total of 13.68 inches at Trenton Dam was 67 percent of normal. The inflow of 22,902 AF to Swanson Lake was between the dry-year and normal-year forecasts. The lake level began the year at elevation 2,738.60 feet (13.4 feet below the top of conservation) and gradually increased throughout the late winter and spring. The peak elevation on June 11 was 2,743.30 feet (8.7 feet below the top of conservation).

The reservoir level decreased throughout the irrigation season and reached an elevation of 2,735.65 feet on December 19. The district diverted 18,654 AF and delivered 7,769 AF to the farms, which is a delivery efficiency of 42 percent. At the end of the year, the reservoir level was at 2,735.70 feet (16.4 feet below the top of conservation). The Corps of Engineers determined that Swanson Lake prevented $24,700 in flood damages in 2021. A daily plot of the reservoir elevation is shown in Figure 2.

In late February 2013, the Upper Republican Natural Resources District (URNRD) began operating the Rock Creek Augmentation Project. The augmentation water is pumped from the ground and diverted into Rock Creek. The water flows from Rock Creek into the North Fork of the Republican River at Parks, Nebraska. From there the water travels approximately 35 miles to Swanson Lake. The URNRD did not pump water into Rock Creek in 2021.

The Republican River Water Conservation District (RRWCD) built and completed the Colorado Compliance Pipeline in April 2014. The augmentation water is pumped from the ground and flows approximately 8 to 15 miles south to the North Fork of the Republican River just above the Colorado-Nebraska state line. The water then travels approximately 55 miles to Swanson Lake. The RRWCD pumped water in spring of 2021 and in December of 2021 for compact compliance.

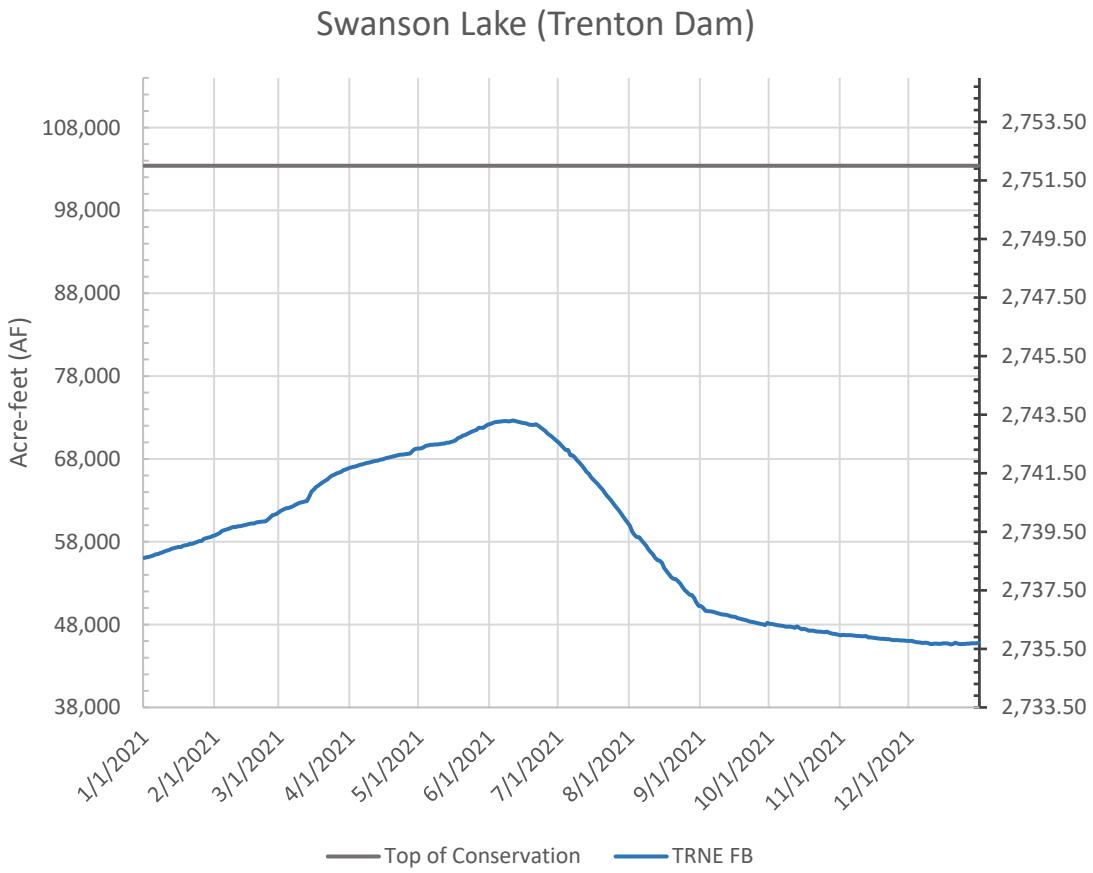


Figure 2 Swanson Lake Elevation and Content.

The annual precipitation total at Red Willow Dam was 18.98 inches (95 percent of normal). The annual inflow of 8,731 AF into Hugh Butler Lake was between the dry-year and normal year forecasts. The reservoir level at the first of the year was 2,568.67 feet, 13.1 feet below the top of conservation. Late winter, spring and summer inflows gradually increased the lake level to a summer peak of 2,572.03 feet on June 3. The district diverted 5,161 AF into Red Willow Canal and delivered 1,741 AF to the farms, which is a delivery efficiency of 34 percent. Late summer evaporation exceeded inflows, decreasing the lake level to 2,565.4 feet on September 29. The end of year elevation was 2,566.13 feet (15.7 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 3.

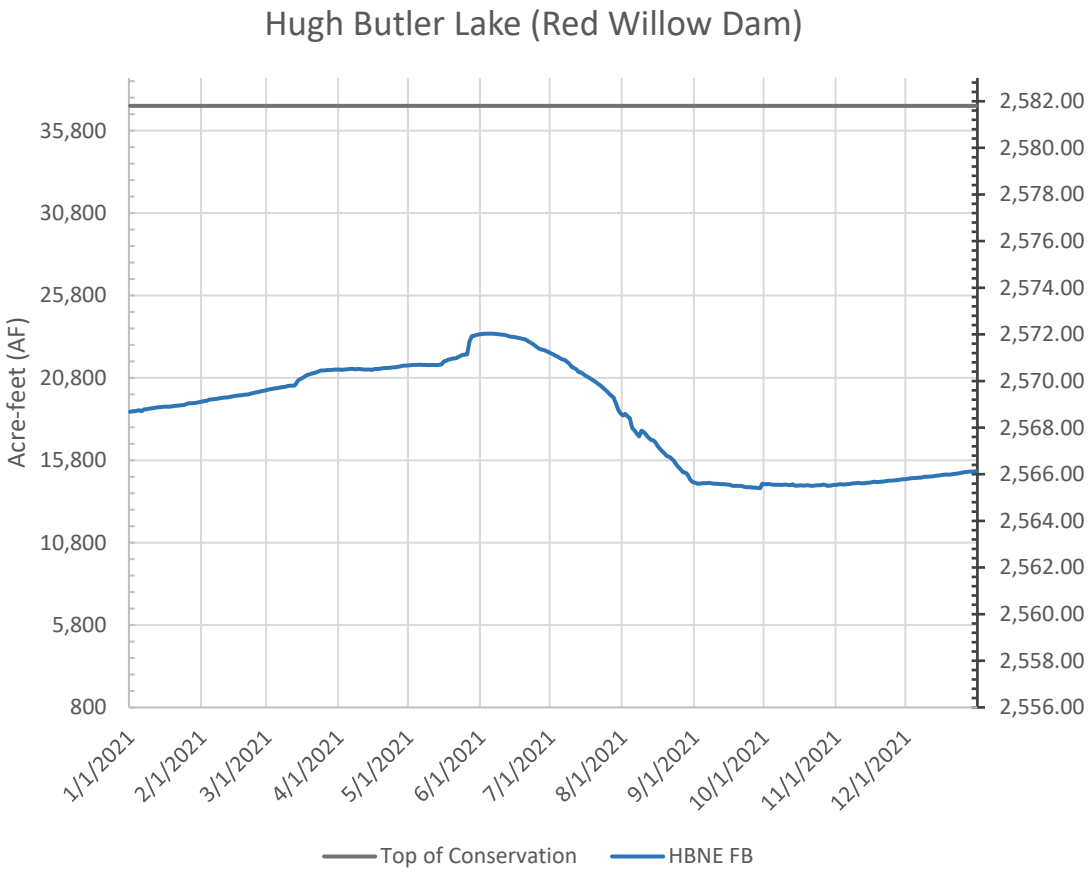


Figure 3 Hugh Butler Lake Elevation and Content.

The annual precipitation total of 19.35 inches at Medicine Creek Dam was 91 percent of normal. The inflow of 31,212 AF was between the dry-year and average forecast. The reservoir level at the beginning the year was 2,359.72 feet (6.4 feet below the top of conservation). The reservoir filled to top of conservation on April 16. Irrigation releases started May 10. The reservoir level peaked at elevation 2,367.58 feet on May 28. A daily plot of the reservoir elevation is shown in Figure 4.

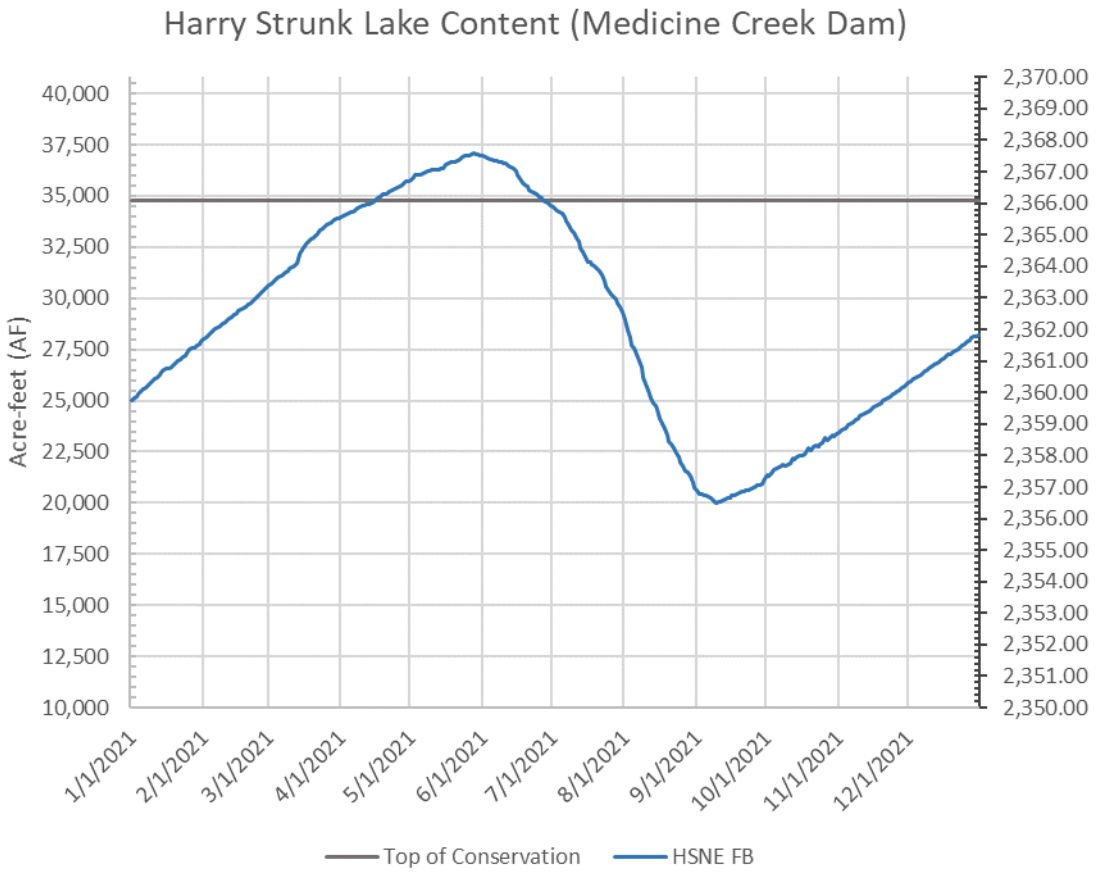


Figure 4 Harry Strunk Lake Elevation and Content.

The district diverted 25,971 AF into Cambridge Canal and delivered 10,707 AF to 15,856 acres of district lands which is a delivery efficiency of 41 percent. The end of year elevation was 2,361.83 feet at the end of the year (4.3 feet below the top of conservation).

The Nebraska Cooperative Republican Platte Enhancement Project (N-CORPE) is an interlocal agency formed by the Upper Republican Natural Resources District (URNRD), the Middle Republican Natural Resources District (MRNRD), the Lower Republican Natural Resources District (LRNRD), and the Twin Platte Natural Resources District. N-CORPE has constructed an augmentation project that pumps groundwater from Lincoln County into Medicine Creek. The delivery system consists of a 42-inch diameter pipe approximately six miles long. The pumped water enters at the source of Medicine Creek and travels approximately 57 stream miles to Harry Strunk Lake. The capacity of the project is approximately 87 cfs (63,000 AF annually). The augmentation project was not operated in 2021.

2022 Outlook

Forecasts show that carry-over storage, streamflow gains, plus reasonable minimum inflows for the three lakes supplying the Frenchman-Cambridge Irrigation District will be inadequate to meet the full dry-year irrigation requirement by 36,400 AF. The water supply will be inadequate under normal- year irrigation requirement by 1,800 AF. The water supply will be adequate under wet-year conditions.

Almena Unit, Kanaska Division in Kansas

General

Service is available to 5,764 acres in the Almena Irrigation District. The project water supply is provided by Prairie Dog Creek flows and Keith Sebelius Lake storage.

The water service contract for the City of Norton, Kansas, provides for a maximum annual use of 1,600 AF from Keith Sebelius Lake.

In 2017, the Almena Irrigation District and the Norton County Community Foundation, Inc. entered into a Memorandum of Agreement (MOA) to maintain a minimum pool elevation in Keith Sebelius Lake through December 31, 2027. The MOA was approved by the irrigators within the district and provided that no water would be released for irrigation below elevation 2,288.5 feet (10,126 AF.)

On November 22, 2019, the district executed an amendment to their contract which changed the irrigation season start date from May 1 to February 1.

2021 Summary

The annual precipitation at Norton Dam totaled 20.89 inches, which is 83 percent of normal. The total inflow of 6,222 AF was between the dry and average year forecast. The reservoir elevation was 2,297.19 feet (7.1 feet below the top of conservation pool) at the first of the year. Late winter, spring and summer inflows gradually increased the lake level to a summer peak of 2,298.77 feet on May 31. Irrigation releases began July 13 and finished for the season on July 30. Approximately 2,815 AF was released from Norton Dam for irrigation of which 2,154 AF was diverted into the Almena Canal of which 1,085 AF was delivered to farms for an efficiency of 39 percent. Inflows in December exceeded evaporation gradually increasing the elevation to the end of year elevation of 2,294.90 feet (9.4 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 5.

The city of Norton used 371 AF of municipal water during 2021.

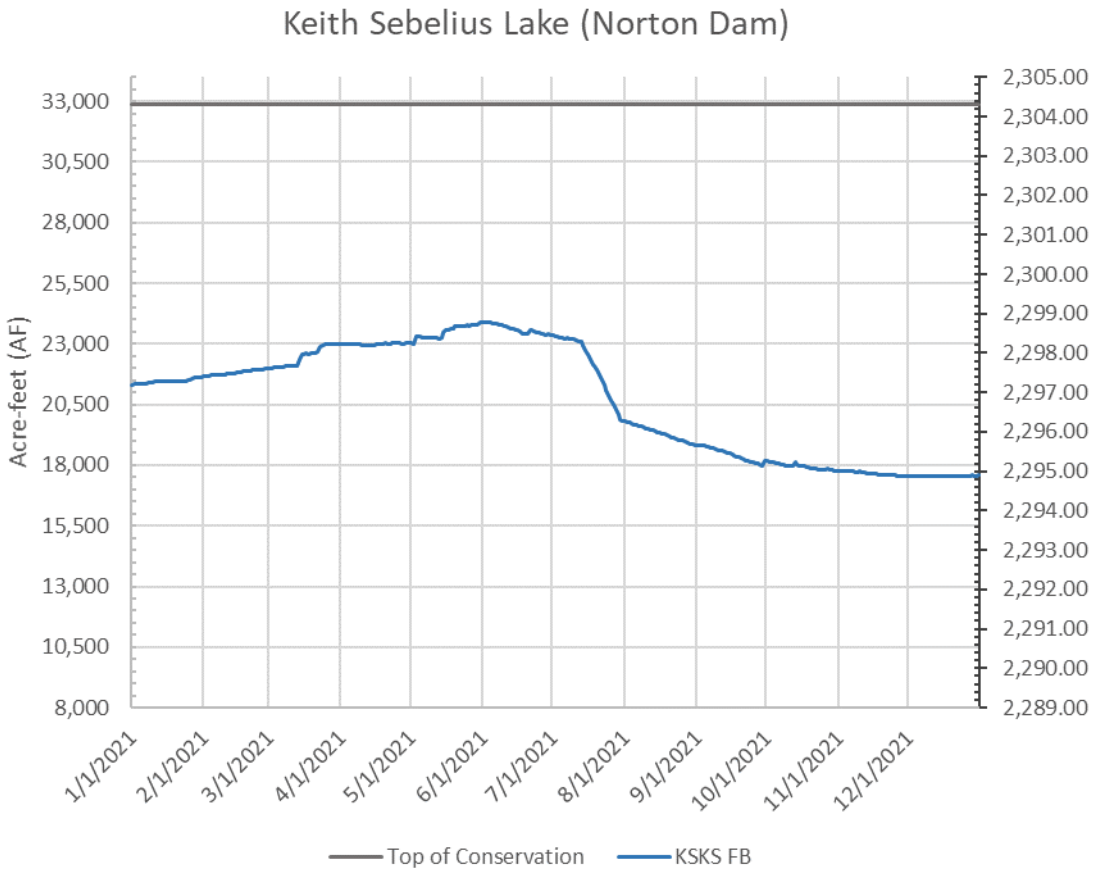


Figure 5 Keith Sebelius Lake Elevation and Content.

2022 Outlook

If 2022 is a dry year without significant runoff-producing storms above Keith Sebelius Lake, it is anticipated that the water supply may be inadequate by as much as 15,900 AF. If normal inflow into the lake and normal rainfall over the irrigated area occur in 2022, a shortage of 10,500 AF may be expected. The water supply will be adequate under wet-year conditions. Requirements for the city of Norton will be met in full in 2022.

Franklin, Superior-Courtland, and Courtland Units, Bostwick Division in Nebraska and Kansas

General

Harlan County Lake storage and Republican River flows provide a project water supply for 22,455 acres in the Bostwick Irrigation District in Nebraska, and 13,378 acres in the Kansas Bostwick Irrigation District No. 2 (KBID) above Lovewell Reservoir. This storage and natural flows, together with White Rock Creek flows and Lovewell Reservoir storage, furnish a water supply for 29,122 acres below Lovewell Reservoir in the KBID.

The lands in the Franklin and Superior-Courtland Units are in the Bostwick Irrigation District in Nebraska. The lands in the Courtland Unit downstream of the Kansas state line are in the KBID.

In accordance with the off-season flow alternative outlined in Reclamation's final environmental assessment dated December 16, 1983, and amended on November 21, 2002, Harlan County Lake releases will be 10 cfs during the months of December, January, and February, except when the reservoir is at low levels. During water-short years releases for these three months will be either zero or 5 cfs depending on reservoir levels.

Natural gain in streamflow, plus irrigation return flows, and operational bypass at Superior-Courtland Diversion Dam will provide some flow downstream.

The KDWP has requested that the KBID and Reclamation maintain, when possible, a flow of 20 cfs into Lovewell Reservoir when the Courtland Canal is in operation and the conservation pool is below capacity. This recommended inflow provides excellent fishing around the canal inlet to the reservoir. The seepage below Lovewell Dam into White Rock Creek maintains a small live stream throughout the year.

Bostwick Division - Harlan County Lake Operations - 2021 Summary

The annual precipitation at Harlan County Dam totaled 28.22 inches of rainfall, which is 121 percent of normal. The 2021 inflow of 130,998 AF was between the average and wet-year forecast. Harlan County Lake began 2021 at 1,943.05 feet (approximately 2.7 feet below the top of conservation pool).

The Corps of Engineers made varying flood releases between April and June to keep the pool elevation near top of conservation. Approximately 44,600 AF was released during that period. The conservation pool as well as the accumulated flood pool were split June 14 as irrigation releases began.

Irrigation releases from Harlan County Lake into Franklin and Naponee Canals totaled 22,288 AF. The end of year elevation was 1,943.11 feet (2.3 feet below the top of conservation). A plot of the reservoir elevation is shown in Figure 6.

On December 21, 2018, Bostwick Irrigation District in Nebraska and KBID amended their original "Memorandum of Agreement" dated October 4, 2000, to modify Harlan County Lake accounting procedures for a period of three years. In the agreement, account balances of the districts carry-over from year to year and inflows are apportioned based on target account balances. This agreement expired at the end of 2021. On March 3, 2022 a new agreement, based on the 2018 agreement, was signed.

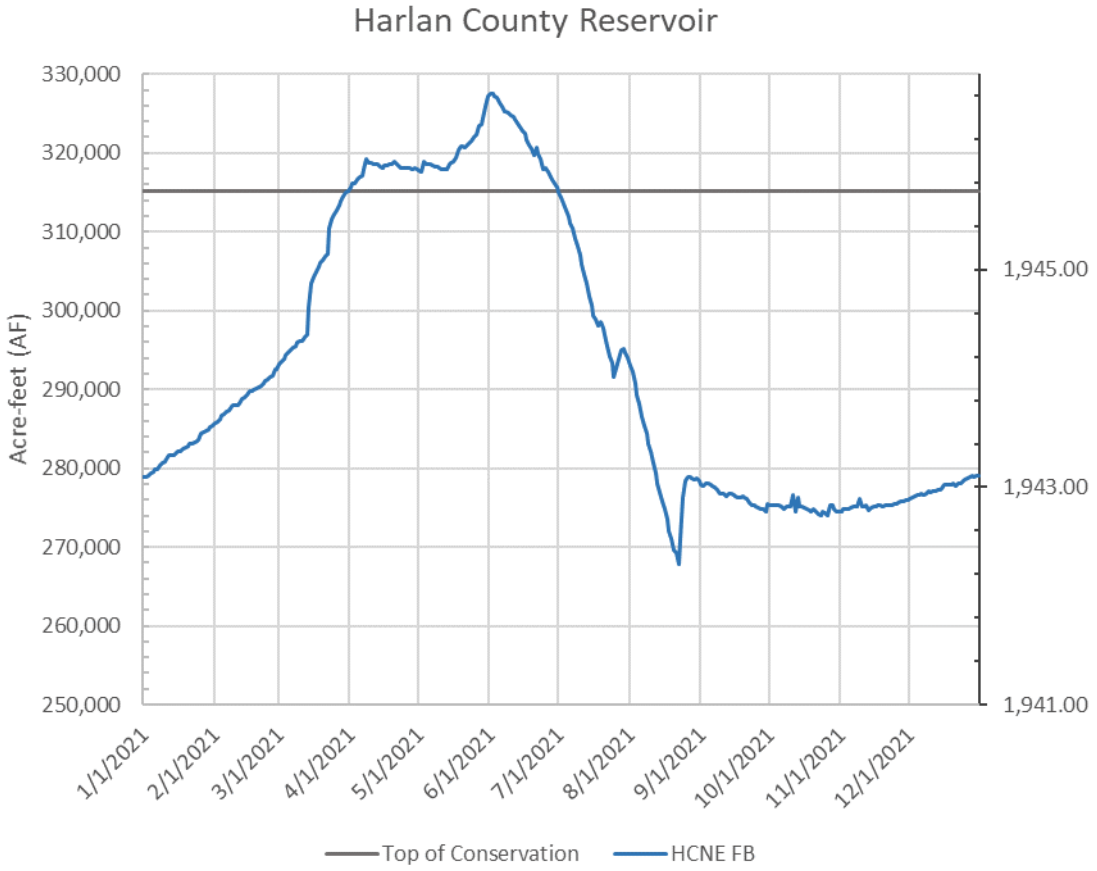


Figure 6 Harlan County Lake Elevation and Content.

Harlan County Lake prevented $69,900 of downstream flood damages during 2021 according to the Corps of Engineers.

There was 30,657 AF delivered to Lovewell Reservoir via the Courtland Canal during 2021. This was approximately 53 percent of the total Lovewell Reservoir inflow.

Bostwick Division – Nebraska - 2021 Summary

Irrigation diversions were made into Franklin, Naponee, Franklin Pump, Superior, and Courtland Canals in Nebraska in 2021. The district diverted 34,528 AF of water and delivered 5,252 AF to the farm head gates (21 percent delivery efficiency).

Bostwick Division – Kansas – 2021 Summary

The 2021 precipitation at Lovewell Dam totaled 24.55 inches, which was 88 percent of normal. The total annual inflow recorded at Lovewell Reservoir was 57,851 AF. Approximately 27,194 AF of the inflow was from White Rock Creek which was between the average and wet-year forecast. The reservoir elevation at the beginning of 2021 was 1,581.03 feet (1.6 feet below the top of conservation). Lovewell dam recorded 5.66 inches of precipitation in 10 days during mid to late March. This increased the lake elevation 2.3 feet to a yearly peak of 1584.34 (1.7 feet above top of conservation. Releases were staged up to 250 cfs. Flood waters were evacuated by April 12. Lovewell dam recorded 4.47 inches of precipitation throughout mid to late May again raising the reservoir elevation into the flood pool. Flood releases of 250 cfs started June 1 and were maintained for about a week until irrigation releases into the canal increased. Flood releases ceased June 7. Irrigation releases for canal seasoning/flushing began May 25 with releases in earnest beginning starting early-June and continued until September 10. Irrigation releases lowered the lake to a yearly low of 1576.38 (6.2 feet below conservation) before a timely rain at the end of August allowed the lake to recover significantly by both reducing demand and increasing diversions into the Courtland Canal. Republican River flow was diverted via the Courtland Canal into Lovewell Reservoir after the irrigation season. The pool level at the end of the year was 1,580.92 feet (1.7 foot below top of conservation). A plot of the reservoir elevation is shown in Figure 7.

KBID diverted a total of 63,954 AF to serve 12,508 acres above Lovewell Dam and 25,089 acres below Lovewell Dam. District farm delivery totaled 35,405 AF for an efficiency of 55 percent. Lovewell Reservoir prevented $34,400 of downstream flood damages during 2021 according to the Corps of Engineers.

A Sedimentation Survey was conducted in the summer of 2020 for Lovewell Reservoir by the Technical Service Center. A final report was published in late 2021. The new area and capacity tables will become effective in 2022. The final report and associated area and capacity tables can be found at: https://www.usbr.gov/tsc/techreferences/reservoir.html.

Bostwick Division - 2022 Outlook

The storage in Harlan County Lake is expected to be adequate in meeting the full dry-year irrigation requirement though Lovewell Reservoir and flows of the Republican River and White Rock Creek are expected to be adequate in meeting the full dry-year irrigation requirement. The water supply will be adequate under normal-year and wet-year conditions.

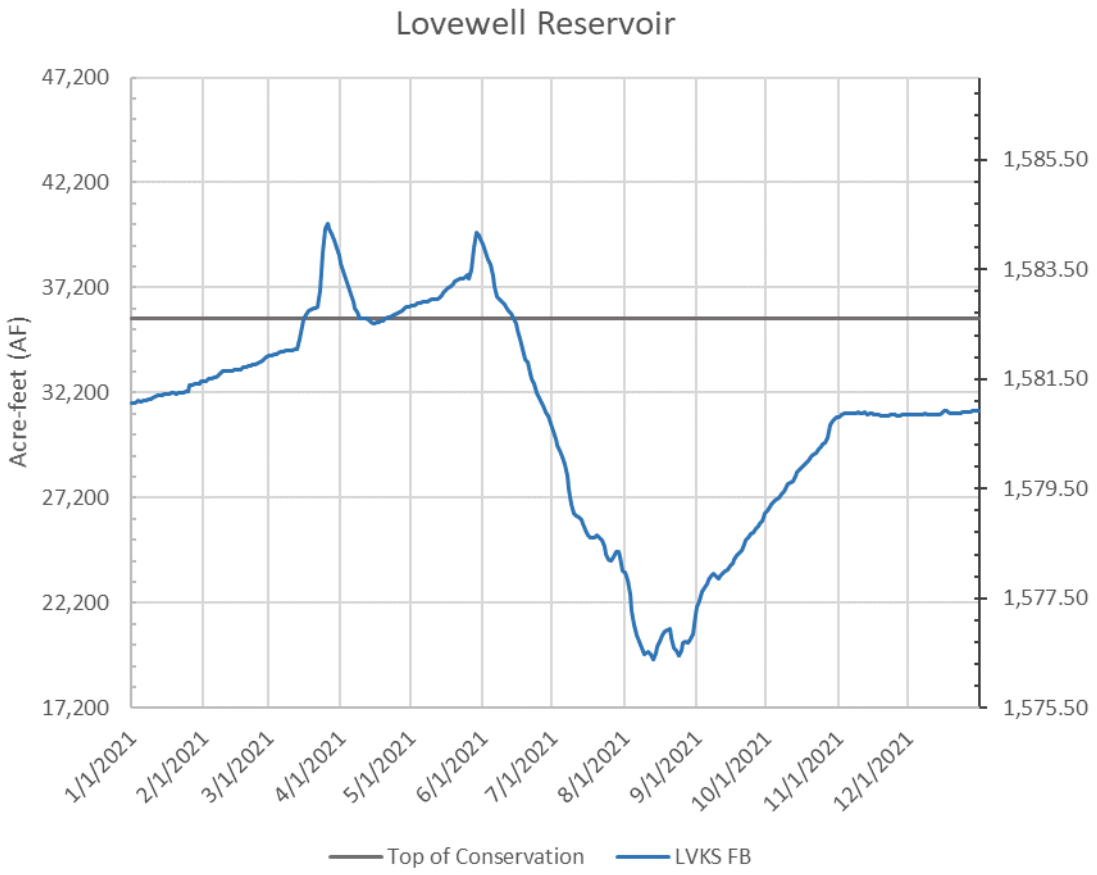


Figure 7 Lovewell Reservoir Elevation and Content.

Chapter IV - Smoky Hill River Basin

Kirwin Unit, Solomon Division in Kansas

General

The water supply for the 11,465 acres of land in the Kirwin Irrigation District is furnished by Kirwin Reservoir storage and inflows from the North Fork Solomon River and Bow Creek.

The operation of Kirwin Dam and Reservoir affords many opportunities for recreation, fishing, hunting, fish spawning, and preservation of waterfowl species.

The U.S. Fish and Wildlife Service (Service) has completed the Kirwin National Wildlife Refuge Comprehensive Conservation Plan (CCP). The 1997 National Refuge System Improvement Act required the Service to develop a CCP for each of its refuges. The Kirwin Refuge CCP will guide the refuge management activities through 2025.

2021 Summary

The annual precipitation total of 24.03 inches at Kirwin Dam was 100 percent of normal. The inflow of 36,820 AF was between the average and wet-year forecast. The reservoir level was 1,727.72 feet (1.5 feet above the top of conservation pool) at the first of the year. Kirwin Dam reported 5.54 inches of precipitation in mid to late March. Inflows brought that reservoir up approximately a foot over two weeks. Flood releases started March 26 and ended April 21. Kirwin Dam reported another 5.34 inches of precipitation during the month of May. This caused the reservoir level to climb throughout June to peak at elevation 1,730.77 feet on June 21, when irrigation releases began. Irrigation releases continued through September 3. The reservoir level gradually decreased throughout the fall to a minimum elevation of 1,726.32 feet on September 27. The reservoir level increased as inflow exceeded evaporation to elevation 1,726.59 feet on December 31 (2.7 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 8 on the following page.

A total of 20,550 AF was released into Kirwin Canal to irrigate 8,966 acres of project lands during 2021. Farm delivery efficiency was 42 percent with 8,684 AF delivered to farms.

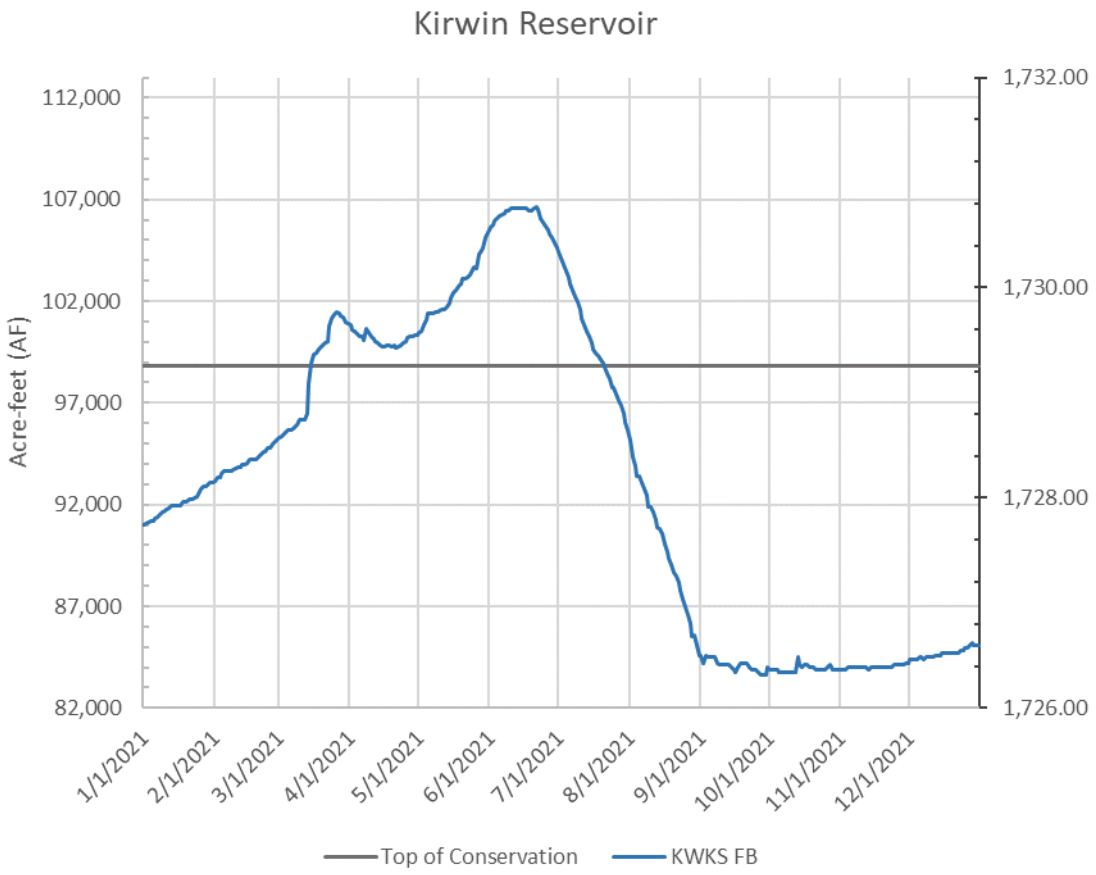


Figure 8 Kirwin Reservoir Elevation and Content.

2022 Outlook

Carry-over storage and the forecasted inflows in the North Fork of the Solomon River are expected to be adequate to irrigate all district lands under all forecasted conditions.

Webster Unit, Solomon Division in Kansas

General

The Webster Irrigation District has service available to 8,537 acres. The project water supply is provided by Webster Reservoir storage and flows of the South Fork Solomon River.

2021 Summary

In 2021, the precipitation at Webster Dam was 94 percent of normal (22.39 inches). The inflow of 37,542 AF was between the average and wet-year forecast. The reservoir level was 1,888.53 feet (3.9 feet below the top of conservation pool) at the first of the year. Webster Dam recorded 4.07 inches of precipitation in mid-March causing the pool elevation to increase 1.5 feet in two weeks. Flood releases of 75 cfs began March 20 were made through May 11 when they were reduced to 15 cfs.

Webster dam recorded 4.31 inches of precipitation during the latter half of May. Runoff increased the reservoir to a yearly peak of 1894.59 feet (2.1 feet above top of conservation) on June 3. This release continued until July 3 when irrigation releases demand exceeded flood releases. The district started to divert flood releases on June 21.

Irrigation releases continued until August 26. The reservoir level gradually decreased throughout the fall to a minimum elevation of 1,888.06 feet on September 29. The reservoir level increased as inflow exceeded evaporation to elevation 1888.53 feet on December 31 (3.9 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 9 below.

A total of 11,775 AF was diverted into Osborne Canal to irrigate 5,772 acres of project lands during 2021. Farm delivery efficiency was 50 percent with 5,865 AF delivered to farms.

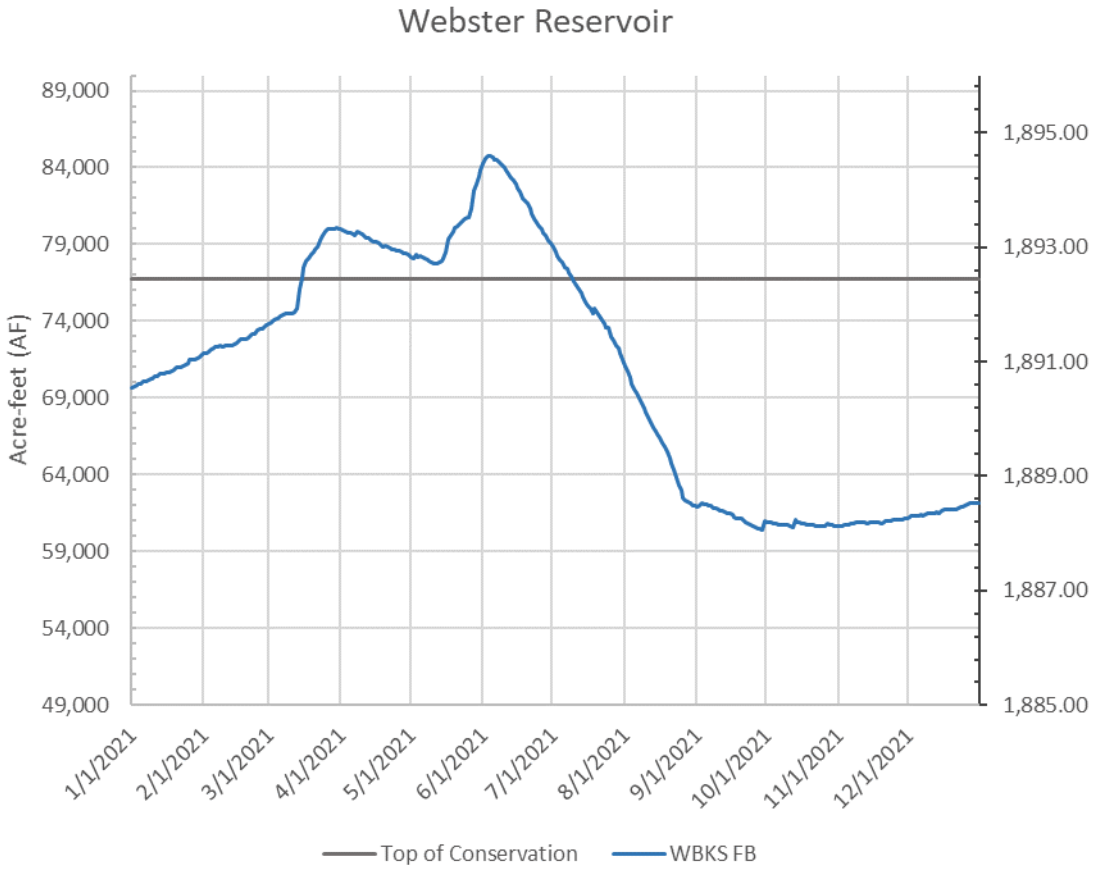


Figure 9 Webster Reservoir Elevation and Content.

2021 Outlook

The carry-over storage and the flows in the South Fork Solomon River are expected to be adequate to irrigate all district lands under all forecasted conditions.

Glen Elder Unit, Solomon Division in Kansas

General

Releases from Waconda Lake are regulated as outlined in two memorandums of understanding between the State of Kansas and Reclamation. Releases are made for the city of Beloit, the Mitchell County Rural Water District No. 2, the long-term water service contract with Glen Elder Irrigation District, and for water right administration.

Renewal of the long-term water service contract with the City of Beloit, Kansas was completed in 2008. The new repayment contract became effective on January 1, 2009. The repayment contract with Beloit, Kansas, provides for the annual use of up to 2,000 AF from Waconda Lake storage. Water is measured at the Glen Elder Dam river outlet works.

The water service contract with the Mitchell County Rural Water District No. 2 provides for 1,009 AF of storage water as available from Waconda Lake.

The long-term water service contract with the Glen Elder Irrigation District was to expire in June 2017. A one-year extension was signed May 18, 2018. Renewal of a long-term water service contract was completed in March of 2019. The new service contract has an upfront fee for a base 2,000 AF of water. They can request an additional 1,500 AF firm supply as needed. Additional water is available up to a total release of 15,170 AF at Reclamation's discretion. The contract's expiration date is March 12, 2059. Water is released and measured through the river outlet works.

When compatible with flood control operations, the operating criteria for Waconda Lake provide for a stable or rising pool level during the fish spawning period each spring.

When possible, Waconda Lake is allowed to fill during the late summer and early fall to flood exposed shoreline vegetation. This flooded aquatic vegetation is very beneficial to waterfowl management.

Waconda Lake is normally regulated at one to two feet below the top of conservation capacity during the winter months. Maintaining the lake at this level reduces shoreline erosion, provides a buffer for spring runoff, and lessens ice damage to the upstream face of Glen Elder Dam. Releases from Waconda Lake are regulated each year to maintain a constant water surface level while the lake is ice-covered.

2021 Summary

The annual precipitation total of 22.55 inches at Glen Elder Dam was 88 percent of normal. The inflow of 248,810 AF was between the average and wet-year forecast. The lake level at the beginning of the year was 1,454.71 feet (0.9 feet below the top of conservation). Releases were made throughout the late winter and spring to reduce the level of Waconda Lake to one foot below top of conservation. Releases were staged down to 12 cfs (water quality bypass for Beloit) on March 9. Glen Elder Dam recorded over three inches of precipitation during mid-March. This raised the lake elevation 2.6 feet to an elevation of 1457.42 (1.8 feet into the flood pool) on March 29. In late March and early April releases were staged up to 1,000 cfs by April 7. Flood releases were staged down to 250 cfs by early May.

Flood releases ceased May 16 due to downstream flooding as directed by the Corps of Engineers. This caused the lake to quickly jump to the yearly peak elevation of 1,458.08 feet (2.5 feet in the flood pool) on May 20. The Corps of Engineers directed releases be staged up to 2,000 cfs by May 20. This dropped the level of the reservoir two feet in three weeks. Flood releases were staged back to 250 cfs in mid-June and finally to 150 cfs in early August. In mid-September releases were staged up to 300 cfs to draw the lake down to 0.5 feet below conservation. This was to allow NKAO personnel to survey the soil cement on the face of the dam. Releases were staged down to 12 cfs in early October and maintained throughout the end of the year.

Waconda Lake ended the year at elevation 1,455.66 feet (0.1 feet above the top of conservation). Waconda Lake prevented $276,300 of downstream flood damages during 2021 according to the Corps of Engineers.

Glen Elder Irrigation District irrigated 5,850 acres with natural flow diversion of 9,248 AF. No releases were required from the district's storage account. The district delivered 4,023 AF to the farms resulting in a delivery efficiency of 48 percent. Due to flood operations, no storage releases were necessary for the City of Beloit. Releases to the Mitchell County Rural Water District No. 2 totaled 339 AF. A daily plot of the reservoir elevation is shown in Figure 10.

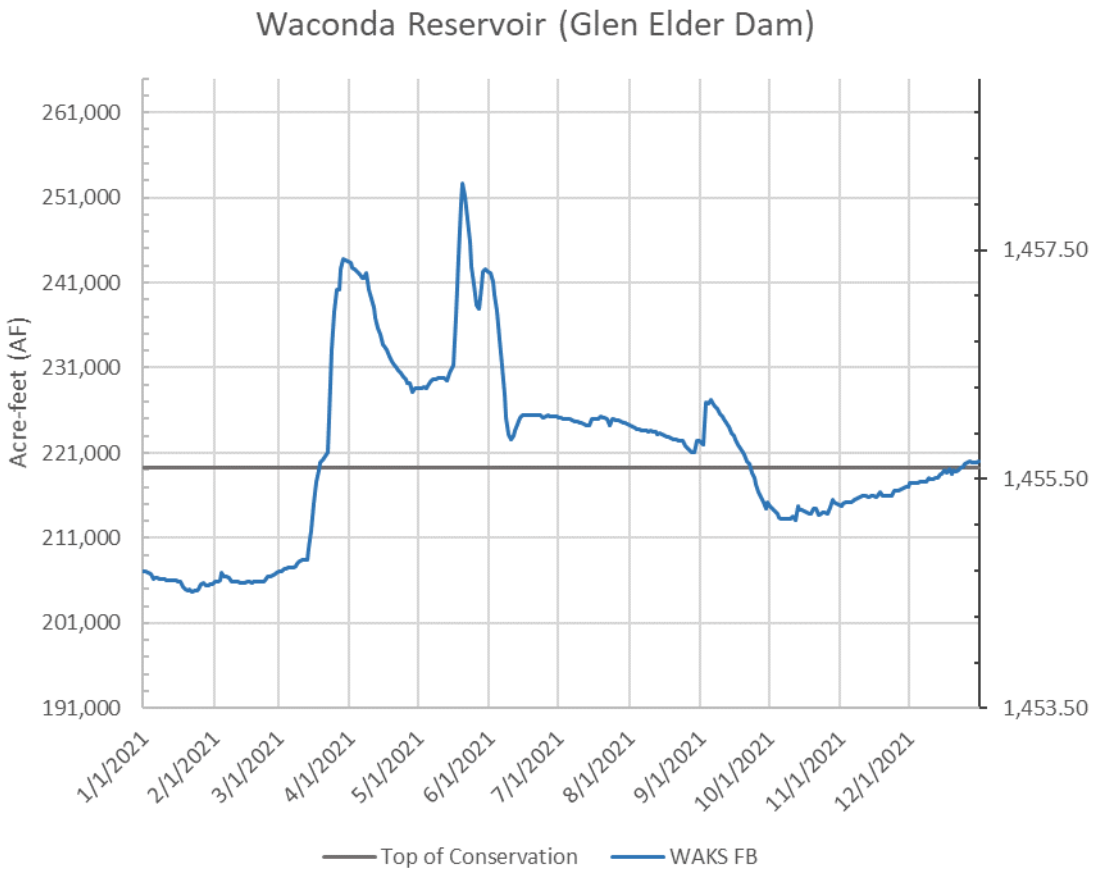


Figure 10 Waconda Lake Elevation and Content.

2022 Outlook

The municipal requirement of Beloit and the requirements of the Mitchell County Rural Water District No. 2 will be met in full with releases as required from Waconda Lake. It is expected that the Kansas Water Commissioner will request that inflows be passed through the lake for water right administration. The storage in Waconda Lake and flows in the North and South Forks of the Solomon River will furnish a full water supply to the Glen Elder Irrigation District. The reservoir will be regulated to maintain a constant level during the winter months when the reservoir is ice-covered to minimize ice damage. Under normal-year conditions, the lake is expected to be maintained between one and two feet below the top of the conservation pool during the winter.

Cedar Bluff Unit, Smoky Hill Division in Kansas

General

Cedar Bluff Reservoir storage furnishes a maximum of 2,000 AF each year for the City of Russell, Kansas when required. Prior to 1993, Cedar Bluff Reservoir storage and Smoky Hill River flows had provided a water supply for 6,800 acres in the Cedar Bluff Irrigation District. Reformulation of the Cedar Bluff Unit in October of 1992 resulted in the dissolution of the Cedar Bluff Irrigation District with the Kansas Water Office and Kansas Department of Wildlife and Parks acquiring the use and control of portions of the reservoir conservation capacity. A "designated operating pool" was established for Cedar Bluff Reservoir and includes the following sub allocation pools: The City of Russell's existing water storage right which remained unchanged (2,700 AF); an artificial recharge pool under control of the Kansas Water Office (5,110 AF); and a fish, wildlife, and recreation pool under control of the KDWP (21,061 AF). A "joint-use pool" has been established between the operating pool and the flood control pool for water supply, flood control, environmental and fish, wildlife, and recreation purposes. Water rights for the "joint-use pool" are held jointly between the KDWP and the Kansas Water Office. A Contract Administration Memorandum between the United States of America, represented by Reclamation, the State of Kansas, and the City of Russell was signed in November/December of 2003, establishing an accounting procedure for water storage in Cedar Bluff Reservoir. In January 2006 a Memorandum of Understanding was signed by the State of Kansas agencies, Kansas Water Office, and Kansas Department of Wildlife and Parks. The KDWP will be responsible for the joint pool releases and for the water rights.

2021 Summary

The annual precipitation total at Cedar Bluff Dam was 17.83 inches which is 84 percent of normal. The 2021 inflow of 14,480 AF was between the average and wet-year forecasts. The reservoir level at the beginning of the year was 2,132.80 feet (11.20 feet below top of conservation). The level of Cedar Bluff Reservoir slowly increased during the winter and spring months to a peak elevation of 2133.79 on June 4. By early June, evaporation exceeded inflow and the reservoir declined the rest of the year to a yearly low elevation of 2,131.19 feet on December 31 (12.80 feet below the top of conservation). Water was not released from the reservoir for the City of Russell or the Kansas Water Office in 2021. The Corps of Engineers determined that the reservoir prevented $2,173,100 in flood damages in 2021. A plot of Cedar Bluff Reservoir daily elevation and content is shown in Figure 11.

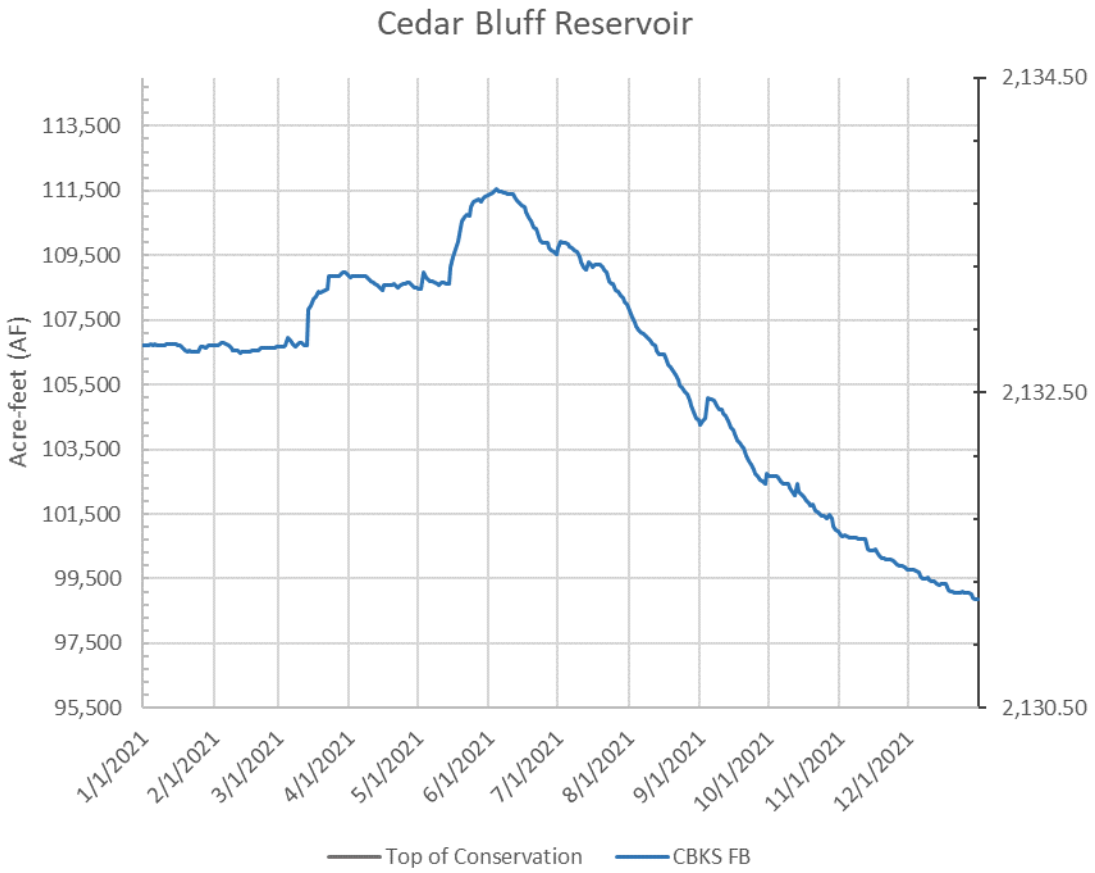


Figure 11 Cedar Bluff Reservoir Elevation and Content.

The State of Kansas operates and maintains the fish hatchery facility located below Cedar Bluff Dam. There were no releases to the facility in 2021.

2022 Outlook

Storage in Cedar Bluff Reservoir on December 31, 2021 was within the joint use pool. The KDWP is expected to use very little if any water in the operations of the fish hatchery facility. If conditions are dry, the City of Russell and the Kansas Water Office may request a release to the river for recharge in 2022.

Appendix A Tables

Table 3: Reservoir Data – Niobrara, Lower Platte, and Kansas River Basins

Reservoir	Top of Dead Pool		Top of Inactive		Top of Conservation		Top of Flood Pool	
	Elevation	Capacity (AF)	Elevation	Capacity (AF)	Elevation	Capacity (AF)	Elevation	Capacity (AF)
BONNY	3635.5	0	3638	0	3672	36,508	3710	165,328
SWANSON	2710	1,027	2720	10,329	2752	110,175	2773	244,362
ENDERS	3080	7,516	3082.4	8,948	3112.3	42,910	3127	72,958
HUGH BUTLER	2552	5,185	2558	8,921	2581.8	36,224	2604.9	85,070
HARRY STRUNK	2335	3,408	2343	7,897	2366.1	34,647	2386.2	87,361
KEITH SEBELIUS	2275	1,636	2280.4	3,993	2304.3	34,510	2331.4	133,740
HARLAN COUNTY	1885	0	1927	118,099	1945.73	314,111	1973.5	814,111
LOVEWELL	1562.07	1,659	1571.7	11,644	1582.6	35,666	1595.3	86,131
KIRWIN	1693	4,969	1697	8,515	1729.25	98,154	1757.3	313,290
WEBSTER	1855.5	1,256	1860	4,231	1892.45	76,157	1923.7	259,510
CEDAR BLUFF	2090	4,402	2107.8	28,574	2144	172,452	2166	364,342
WACONDA	1407.8	248	1428	26,237	1455.6	219,420	1488.3	942,408
BOX BUTTE	3969	188	3979	2,392	4007	29,161	NA	NA
MERRITT	2875	774	2896	4,662	2946	66,726	NA	NA
CALAMUS	2185	35	2213.3	20,150	2244	119,469	NA	NA
DAVIS CREEK	1998.5	76	2003	172	2076	31,158	NA	NA

Table 4: Summary of Precipitation, Reservoir Storage and Inflows, Calendar Year 2021.

Reservoir	Total Precip. (Inches)	Percent Of Average	Storage 12-31-20	Storage 12-31-21	Gain or Loss (AF)	Maximum Content (AF)	Date	Minimum Content (AF)	Date	Total Inflow (AF)	Percent Of Most Probable
Box Butte	12.37	72	14,856	10,681	-4,175	22,601	4-Jun	7,285	1-Sep	21,968	146
Merritt	19.21	90	61,100	60,966	-134	65,655	17-May	48,207	19-Aug	223,085	118
Calamus	19.9	79	96,864	92,689	-4,175	121,202	17-May	62,401	19-Sep	313,821	117
Davis Creek	23.52	90	12,637	13,024	387	28,074	16-Jun	12,073	11-Mar	57,974	119
Bonny	17.93	101	0	0	0	0	#N/A	0	#N/A	2,295	34
Enders	16.09	83	8,638	7,983	-655	9,753	2-Jun	7,913	18-Nov	4,001	77
Swanson	13.68	67	55,478	46,186	-9,292	72,408	11-Jun	46,033	19-Dec	22,902	89
Hugh Butler	18.98	95	18,430	15,811	-2,619	22,279	3-Jun	15,106	29-Sep	8,731	85
Harry Strunk	19.35	91	24,696	27,646	2,950	37,454	28-May	20,575	9-Sep	31,212	76
Keith Sebelius	20.89	83	21,197	17,753	-3,444	23,792	31-May	17,710	5-Dec	6,222	94
Harlan County	28.22	121	279,631	280,385	754	326,076	1-Jun	270,202	22-Aug	130,998	125
Lovewell	24.55	88	31,163	30,861	-302	41,093	26-Mar	19,936	13-Aug	57,851	90
Kirwin	24.03	100	90,582	85,227	-5,355	106,054	21-Jun	83,978	27-Sep	36,820	130
Webster	22.39	94	69,098	62,254	-6,844	84,474	3-Jun	60,697	29-Sep	37,542	200
Waconda	22.55	88	208,367	220,177	11,810	251,969	20-May	206,057	22-Jan	248,810	183
Cedar Bluff	17.83	84	106,503	98,996	-7,507	111,370	4-Jun	98,996	30-Dec	14,480	121

Table 5: Acreage irrigated in 2021, and projections for 2022

Irrigation District and Canal	Acres With Service Available	Acres Irrigated in 2021	Estimated Acres to be Irrigated in 2022
Mirage Flats Irrigation District			
Mirage Flats Canal	11,662	8,975	10,000
Ainsworth Irrigation District			
Ainsworth Canal	35,000	34,626	34,500
Twin Loups Irrigation District			
Above Davis Creek	34,711	34,110	34,000
Below Davis Creek	21,342	21,016	21,000
Total Twin Loups Irrigation District	**56,053**	**55,126**	**55,000**
Frenchman Valley Irrigation District			
Culbertson Canal	9,292	360	500
H & RW Irrigation District			
Culbertson Extension Canal	11,915	0	0
Frenchman-Cambridge Irrigation District			
Meeker-Driftwood Canal	16,691	11,059	10,000
Red Willow Canal	4,643	2,629	3,000
Bartley Canal	6,130	5,080	4,500
Cambridge Canal	18,205	15,856	15,000
Total Frenchman-Cambridge Irrigation District	**45,669**	**34,624**	**32,500**
Almena Irrigation District			
Almena Canal	5,764	5,763	2,500
Bostwick Irrigation District in Nebraska			
Franklin Canal	11,031	10,917	11,000
Naponee Canal	1,607	727	750
Franklin Pump Canal	2,026	864	1,000
Superior Canal	6,056	5,710	6,000
Courtland Canal (Nebraska)	1,735	1,014	1,000
Total Bostwick Irrigation Dist. in Nebraska	**22,455**	**19,232**	**19,750**
Kansas-Bostwick Irrigation District			
Courtland Canal above Lovewell	13,378	16,007	12,500
Courtland Canal below Lovewell	29,122	25,089	28,000
Total Kansas-Bostwick Irrigation District	**42,500**	**41,096**	**40,500**
Kirwin Irrigation District			
Kirwin Canal	11,465	8,966	9,000
Webster Irrigation District			
Osborne Canal	8,537	5,772	6,000
Glen Elder Irrigation District	**10,370**	**5,850**	**6,000**
TOTAL PROJECT USES	**270,682**	**220,390**	**216,250**
Hale Ditch	700	0	0
TOTAL PROJECT AND NON-PROJECT	**271,382**	**220,390**	**216,250**

Table 6: Water diverted in 2021, and estimated diversions in 2022.

Irrigation District and Canal	Start Date	End Date	10-Year Average Diversion (AF)	2021 Diversions (AF)	Estimated Diversion in 2022 (AF)
Mirage Flats Irrigation District					
Mirage Flats Canal	06/27	09/02	12,359	14,926	11,000
Ainsworth Irrigation District					
Ainsworth Canal	05/16	09/15	67,613	68,609	70,000
Twin Loups Irrigation District					
Above Davis Creek	04/19	09/30	42,586	49,248	46,000
Below Davis Creek	05/07	09/20	42,721	48,215	44,000
Total Twin Loups Irrigation District			**85,307**	**97,463**	**90,000**
Frenchman Valley Irrigation District					
Culbertson Canal	04/22	10/15	5,759	5,988	6,000
H & RW Irrigation District					
Culbertson Extension Canal	Did not run.		0	0	0
Frenchman-Cambridge Irrigation District					
Meeker-Driftwood Canal	06/21	09/03	17,140	18,654	18,000
Red Willow Canal	05/01	09/03	1,100	5,161	5,500
Bartley Canal	04/18	09/05	6,923	7,524	9,000
Cambridge Canal	04/02	09/10	23,830	25,971	28,000
Total Frenchman-Cambridge Irrigation District			**48,993**	**57,310**	**60,500**
Almena Irrigation District					
Almena Canal	07/15	07/30	1,375	2,154	2,000
Bostwick Irrigation District in Nebraska					
Franklin Canal	06/21	09/10	18,243	20,907	18,000
Naponee Canal	06/15	09/03	1,158	1,381	1,000
Franklin Pump Canal	06/17	08/23	933	904	1,000
Superior Canal	06/10	08/31	6,928	9,551	8,000
Courtland Canal (Nebraska)	05/19	11/01	455	980	600
Total Bostwick Irrigation Dist. in Nebraska			**27,717**	**33,723**	**28,600**
Kansas-Bostwick Irrigation District					
Courtland Canal above Lovewell	05/27	11/08	19,348	15,949	22,000
Courtland Canal below Lovewell	05/25	09/10	33,129	38,977	36,000
Total Kansas-Bostwick Irrigation District			**52,477**	**54,926**	**58,000**
Kirwin Irrigation District					
Kirwin Canal	06/21	09/03	16,626	20,550	18,000
Webster Irrigation District					
Osborne Canal	06/21	08/27	7,814	11,775	12,000
Glen Elder Irrigation District	06/10	10/15	3,596	9,248	4,000
Total Project Diversions			**329,636**	**376,672**	**360,100**

Table 7: Summary of 2021 Operations - Mirage Flats Project.

BOX BUTTE RESERVOIR						MIRAGE FLATS CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Diversions To Canal (AF)	Delivered To Farms (AF)
Jan.	1,506	139	101	0.16	16,122	0	0
Feb.	1,365	248	131	0.57	17,108	0	0
Mar.	3,063	135	245	2.15	19,791	0	0
Apr.	2,226	123	421	1.07	21,473	0	0
May	1,758	180	519	2.70	22,532	0	0
June	6,794	6,522	825	1.56	21,979	799	181
July	897	7,625	783	1.34	14,468	7,545	3,535
Aug.	54	5,709	1,019	0.30	7,794	6,241	3,232
Sep.	783	260	295	0.94	8,022	341	199
Oct.	1,046	135	197	1.13	8,736	0	0
Nov.	1,162	75	115	0.07	9,708	0	0
Dec.	1,314	270	71	0.38	10,681	0	0
TOTAL	**21,968**	**21,421**	**4,722**	**12.37**	--	**14,926**	**7,147**

Note: Acres irrigated in 2021: Mirage Flats Canal: 8,975

Table 8: Summary of 2021 Operations - Sandhills Division, Ainsworth Unit.

MERRITT RESERVOIR						AINSWORTH CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Diversions To Canal (AF)	Delivered To Farms (AF)
Jan.	19,008	18,772	236	0.33	61,100	0	0
Feb.	17,080	16,511	299	0.78	61,370	0	0
Mar.	24,567	24,691	415	2.95	60,831	0	0
Apr.	18,919	15,947	702	1.67	63,101	0	0
May	18,845	16,356	908	3.33	64,682	2,716	0
June	15,722	14,777	1,768	1.65	63,859	10,495	2,534
July	18,083	24,417	1,540	1.41	55,985	24,857	13,461
Aug.	17,636	24,010	1,301	1.80	48,310	24,879	13,930
Sep.	18,021	5,693	841	4.22	59,797	5,662	2,736
Oct.	18,048	15,670	778	0.45	61,397	0	0
Nov.	16,106	15,709	451	0.12	61,343	0	0
Dec.	21,050	21,210	217	0.50	60,966	0	0
TOTAL	223,085	213,763	9,456	19.21	--	68,609	32,661

Note: Acres irrigated 2021: Ainsworth Canal 34,626 acres.

Table 9: Summary of 2021 Operations - North Loup Division.

CALAMUS RESERVOIR							ABOVE DAVIS CREEK MIRDAN CANAL		
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release to Calamus Fish Hatch. (AF)	Release to Canal (AF)	Canal Use (AF)	Delivered to Farms (AF)
Jan.	27,511	25,393	423	0.66	98,559	0	0	0	0
Feb.	24,827	17,157	544	0.46	105,685	0	0	0	0
Mar.	35,788	25,430	1,023	4.81	115,020	29	0	0	0
Apr.	26,768	20,527	1,741	0.36	119,520	647	7,090	0	0
May	27,078	27,646	1,148	1.78	117,804	60	18,966	3,402	329
June	23,922	27,007	3,153	1.00	111,566	230	24,099	10,321	5,795
July	27,758	46,279	3,849	3.80	89,196	219	29,397	15,395	10,447
Aug	24,454	47,414	1,752	3.37	64,484	349	30,543	17,794	12,559
Sep.	22,764	22,471	869	1.46	63,908	182	5,568	2,336	431
Oct.	24,917	11,080	1,016	1.14	76,729	81	0	0	0
Nov.	24,628	12,375	608	0.91	88,374	0	0	0	0
Dec.	23,406	18,720	371	0.15	92,689	0	0	0	0
TOTAL	313,821	301,499	16,497	19.90	--	1,797	115,663	49,248	29,561

NOTE: Acres irrigated 2021: Mirdan Canal 34,110 acres.

Table 10: Summary of 2021 Operations - North Loup Division (continues).

DAVIS CREEK RESERVOIR						BELOW DAVIS CREEK FULLERTON CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release to Canal (AF)	Delivered to Farms (AF)
Jan.	154	349	59	0.41	12,383	0	0
Feb.	169	317	73	0.39	12,162	0	0
Mar.	598	333	128	5.39	12,299	0	0
Apr.	4,408	365	229	1.98	16,113	0	0
May	14,314	4,370	324	3.56	25,733	3,419	27
June	11,479	9,810	535	0.78	26,867	8,671	3,830
July	11,726	15,842	441	2.30	22,310	14,787	9,751
Aug.	11,197	14,614	400	4.38	18,493	14,093	8,340
Sep.	3,447	7,672	185	2.16	14,083	7,245	216
Oct.	234	407	184	1.62	13,726	0	0
Nov.	149	403	98	0.33	13,374	0	0
Dec.	99	393	56	0.22	13,024	0	0
TOTAL	57,974	54,875	2,712	23.52	--	48,215	22,164

NOTE: Acres irrigated 2021: Fullerton Canal 21,016 acres.

Table 11: Summary of 2021 Operations - Upper Republican Division, Armel Unit.

BONNY RESERVOIR						HALE DITCH
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Outflow (AF)
Jan.	123	123	0	0.65	0	0
Feb.	123	123	0	0.20	0	0
Mar.	198	198	0	4.06	0	0
Apr.	327	327	0	1.42	0	0
May	532	532	0	4.61	0	0
June	262	262	0	2.42	0	0
July	123	123	0	0.80	0	0
Aug.	123	123	0	1.51	0	0
Sep.	119	119	0	1.09	0	0
Oct.	123	123	0	1.17	0	0
Nov.	119	119	0	0.00	0	0
Dec.	123	123	0	0.00	0	0
TOTAL	2,295	2,295	0	17.93	--	0

Table 12: Summary of 2021 Operations - Frenchman-Cambridge Division, Frenchman Unit.

ENDERS RESERVOIR						CULBERTSON CANAL		CULBERTSON EXT.CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)
Jan.	423	184	48	0.54	8,829	0	0	0	0
Feb.	442	167	49	0.61	9,055	0	0	0	0
Mar.	598	184	94	2.78	9,375	0	0	0	0
Apr.	584	179	249	1.70	9,531	454	0	0	0
May	620	184	260	4.55	9,707	1,836	0	0	0
June	199	179	326	1.20	9,401	1,421	43	0	0
July	94	184	426	0.67	8,885	779	133	0	0
Aug.	277	184	420	2.17	8,558	487	0	0	0
Sep.	31	179	262	0.87	8,148	588	0	0	0
Oct.	165	184	198	0.84	7,931	423	0	0	0
Nov.	275	179	96	0.16	7,931	0	0	0	0
Dec.	293	184	57	0.00	7,983	0	0	0	0
TOTAL	4,001	2,171	2,485	16.09	--	5,988	176	0	0

NOTE: Acres irrigated 2021: Culbertson Canal - 360 acres; Culbertson Extension Canal - 0 acres.

Table 13: Summary of 2021 Operations - Frenchman-Cambridge Division, Meeker-Driftwood Unit.

	SWANSON LAKE					MEEKER-DRIFTWOOD	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release To Canal (AF)	Delivered To Farms (AF)
Jan.	2,883	61	249	0.73	58,051	0	0
Feb.	2,963	56	275	0.41	60,683	0	0
Mar.	6,132	61	527	2.83	66,227	0	0
Apr.	4,119	60	1,106	1.05	69,180	0	0
May	3,841	61	1,087	3.97	71,873	0	0
June	1,604	1,904	1,828	1.57	69,745	2,010	677
July	339	8,374	2,108	0.59	59,602	8,345	3,179
Aug.	635	7,775	1,986	0.58	50,476	7,660	3,913
Sep.	180	883	1,449	1.39	48,324	639	0
Oct.	47	61	1,262	0.36	47,048	0	0
Nov.	10	60	597	0.20	46,401	0	0
Dec.	149	61	303	0.00	46,186	0	0
TOTAL	22,902	19,417	12,777	13.68	--	18,654	7,769

NOTE: Acres irrigated 2021: Meeker-Driftwood Canal - 11,059 acres.

Table 14: Summary of 2021 Operations – Frenchman-Cambridge Division, Red Willow Unit.

	HUGH BUTLER LAKE					RED WILLOW CANAL		BARTLEY CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)
Jan.	665	123	74	0.50	18,898	0	0	0	0
Feb.	734	111	81	0.67	19,440	0	0	0	0
Mar.	1,300	123	157	2.92	20,460	0	0	0	0
Apr.	694	119	333	0.80	20,702	0	0	765	0
May	2,198	123	534	5.83	22,243	379	0	2,147	0
June	462	801	570	1.85	21,334	786	100	1,779	397
July	287	2,321	599	0.79	18,701	1,833	670	1,340	892
Aug.	430	3,088	610	1.22	15,433	2,036	971	1,324	1,427
Sep.	625	307	453	3.72	15,298	127	0	169	0
Oct.	278	123	213	0.35	15,240	0	0	0	0
Nov.	506	119	155	0.33	15,472	0	0	0	0
Dec.	552	123	90	0.00	15,811	0	0	0	0
TOTAL	8,731	7,481	3,869	18.98	--	5,161	1,741	7,524	2,716

NOTE: Acres irrigated 2021: Red Willow Canal - 2,626 acres; Bartley Canal 5,080 acres.

Table 15: Summary of 2021 Operations - Frenchman-Cambridge Division, Cambridge Unit.

HARRY STRUNK LAKE						CAMBRIDGE CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)
Jan.	2,793	61	99	0.50	27,329	0	0
Feb.	2,742	56	106	0.46	29,909	0	0
Mar.	3,992	61	227	3.92	33,613	0	0
Apr.	2,989	60	361	0.89	36,181	2,290	14
May	3,652	1,742	754	5.00	37,337	3,544	82
June	2,212	4,217	997	2.10	34,335	5,419	2,090
July	1,808	6,671	796	2.34	28,676	6,400	3,397
Aug.	1,903	8,676	654	1.04	21,249	7,281	4,826
Sep.	2,151	1,379	499	2.35	21,522	1,037	298
Oct.	2,172	61	329	0.55	23,304	0	0
Nov.	2,397	60	211	0.20	25,430	0	0
Dec.	2,401	61	124	0.00	27,646	0	0
TOTAL	31,212	23,105	5,157	19.35	--	25,971	10,707

Table 16: Summary of 2021 Operations - Kanaska Division, Almena Unit.

KEITH SEBELIUS LAKE							ALMENA CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release to City of Norton (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)
Jan.	482	50	113	0.45	21,516	20	0	0
Feb.	529	52	124	0.20	21,869	23	0	0
Mar.	1,283	52	232	5.51	22,868	23	0	0
Apr.	928	51	560	0.86	23,185	21	0	0
May	1,541	57	877	6.05	23,792	26	0	0
June	504	71	956	1.64	23,269	41	0	0
July	276	2,873	873	0.86	19,799	50	2,154	1,085
Aug.	107	86	965	0.74	18,855	55	0	0
Sep.	195	78	702	2.62	18,270	48	0	0
Oct.	61	63	358	1.96	17,910	31	0	0
Nov.	112	46	251	0.00	17,725	16	0	0
Dec.	204	49	127	0.00	17,753	17	0	0
TOTAL	6,222	3,528	6,138	20.89	--	371	2,154	1,085

NOTE: Acres irrigated 2021: Almena Canal 5,763 acres.

Table 17: Summary of 2021 Operations - Bostwick Division, Franklin Unit.

HARLAN COUNTY LAKE (USACE)						FRANKLIN CANAL		NAPONEE CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release to Canal (AF)	Delivered to Farms (AF)	Release to Canal (AF)	Delivered to Farms (AF)
Jan.	7,143	0	607	0.46	286,167	0	0	0	0
Feb.	7,220	0	786	0.47	292,601	0	0	0	0
Mar.	22,856	0	1,345	6.65	314,112	0	0	0	0
Apr.	12,264	6,458	2,628	1.38	317,290	0	0	0	0
May	20,394	7,563	4,316	5.29	325,805	0	0	0	0
June	13,748	19,349	5,695	1.80	314,509	3,099	14	218	0
July	13,329	27,926	5,897	4.70	294,015	8,555	1,610	549	123
Aug.	16,423	24,127	6,555	3.65	279,756	7,166	2,304	551	157
Sep.	5,720	2,799	5,534	2.16	277,143	2,087	564	63	42
Oct.	3,703	0	4,571	1.39	276,275	0	0	0	0
Nov.	4,027	0	2,787	0.27	277,515	0	0	0	0
Dec.	4,171	0	1,301	0.00	280,385	0	0	0	0
TOTAL	130,998	88,222	42,022	28.22	--	20,907	4,492	1,381	322

NOTE: Acres irrigated 2021: Franklin Canal - 10,917 acres; Naponee Canal - 727 acres.

Table 18: Summary of 2021 Operations - Bostwick Division, Superior-Courtland Unit.

FRANKLIN PUMP CANAL			SUPERIOR CANAL		COURTLAND CANAL - ABOVE LOVEWELL				
						NEBRASKA USE		KANSAS USE	
Month	Diverted To Canal (AF)	Delivered To Farms (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)	Total Diversion (AF)	Total Use (AF)	Delivered To Farms (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)
Jan.	0	0	0	0	0	0	0	0	0
Feb.	0	0	0	0	0	0	0	0	0
Mar.	0	0	0	0	0	0	0	0	0
Apr.	0	0	0	0	0	0	0	0	0
May	0	0	2,147	0	2,287	0	0	0	0
June	9	0	2,326	116	10,648	59	52	7,442	2,310
July	381	120	2,029	370	22,254	415	143	9,576	4,284
Aug.	676	256	2,953	850	22,445	407	179	7,540	3,280
Sep.	124	76	615	250	8,800	99	26	419	29
Oct.	0	0	0	0	6,727	0	0	0	0
Nov.	0	0	0	0	63	0	0	0	0
Dec.	0	0	0	0	0	0	0	0	0
TOTAL	1,190	452	10,070	1,586	73,224	980	400	24,977	9,903

NOTE: Acres irrigated 2021: Courtland Canal-Nebraska - 1,014 acres; Kansas 12,508 acres; Franklin Pump Canal - 864 acres; Superior 5,710 acres.

Table 19: Summary of 2021 Operations - Bostwick Division, Courtland Unit.

LOVEWELL RESERVOIR								COURTLAND (Below)	
Month	Est. Flow from White Rock Creek (FB)	Inflow from Courtland 34.8 (AF)	Total Inflow (AF)	Outflow (FB)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release to Canal (AF)	Delivered To Farms (AF)
Jan.	1,336	0	1,336	12	156	1.43	32,331	0	0
Feb.	1,485	0	1,485	11	193	0.67	33,612	0	0
Mar.	8,875	0	8,875	2,864	390	5.70	39,233	0	0
Apr.	3,353	0	3,353	5,171	907	1.46	36,508	0	0
May	5,260	214	5,474	758	1,035	4.66	40,189	838	0
June	1,972	1,627	3,599	12,198	1,354	0.80	30,236	9,420	5,083
July	727	8,349	9,076	14,779	1,033	1.75	23,500	14,725	10,847
Aug.	2,297	10,193	12,490	13,304	971	3.72	21,715	12,978	9,376
Sep.	561	5,558	6,119	1,150	676	1.55	26,008	1,016	196
Oct.	487	4,586	5,073	12	535	2.60	30,534	0	0
Nov.	403	130	533	12	412	0.16	30,643	0	0
Dec.	438	0	438	12	208	0.05	30,861	0	0
TOTAL	27,194	30,657	57,851	50,283	7,870	24.55	--	38,977	25,502

NOTE: Acres irrigated 2021: Courtland Canal below Lovewell 25,089 acres.

Table 20: Summary of 2021 Operations - Solomon Division, Kirwin Unit.

KIRWIN RESERVOIR						KIRWIN CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Release to Canal (AF)	Delivered To Farms (AF)
Jan.	2,419	0	329	1.01	92,672	0	0
Feb.	2,365	0	394	0.28	94,643	0	0
Mar.	7,282	972	707	5.54	100,246	0	0
Apr.	5,481	3,384	1,633	2.74	100,710	0	0
May	5,919	0	1,903	5.34	104,726	0	0
June	4,497	1,997	3,238	1.26	103,988	2,208	408
July	2,428	8,944	2,332	1.18	95,140	9,025	3,278
Aug.	1,561	8,878	2,689	1.34	85,134	8,805	4,721
Sep.	1,950	684	2,099	3.52	84,301	512	277
Oct.	729	0	867	1.78	84,163	0	0
Nov.	1,059	0	736	0.04	84,486	0	0
Dec.	1,130	0	389	0.00	85,227	0	0
TOTAL	36,820	24,859	17,316	24.03	--	20,550	8,684

NOTE: Acres irrigated 2021: Kirwin Canal - 8,966 acres.

Table 21: Summary of 2021 Operations - Solomon Division, Webster Unit.

WEBSTER RESERVOIR						OSBORNE CANAL	
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Diverted To Canal (AF)	Delivered To Farms (AF)
Jan.	2,377	0	265	0.67	71,210	0	0
Feb.	2,220	0	287	0.13	73,143	0	0
Mar.	7,613	726	554	5.14	79,476	0	0
Apr.	3,742	4,463	1,121	1.64	77,634	0	0
May	10,427	2,741	1,845	5.67	83,475	0	0
June	5,565	8,479	2,085	0.94	78,476	1,656	314
July	1,956	7,496	2,014	2.21	70,922	5,457	2,504
Aug.	391	7,111	2,115	1.11	62,087	4,662	3,047
Sep.	560	0	1,455	3.04	61,192	0	0
Oct.	527	0	791	1.70	60,928	0	0
Nov	969	0	539	0.10	61,358	0	0
Dec.	1,195	0	299	0.04	62,254	0	0
TOTAL	37,542	31,016	13,370	22.39	--	11,775	5,865

NOTE: Acres irrigated 2021: Osborne Canal - 5,772 acres.

Table 22: Summary of 2021 Operations - Solomon Division, Glen Elder Unit.

WACONDA LAKE						OUTFLOW TO RIVER				
						City of Beloit				
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	Storage Release (AF)	Quality Bypass (AF)	Irrig. District Storage Release (AF)	Other Controlled Releases (AF)	Release To Mitchell Co. RWD No. 2 (AF)
Jan.	8,130	8,916	796	0.92	206,785	0	0	0	8,884	32
Feb.	7,670	5,588	866	0.00	208,001	0	0	0	5,552	36
Mar.	41,481	4,929	1,767	3.06	242,786	0	175	0	4,736	18
Apr.	27,814	37,730	4,267	1.50	228,603	0	0	0	37,703	27
May	69,253	52,178	4,093	4.31	241,585	0	0	0	52,153	25
June	33,876	44,187	6,139	0.52	225,135	0	0	0	44,160	27
July	19,041	12,371	7,565	3.31	224,240	0	0	0	12,339	32
Aug.	14,739	9,126	7,523	3.41	222,330	0	0	0	9,094	32
Sep.	12,059	13,128	5,604	2.71	215,657	0	0	0	13,102	26
Oct.	5,226	2,192	3,283	2.72	215,408	0	595	0	1,570	27
Nov.	4,871	741	2,254	0.09	217,284	0	714	0	0	28
Dec.	4,650	766	991	0.00	220,177	0	738	0	0	29
TOTAL	248,810	191,852	45,148	22.55	--	0	2,222	0	189,293	339

NOTE: Acres irrigated 2021: Glen Elder District 5,850 acres.

Table 23: Summary of 2021 Operations - Smoky Hill Division, Cedar Bluff Unit.

CEDAR BLUFF RESERVOIR						RELEASE TO:		
Month	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	End of Month Content (AF)	City of Russell (AF)	Fish Hatchery (AF)	Kansas Water Office (AF)
Jan.	441	0	441	0.49	106,503	0	0	0
Feb.	351	0	399	0.06	106,455	0	0	0
Mar.	3,009	0	772	4.27	108,692	0	0	0
Apr.	1,878	0	2,026	0.78	108,544	0	0	0
May	4,652	0	2,026	4.10	111,170	0	0	0
June	2,083	0	3,922	0.41	109,331	0	0	0
July	1,300	0	2,868	2.05	107,763	0	0	0
Aug.	26	0	3,530	2.08	104,259	0	0	0
Sep.	669	0	2,265	2.74	102,663	0	0	0
Oct.	21	0	1,732	0.63	100,952	0	0	0
Nov.	7	0	1,103	0.22	99,856	0	0	0
Dec.	43	0	903	0.00	98,996	0	0	0
TOTAL	14,480	0	21,987	17.83	--	0	0	0

Table 24: Box Butte Reservoir Operation Estimates – 2022.

BOX BUTTE RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	15	0.9	1.6	0.1	2	0.1	0.0	0.0	3993.1	11.4	0.7
FEB	18	1.0	1.9	0.1	2	0.1	0.0	0.0	3993.9	12.2	0.8
MAR	24	1.5	3.8	0.2	2	0.1	0.0	0.0	3995.1	13.4	1.2
APR	20	1.2	5.3	0.3	2	0.1	0.0	0.0	3995.7	14.2	0.8
MAY	16	1.0	6.6	0.4	2	0.1	0.0	0.0	3996.2	14.7	0.5
JUN	10	0.6	8.8	0.6	89	5.3	0.0	0.0	3990.8	9.4	-5.3
JUL	6	0.4	10.1	0.5	226	13.9	0.0	7.0	3979.0	2.4	-7.0
AUG	11	0.7	8.8	0.2	213	13.1	0.0	12.6	3979.0	2.4	0.0
SEP	12	0.7	6.6	0.1	40	2.4	0.0	1.8	3979.0	2.4	0.0
OCT	15	0.9	5.0	0.1	2	0.1	0.0	0.0	3980.9	3.1	0.7
NOV	18	1.1	2.5	0.1	2	0.1	0.0	0.0	3982.5	4.0	0.9
DEC	15	0.9	1.9	0.1	2	0.1	0.0	0.0	3983.9	4.7	0.7
TOTAL		**10.9**	**62.9**	**2.8**		**35.5**	**0.0**	**21.4**			**-6.0**
MOST PROBABLE INFLOW CONDITIONS											
JAN	19	1.2	1.5	0.1	2	0.1	0.0	0.0	3993.3	11.7	1.0
FEB	27	1.5	1.7	0.1	2	0.1	0.0	0.0	3994.6	13.0	1.3
MAR	34	2.1	3.5	0.2	2	0.1	0.0	0.0	3996.3	14.8	1.8
APR	30	1.8	5.0	0.3	2	0.1	0.0	0.0	3997.6	16.2	1.4
MAY	23	1.4	6.1	0.4	2	0.1	0.0	0.0	3998.3	17.1	0.9
JUN	13	0.8	8.2	0.6	70	4.2	0.0	0.0	3994.8	13.1	-4.0
JUL	10	0.6	9.3	0.6	209	12.9	0.0	2.2	3979.0	2.4	-10.7
AUG	16	1.0	8.2	0.2	164	10.1	0.0	9.3	3979.0	2.4	0.0
SEP	17	1.0	6.1	0.1	29	1.7	0.0	0.8	3979.0	2.4	0.0
OCT	19	1.2	4.7	0.1	2	0.1	0.0	0.0	3981.3	3.4	1.0
NOV	25	1.5	2.3	0.1	2	0.1	0.0	0.0	3983.9	4.7	1.3
DEC	21	1.3	1.7	0.1	2	0.1	0.0	0.0	3985.8	5.8	1.1
TOTAL		**15.4**	**58.3**	**2.9**		**29.7**	**0.0**	**12.3**			**-4.9**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	29	1.8	1.3	0.1	2	0.1	0.0	0.0	3993.9	12.3	1.6
FEB	40	2.2	1.6	0.1	2	0.1	0.0	0.0	3995.7	14.3	2.0
MAR	50	3.1	3.2	0.2	2	0.1	0.0	0.0	3998.3	17.1	2.8
APR	44	2.6	4.6	0.3	2	0.1	0.0	0.0	4000.1	19.3	2.2
MAY	34	2.1	5.6	0.4	2	0.1	0.0	0.0	4001.3	20.9	1.6
JUN	20	1.2	7.5	0.6	47	2.8	0.0	0.0	3999.6	18.7	-2.2
JUL	13	0.8	8.6	0.6	135	8.3	0.0	0.0	3992.2	10.6	-8.1
AUG	23	1.4	7.5	0.4	104	6.4	0.0	0.0	3984.7	5.2	-5.4
SEP	25	1.5	5.6	0.2	18	1.1	0.0	0.0	3985.1	5.4	0.2
OCT	29	1.8	4.3	0.1	2	0.1	0.0	0.0	3987.6	7.0	1.6
NOV	37	2.2	2.1	0.1	2	0.1	0.0	0.0	3990.3	9.0	2.0
DEC	31	1.9	1.6	0.1	2	0.1	0.0	0.0	3992.3	10.7	1.7
TOTAL		**22.6**	**53.5**	**3.2**		**19.4**	**0.0**	**0.0**			**0.0**

Table 25: Merritt Reservoir Operation Estimates – 2022.

MERRITT RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	224	13.8	1.9	0.3	16	1.0	12.4	0.0	2944.0	61.1	0.1
FEB	244	13.6	2.6	0.4	18	1.0	12.2	0.0	2944.0	61.1	0.0
MAR	252	15.5	3.2	0.5	16	1.0	11.2	0.0	2945.0	63.9	2.8
APR	258	15.4	5.1	0.8	17	1.0	10.8	0.0	2946.0	66.7	2.8
MAY	250	15.4	6.4	1.1	71	4.4	9.9	0.0	2946.0	66.7	0.0
JUN	237	14.1	8.3	1.4	144	8.6	4.1	0.0	2946.0	66.7	0.0
JUL	239	14.7	9.6	1.6	558	34.4	0.0	0.0	2937.0	45.4	-21.3
AUG	243	15.0	8.3	0.9	519	32.0	0.0	0.0	2925.9	27.5	-17.9
SEP	240	14.3	7.1	0.5	159	9.5	0.0	0.0	2929.1	31.8	4.3
OCT	243	15.0	6.4	0.5	41	2.5	0.0	0.0	2936.2	43.8	12.0
NOV	237	14.1	3.2	0.4	67	4.0	0.0	0.0	2940.9	53.5	9.7
DEC	221	13.6	1.9	0.3	16	1.0	4.7	0.0	2944.0	61.1	7.6
TOTAL		**174.5**	**64.0**	**8.7**		**100.4**	**65.3**	**0.0**			**0.1**
MOST PROBABLE INFLOW CONDITIONS											
JAN	243	15.0	1.7	0.3	16	1.0	13.6	0.0	2944	61.1	0.1
FEB	266	14.8	2.3	0.4	18	1.0	13.4	0.0	2944	61.1	0.0
MAR	274	16.9	2.8	0.4	16	1.0	12.7	0.0	2945	63.9	2.8
APR	282	16.8	4.5	0.7	17	1.0	12.3	0.0	2946	66.7	2.8
MAY	273	16.8	5.7	1.0	63	3.9	11.9	0.0	2946	66.7	0.0
JUN	258	15.4	7.4	1.3	126	7.5	6.6	0.0	2946	66.7	0.0
JUL	260	16.0	8.5	1.4	479	29.5	0.0	0.0	2940	51.8	-14.9
AUG	266	16.4	7.4	0.9	448	27.6	0.0	0.0	2934	39.7	-12.1
SEP	262	15.6	6.2	0.6	139	8.3	0.0	0.0	2938	46.4	6.7
OCT	266	16.4	5.7	0.7	41	2.5	0.0	0.0	2943	59.6	13.2
NOV	258	15.4	2.8	0.4	67	4.0	9.5	0.0	2944	61.1	1.5
DEC	240	14.8	1.7	0.3	16	1.0	13.5	0.0	2944	61.1	0.0
TOTAL		**190.3**	**56.7**	**8.4**		**88.3**	**93.5**	**0.0**			**0.1**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	282	17.4	1.5	0.2	16	1.0	16.1	0.0	2944.0	61.1	0.1
FEB	309	17.2	2.0	0.3	18	1.0	15.9	0.0	2944.0	61.1	0.0
MAR	318	19.6	2.5	0.4	16	1.0	15.4	0.0	2945.0	63.9	2.8
APR	325	19.4	4.0	0.7	17	1.0	14.9	0.0	2946.0	66.7	2.8
MAY	315	19.4	5.0	0.8	55	3.4	15.2	0.0	2946.0	66.7	0.0
JUN	300	17.9	6.6	1.1	106	6.3	10.5	0.0	2946.0	66.7	0.0
JUL	300	18.5	7.6	1.3	394	24.3	0.0	0.0	2943.4	59.6	-7.1
AUG	308	19.0	6.6	1.0	370	22.8	0.0	0.0	2941.5	54.8	-4.8
SEP	304	18.1	5.5	0.8	116	6.9	0.0	0.0	2945.4	65.2	10.4
OCT	308	19.0	5.0	0.8	41	2.5	19.8	0.0	2944.0	61.1	-4.1
NOV	300	17.9	2.5	0.4	67	4.0	13.5	0.0	2944.0	61.1	0.0
DEC	279	17.2	1.5	0.2	16	1.0	16.0	0.0	2944.0	61.1	0.0
TOTAL		**220.6**	**50.3**	**8.0**		**75.2**	**137.3**	**0.0**			**0.1**

Table 26: Calamus Reservoir Operation Estimates – 2021.

CALAMUS RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	294	18.1	1.9	0.5	58	3.6	6.2	0.0	2240.0	100.5	7.8
FEB	311	17.3	2.3	0.6	59	3.3	13.4	0.0	2240.0	100.5	0.0
MAR	347	21.4	4.2	1.1	58	3.6	7.5	0.0	2242.0	109.7	9.2
APR	359	21.4	6.7	1.9	59	3.5	6.2	0.0	2244.0	119.5	9.8
MAY	399	24.6	6.9	2.0	94	5.8	16.8	0.0	2244.0	119.5	0.0
JUN	364	21.7	8.4	2.5	144	8.6	10.6	0.0	2244.0	119.5	0.0
JUL	339	20.9	9.5	2.8	953	58.7	0.0	0.0	2234.7	78.9	-40.6
AUG	320	19.7	9.5	2.1	813	50.1	0.0	0.0	2224.9	46.4	-32.5
SEP	304	18.1	7.4	1.2	470	28.0	0.0	0.0	2220.6	35.3	-11.1
OCT	300	18.5	5.6	0.8	58	3.6	0.0	0.0	2226.0	49.4	14.1
NOV	327	19.5	3.0	0.5	59	3.5	0.0	0.0	2230.9	64.9	15.5
DEC	317	19.5	1.7	0.3	58	3.6	0.0	0.0	2235.1	80.5	15.6
TOTAL		**240.7**	**67.1**	**16.3**		**175.9**	**60.7**	**0.0**			**-12.2**
MOST PROBABLE INFLOW CONDITIONS											
JAN	330	20.3	1.7	0.4	58	3.6	8.5	0.0	2240	100.5	7.8
FEB	350	19.5	2.0	0.5	54	3.3	15.7	0.0	2240	100.5	0.0
MAR	391	24.1	3.7	1.0	58	3.6	10.3	0.0	2242	109.7	9.2
APR	404	24.1	5.9	1.6	57	3.5	9.2	0.0	2244	119.5	9.8
MAY	448	27.6	6.1	1.8	88	5.4	20.4	0.0	2244	119.5	0.0
JUN	408	24.3	7.4	2.2	125	7.7	14.4	0.0	2244	119.5	0.0
JUL	381	23.5	8.4	2.5	872	53.7	0.0	0.0	2237	86.8	-32.7
AUG	360	22.2	8.4	2.0	747	46.0	0.0	0.0	2230	61.0	-25.8
SEP	341	20.3	6.5	1.2	422	26.0	0.0	0.0	2228	54.1	-6.9
OCT	338	20.8	5.0	0.9	58	3.6	0.0	0.0	2232	70.4	16.3
NOV	367	21.9	2.7	0.6	57	3.5	0.0	0.0	2237	88.2	17.8
DEC	356	21.9	1.5	0.4	58	3.6	5.6	0.0	2240	100.5	12.3
TOTAL		**270.5**	**59.3**	**15.1**		**163.5**	**84.1**	**0.0**			**7.8**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	411	25.3	1.5	0.4	58	3.6	13.5	0.0	2240.0	100.5	7.8
FEB	437	24.3	1.8	0.5	59	3.3	20.5	0.0	2240.0	100.5	0.0
MAR	489	30.1	3.3	0.9	58	3.6	16.4	0.0	2242.0	109.7	9.2
APR	505	30.1	5.2	1.4	59	3.5	15.4	0.0	2244.0	119.5	9.8
MAY	560	34.5	5.5	1.6	81	5.0	27.9	0.0	2244.0	119.5	0.0
JUN	510	30.4	6.6	2.0	114	6.8	21.6	0.0	2244.0	119.5	0.0
JUL	477	29.4	7.5	2.2	834	51.4	0.0	0.0	2238.8	95.3	-24.2
AUG	450	27.7	7.5	1.9	734	45.2	0.0	0.0	2233.9	75.9	-19.4
SEP	424	25.3	5.8	1.3	493	29.4	0.0	0.0	2232.5	70.5	-5.4
OCT	422	26.0	4.4	0.9	58	3.6	0.0	0.0	2238.0	92.0	21.5
NOV	460	27.4	2.4	0.6	59	3.5	14.8	0.0	2240.0	100.5	8.5
DEC	445	27.4	1.4	0.4	58	3.6	23.4	0.0	2240.0	100.5	0.0
TOTAL		**337.9**	**52.9**	**14.1**		**162.5**	**153.5**	**0.0**			**7.8**

Table 27: Davis Creek Reservoir Operation Estimates – 2022.

DAVIS CREEK RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	0	0.0	1.9	0.1	6	0.4	0.0	0.0	2054.3	12.5	-0.5
FEB	0	0.0	2.3	0.1	7	0.4	0.0	0.0	2053.5	12.0	-0.5
MAR	0	0.0	4.1	0.1	6	0.4	0.0	0.0	2052.6	11.5	-0.5
APR	54	3.2	6.6	0.2	7	0.4	0.0	0.0	2056.8	14.1	2.6
MAY	239	14.7	7.0	0.3	57	3.5	0.0	0.0	2070.2	25.0	10.9
JUN	240	14.3	8.4	0.5	127	7.6	0.0	0.0	2076.0	31.2	6.2
JUL	239	14.7	9.0	0.6	297	18.3	0.0	0.0	2072.1	27.0	-4.2
AUG	162	10.0	7.0	0.4	273	16.8	0.0	0.0	2064.5	19.8	-7.2
SEP	59	3.5	6.1	0.3	133	7.9	0.0	0.0	2058.3	15.1	-4.7
OCT	0	0.0	5.4	0.2	6	0.4	0.0	0.0	2057.4	14.5	-0.6
NOV	0	0.0	2.9	0.1	7	0.4	0.0	0.0	2056.7	14.0	-0.5
DEC	0	0.0	1.7	0.1	6	0.4	0.0	0.0	2055.9	13.5	-0.5
TOTAL		**60.4**	**62.4**	**3.0**		**56.9**	**0.0**	**0.0**			**0.5**
MOST PROBABLE INFLOW CONDITIONS											
JAN	0	0.0	1.8	0.1	6	0.4	0.0	0.0	2054	12.5	-0.5
FEB	0	0.0	2.2	0.1	7	0.4	0.0	0.0	2054	12.0	-0.5
MAR	0	0.0	3.9	0.1	6	0.4	0.0	0.0	2053	11.5	-0.5
APR	54	3.2	6.1	0.2	6	0.4	0.0	0.0	2057	14.1	2.6
MAY	239	14.7	6.5	0.2	42	2.6	0.0	0.0	2071	26.0	11.9
JUN	198	11.8	7.9	0.5	99	6.1	0.0	0.0	2076	31.2	5.2
JUL	179	11.0	8.4	0.6	231	14.2	0.0	0.0	2073	27.4	-3.8
AUG	112	6.9	6.5	0.4	211	13.0	0.0	0.0	2066	20.9	-6.5
SEP	10	0.6	5.7	0.3	99	6.1	0.0	0.0	2058	15.1	-5.8
OCT	0	0.0	5.1	0.2	6	0.4	0.0	0.0	2057	14.5	-0.6
NOV	0	0.0	2.7	0.1	6	0.4	0.0	0.0	2057	14.0	-0.5
DEC	0	0.0	1.6	0.1	6	0.4	0.0	0.0	2056	13.5	-0.5
TOTAL		**48.2**	**58.4**	**2.9**		**44.8**	**0.0**	**0.0**			**0.5**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	0	0.0	1.7	0.1	6	0.4	0.0	0.0	2054.3	12.5	-0.5
FEB	0	0.0	2.0	0.1	7	0.4	0.0	0.0	2053.5	12.0	-0.5
MAR	0	0.0	3.6	0.1	6	0.4	0.0	0.0	2052.6	11.5	-0.5
APR	8	0.5	5.8	0.2	7	0.4	0.0	0.0	2052.4	11.4	-0.1
MAY	239	14.7	6.2	0.2	32	2.0	0.0	0.0	2069.0	23.9	12.5
JUN	206	12.3	7.4	0.4	77	4.6	0.0	0.0	2076.0	31.2	7.3
JUL	114	7.0	7.9	0.5	172	10.6	0.0	0.0	2072.2	27.1	-4.1
AUG	67	4.1	6.2	0.4	156	9.6	0.0	0.0	2066.1	21.2	-5.9
SEP	0	0.0	5.4	0.3	97	5.8	0.0	0.0	2058.3	15.1	-6.1
OCT	0	0.0	4.8	0.2	6	0.4	0.0	0.0	2057.4	14.5	-0.6
NOV	0	0.0	2.5	0.1	7	0.4	0.0	0.0	2056.7	14.0	-0.5
DEC	0	0.0	1.5	0.1	6	0.4	0.0	0.0	2055.9	13.5	-0.5
TOTAL		**38.6**	**55.0**	**2.7**		**35.4**	**0.0**	**0.0**			**0.5**

Table 28: Bonny Reservoir Operation Estimates – 2021.

BONNY RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	3	0.2	2.3	0.0	2	0.1	0.1	0.0	3638.0	0.0	0.0
FEB	3	0.2	3.1	0.0	2	0.1	0.1	0.0	3638.0	0.0	0.0
MAR	5	0.3	3.8	0.0	2	0.1	0.2	0.0	3638.0	0.0	0.0
APR	5	0.3	6.1	0.0	2	0.1	0.2	0.0	3638.0	0.0	0.0
MAY	6	0.4	7.7	0.0	2	0.1	0.3	0.0	3638.0	0.0	0.0
JUN	5	0.3	10.0	0.0	2	0.1	0.2	0.0	3638.0	0.0	0.0
JUL	3	0.2	11.5	0.0	2	0.1	0.1	0.0	3638.0	0.0	0.0
AUG	2	0.1	10.0	0.0	2	0.1	0.0	0.0	3638.0	0.0	0.0
SEP	2	0.1	8.4	0.0	2	0.1	0.0	0.0	3638.0	0.0	0.0
OCT	2	0.1	7.7	0.0	2	0.1	0.0	0.0	3638.0	0.0	0.0
NOV	3	0.2	3.8	0.0	2	0.1	0.1	0.0	3638.0	0.0	0.0
DEC	3	0.2	2.3	0.0	2	0.1	0.1	0.0	3638.0	0.0	0.0
TOTAL		**2.6**	**76.7**	**0.0**		**1.2**	**1.4**	**0.0**			**0.0**
MOST PROBABLE INFLOW CONDITIONS											
JAN	8	0.5	2.1	0.0	2	0.1	0.4	0.0	3638.0	0.0	0.0
FEB	9	0.5	2.7	0.0	2	0.1	0.4	0.0	3638.0	0.0	0.0
MAR	10	0.6	3.4	0.0	2	0.1	0.5	0.0	3638.0	0.0	0.0
APR	10	0.6	5.5	0.0	2	0.1	0.5	0.0	3638.0	0.0	0.0
MAY	11	0.7	6.8	0.0	2	0.1	0.6	0.0	3638.0	0.0	0.0
JUN	10	0.6	8.9	0.0	2	0.1	0.5	0.0	3638.0	0.0	0.0
JUL	5	0.3	10.3	0.0	2	0.1	0.2	0.0	3638.0	0.0	0.0
AUG	3	0.2	8.9	0.0	2	0.1	0.1	0.0	3638.0	0.0	0.0
SEP	2	0.1	7.5	0.0	2	0.1	0.0	0	3638.0	0.0	0.0
OCT	5	0.3	6.8	0.0	2	0.1	0.2	0.0	3638.0	0.0	0.0
NOV	7	0.4	3.4	0.0	2	0.1	0.3	0.0	3638.0	0.0	0.0
DEC	6	0.4	2.1	0.0	2	0.1	0.3	0.0	3638.0	0.0	0.0
TOTAL		**5.2**	**68.4**	**0.0**		**1.2**	**4.0**	**0.0**			**0.0**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	18	1.1	1.8	0.0	2	0.1	1.0	0.0	3638.0	0.0	0.0
FEB	17	1.0	2.5	0.0	2	0.1	0.9	0.0	3638.0	0.0	0.0
MAR	19	1.2	3.1	0.0	2	0.1	1.1	0.0	3638.0	0.0	0.0
APR	22	1.3	4.9	0.0	2	0.1	1.2	0.0	3638.0	0.0	0.0
MAY	24	1.5	6.1	0.0	2	0.1	1.4	0.0	3638.0	0.0	0.0
JUN	22	1.3	8.0	0.0	2	0.1	1.2	0.0	3638.0	0.0	0.0
JUL	11	0.7	9.2	0.0	2	0.1	0.6	0.0	3638.0	0.0	0.0
AUG	8	0.5	8.0	0.0	2	0.1	0.4	0.0	3638.0	0.0	0.0
SEP	5	0.3	6.7	0.0	2	0.1	0.2	0.0	3638.0	0.0	0.0
OCT	8	0.5	6.1	0.0	2	0.1	0.4	0.0	3638.0	0.0	0.0
NOV	15	0.9	3.1	0.0	2	0.1	0.8	0.0	3638.0	0.0	0.0
DEC	15	0.9	1.8	0.0	2	0.1	0.8	0.0	3638.0	0.0	0.0
TOTAL		**11.2**	**61.3**	**0.0**		**1.2**	**10.0**	**0.0**			**0.0**

Table 29: Enders Reservoir Operation Estimates – 2022.

ENDERS RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	5	0.3	1.5	0.1	3	0.2	0.0	0.0	3080.9	8.1	0.1
FEB	5	0.3	1.6	0.1	4	0.2	0.0	0.0	3080.9	8.1	0.0
MAR	5	0.3	2.8	0.1	3	0.2	0.0	0.0	3080.9	8.1	0.0
APR	5	0.3	6.0	0.2	3	0.2	0.0	0.0	3080.7	8.0	-0.1
MAY	6	0.4	7.7	0.3	3	0.2	0.0	0.0	3080.5	7.9	-0.1
JUN	5	0.3	9.8	0.3	176	10.5	0.0	10.3	3080.2	7.7	-0.2
JUL	6	0.4	10.7	0.4	532	32.8	0.0	32.6	3079.8	7.5	-0.2
AUG	6	0.4	9.0	0.3	505	31.1	0.0	30.9	3079.7	7.4	-0.1
SEP	5	0.3	6.7	0.2	75	4.5	0.0	4.3	3079.5	7.3	-0.1
OCT	5	0.3	4.3	0.1	3	0.2	0.0	0.0	3079.5	7.3	0.0
NOV	5	0.3	3.1	0.1	3	0.2	0.0	0.0	3079.5	7.3	0.0
DEC	5	0.3	1.8	0.1	3	0.2	0.0	0.0	3079.5	7.3	0.0
TOTAL		**3.9**	**65.0**	**2.3**		**80.5**	**0.0**	**78.1**			**-0.8**
MOST PROBABLE INFLOW CONDITIONS											
JAN	6	0.4	1.3	0.0	3	0.2	0.0	0	3081.1	8.2	0.2
FEB	7	0.4	1.5	0.1	3	0.2	0.0	0	3081.3	8.3	0.1
MAR	6	0.4	2.5	0.1	3	0.2	0.0	0	3081.5	8.4	0.1
APR	7	0.4	5.4	0.2	3	0.2	0.0	0	3081.5	8.4	0.0
MAY	6	0.4	6.9	0.2	3	0.2	0.0	0	3081.5	8.4	0.0
JUN	7	0.4	8.8	0.3	114	7.0	0.0	7	3081.3	8.3	-0.1
JUL	8	0.5	9.6	0.3	487	30.0	0.0	30	3081.3	8.3	0.0
AUG	8	0.5	8.1	0.3	388	23.9	0.0	24	3081.3	8.3	0.0
SEP	7	0.4	6.0	0.2	36	2.2	0.0	2	3081.3	8.3	0.0
OCT	6	0.4	3.9	0.1	3	0.2	0.0	0	3081.5	8.4	0.1
NOV	7	0.4	2.8	0.1	3	0.2	0.0	0	3081.7	8.5	0.1
DEC	6	0.4	1.6	0.1	3	0.2	0.0	0	3081.8	8.6	0.1
TOTAL		**5.0**	**58.4**	**2.0**		**64.7**	**0.0**	**62.3**			**0.6**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	11	0.7	1.2	0.0	3	0.2	0.0	0.0	3081.7	8.5	0.5
FEB	11	0.6	1.3	0.0	4	0.2	0.0	0.0	3082.4	8.9	0.4
MAR	11	0.7	2.3	0.1	3	0.2	0.0	0.0	3083.0	9.3	0.4
APR	12	0.7	4.9	0.2	3	0.2	0.0	0.0	3083.4	9.6	0.3
MAY	11	0.7	6.2	0.2	3	0.2	0.0	0.0	3083.8	9.9	0.3
JUN	12	0.7	7.9	0.3	40	2.4	0.0	1.0	3082.4	8.9	-1.0
JUL	13	0.8	8.7	0.3	297	18.3	0.0	17.8	3082.4	8.9	0.0
AUG	11	0.7	7.4	0.3	229	14.1	0.0	13.7	3082.4	8.9	0.0
SEP	10	0.6	5.5	0.2	3	0.2	0.0	0.0	3082.6	9.1	0.2
OCT	11	0.7	3.5	0.1	3	0.2	0.0	0.0	3083.2	9.5	0.4
NOV	12	0.7	2.5	0.1	3	0.2	0.0	0.0	3083.8	9.9	0.4
DEC	11	0.7	1.4	0.1	3	0.2	0.0	0.0	3084.4	10.3	0.4
TOTAL		**8.3**	**52.8**	**1.9**		**36.6**	**0.0**	**32.5**			**2.3**

Table 30: Swanson Lake Operation Estimates – 2022.

SWANSON LAKE OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	19	1.2	1.5	0.3	2	0.1	0.0	0.0	2735.9	47.0	0.8
FEB	31	1.7	1.6	0.3	2	0.1	0.0	0.0	2736.3	48.3	1.3
MAR	34	2.1	2.9	0.5	2	0.1	0.0	0.0	2736.8	49.8	1.5
APR	39	2.3	6.3	1.2	2	0.1	0.0	0.0	2737.1	50.8	1.0
MAY	34	2.1	7.5	1.4	3	0.2	0.0	0.0	2737.3	51.3	0.5
JUN	27	1.6	9.7	1.8	89	5.3	0.0	0.0	2735.5	45.8	-5.5
JUL	15	0.9	9.7	1.7	377	23.2	0.0	0.0	2726.3	21.8	-24.0
AUG	8	0.5	9.7	1.2	323	19.9	0.0	17.8	2725.0	19.0	-2.8
SEP	3	0.2	7.5	0.9	69	4.1	0.0	4.0	2724.6	18.2	-0.8
OCT	6	0.4	4.6	0.5	2	0.1	0.0	0.0	2724.5	18.0	-0.2
NOV	15	0.9	3.2	0.4	2	0.1	0.0	0.0	2724.7	18.4	0.4
DEC	16	1.0	1.7	0.2	2	0.1	0.0	0.0	2725.0	19.1	0.7
TOTAL		**14.9**	**65.9**	**10.4**		**53.4**	**0.0**	**21.8**			**-27.1**
MOST PROBABLE INFLOW CONDITIONS											
JAN	34	2.1	1.3	0.2	2	0.1	0.0	0.0	2736.2	48.0	1.8
FEB	52	2.9	1.4	0.3	2	0.1	0.0	0.0	2737.0	50.5	2.5
MAR	58	3.6	2.7	0.5	2	0.1	0.0	0.0	2738.0	53.5	3.0
APR	64	3.8	5.8	1.1	2	0.1	0.0	0.0	2738.7	56.1	2.6
MAY	57	3.5	6.9	1.4	3	0.2	0.0	0.0	2739.3	58.0	1.9
JUN	45	2.7	8.9	1.8	63	3.9	0.0	0.0	2738.4	55.0	-3.0
JUL	24	1.5	8.9	1.7	299	18.4	0.0	0.0	2732.3	36.4	-18.6
AUG	13	0.8	8.9	1.4	256	15.8	0.0	0.0	2725.5	20.0	-16.4
SEP	7	0.4	6.9	0.8	29	1.8	0.0	1	2725.0	19.0	-1.0
OCT	10	0.6	4.2	0.5	2	0.1	0.0	0	2725.0	19.0	0.0
NOV	25	1.5	2.9	0.3	2	0.1	0.0	0.0	2725.5	20.1	1.1
DEC	28	1.7	1.6	0.2	2	0.1	0.0	0.0	2726.2	21.5	1.4
TOTAL		**25.1**	**60.4**	**10.2**		**40.8**	**0.0**	**1.2**			**-24.7**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	54	3.3	1.2	0.2	2	0.1	0.0	0.0	2736.6	49.2	3.0
FEB	83	4.6	1.3	0.2	2	0.1	0.0	0.0	2738.0	53.5	4.3
MAR	93	5.7	2.4	0.5	2	0.1	0.0	0.0	2739.5	58.6	5.1
APR	102	6.1	5.3	1.1	2	0.1	0.0	0.0	2740.9	63.5	4.9
MAY	91	5.6	6.3	1.3	3	0.2	0.0	0.0	2742.0	67.6	4.1
JUN	74	4.4	8.1	1.8	54	3.2	0.0	0.0	2741.8	67.0	-0.6
JUL	39	2.4	8.1	1.8	208	12.8	0.0	0.0	2738.3	54.8	-12.2
AUG	21	1.3	8.1	1.6	183	11.3	0.0	0.0	2734.7	43.2	-11.6
SEP	10	0.6	6.3	1.1	25	1.5	0.0	0.0	2734.0	41.2	-2.0
OCT	16	1.0	3.9	0.7	2	0.1	0.0	0.0	2734.0	41.4	0.2
NOV	39	2.3	2.6	0.4	2	0.1	0.0	0.0	2734.7	43.2	1.8
DEC	42	2.6	1.4	0.2	2	0.1	0.0	0.0	2735.4	45.5	2.3
TOTAL		**39.9**	**55.0**	**10.9**		**29.7**	**0.0**	**0.0**			**-0.7**

Table 31: Hugh Butler Lake Operation Estimates – 2022.

HUGH BUTLER LAKE OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	8	0.5	1.3	0.1	2	0.1	0.0	0.0	2566.4	16.1	0.3
FEB	11	0.6	1.4	0.1	2	0.1	0.0	0.0	2566.8	16.5	0.4
MAR	13	0.8	2.6	0.2	2	0.1	0.0	0.0	2567.3	17.0	0.5
APR	12	0.7	7.1	0.4	2	0.1	0.0	0.0	2567.5	17.2	0.2
MAY	13	0.8	8.4	0.5	2	0.1	0.0	0.0	2567.7	17.4	0.2
JUN	13	0.8	10.3	0.6	28	1.6	0.0	0.0	2566.3	16.0	-1.4
JUL	10	0.6	11.4	0.7	71	4.4	0.0	0.0	2561.3	11.5	-4.5
AUG	10	0.6	10.1	0.5	61	3.7	0.0	3.3	2560.9	11.2	-0.3
SEP	7	0.4	7.8	0.4	13	0.8	0.0	0.7	2560.8	11.1	-0.1
OCT	6	0.4	5.0	0.2	2	0.1	0.0	0.0	2560.9	11.2	0.1
NOV	8	0.5	3.0	0.1	2	0.1	0.0	0.0	2561.3	11.5	0.3
DEC	8	0.5	1.5	0.1	2	0.1	0.0	0.0	2561.7	11.8	0.3
TOTAL		**7.2**	**69.9**	**3.9**		**11.3**	**0.0**	**4.0**			**-4.0**
MOST PROBABLE INFLOW CONDITIONS											
JAN	11	0.7	1.1	0.1	2	0.1	0.0	0.0	2566.6	16.3	0.5
FEB	14	0.8	1.2	0.1	2	0.1	0.0	0.0	2567.2	16.9	0.6
MAR	18	1.1	2.3	0.1	2	0.1	0.0	0.0	2568.0	17.8	0.9
APR	17	1.0	6.3	0.4	2	0.1	0.0	0.0	2568.5	18.3	0.5
MAY	18	1.1	7.5	0.5	2	0.1	0.0	0.0	2569.0	18.8	0.5
JUN	18	1.1	9.1	0.6	22	1.3	0.0	0.0	2568.2	18.0	-0.8
JUL	15	0.9	10.1	0.6	61	3.7	0.0	0.0	2564.8	14.6	-3.4
AUG	15	0.9	9.0	0.5	50	3.1	0.0	0.0	2561.8	11.9	-2.7
SEP	10	0.6	7.0	0.3	11	0.7	0.0	0.0	2561.4	11.5	-0.4
OCT	10	0.6	4.4	0.2	2	0.1	0.0	0.0	2561.7	11.8	0.3
NOV	12	0.7	2.7	0.1	2	0.1	0.0	0.0	2562.3	12.3	0.5
DEC	11	0.7	1.4	0.1	2	0.1	0.0	0.0	2562.9	12.8	0.5
TOTAL		**10.2**	**62.1**	**3.6**		**9.6**	**0.0**	**0.0**			**-3.0**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	18	1.1	1.0	0.1	2	0.1	0.0	0.0	2567.0	16.7	0.9
FEB	23	1.3	1.1	0.1	2	0.1	0.0	0.0	2568.0	17.8	1.1
MAR	28	1.7	2.1	0.1	2	0.1	0.0	0.0	2569.4	19.3	1.5
APR	27	1.6	5.8	0.4	2	0.1	0.0	0.0	2570.4	20.4	1.1
MAY	29	1.8	6.9	0.5	2	0.1	0.0	0.0	2571.4	21.6	1.2
JUN	29	1.7	8.4	0.6	16	1.0	0.0	0.0	2571.5	21.7	0.1
JUL	23	1.4	9.3	0.6	44	2.7	0.0	0.0	2569.8	19.8	-1.9
AUG	23	1.4	8.3	0.5	37	2.3	0.0	0.0	2568.6	18.4	-1.4
SEP	15	0.9	6.4	0.4	7	0.4	0.0	0.0	2568.6	18.5	0.1
OCT	16	1.0	4.1	0.3	2	0.1	0.0	0.0	2569.2	19.1	0.6
NOV	18	1.1	2.5	0.2	2	0.1	0.0	0.0	2569.9	19.9	0.8
DEC	18	1.1	1.3	0.1	2	0.1	0.0	0.0	2570.7	20.8	0.9
TOTAL		**16.1**	**57.2**	**3.9**		**7.3**	**0.0**	**0.0**			**5.0**

Table 32: Harry Strunk Lake Operation Estimates – 2022.

HARRY STRUNK LAKE OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	34	2.1	1.3	0.1	2	0.1	0.0	0.0	2363.0	29.5	1.9
FEB	43	2.4	1.4	0.1	2	0.1	0.0	0.0	2364.4	31.7	2.2
MAR	44	2.7	2.5	0.2	2	0.1	0.0	0.0	2365.7	34.1	2.4
APR	44	2.6	7.0	0.7	2	0.1	1.3	0.0	2366.1	34.6	0.5
MAY	47	2.9	8.1	0.9	2	0.1	1.9	0.0	2366.1	34.6	0.0
JUN	49	2.9	10.1	1.1	89	5.3	0.0	0.0	2364.0	31.1	-3.5
JUL	45	2.8	11.1	1.1	318	19.6	0.0	0.0	2349.6	13.2	-17.9
AUG	36	2.2	9.8	0.5	268	16.5	0.0	9.5	2343.0	7.9	-5.3
SEP	23	1.4	7.7	0.3	27	1.6	0.0	0.5	2343.0	7.9	0.0
OCT	29	1.8	5.0	0.2	2	0.1	0.0	0.0	2345.1	9.4	1.5
NOV	32	1.9	3.0	0.1	2	0.1	0.0	0.0	2347.2	11.1	1.7
DEC	31	1.9	1.6	0.1	2	0.1	0.0	0.0	2349.1	12.8	1.7
TOTAL		**27.6**	**68.6**	**5.4**		**43.8**	**3.2**	**10.0**			**-14.8**
MOST PROBABLE INFLOW CONDITIONS											
JAN	49	3.0	1.2	0.1	2	0.1	0.0	0.0	2363.6	30.4	2.8
FEB	61	3.4	1.2	0.1	2	0.1	0.0	0.0	2365.5	33.6	3.2
MAR	65	4.0	2.3	0.2	2	0.1	2.7	0.0	2366.1	34.6	1.0
APR	64	3.8	6.3	0.7	2	0.1	3.0	0.0	2366.1	34.6	0.0
MAY	70	4.3	7.3	0.8	2	0.1	3.4	0.0	2366.1	34.6	0.0
JUN	70	4.2	9.1	1.0	74	4.4	0.0	0.0	2365.4	33.4	-1.2
JUL	67	4.1	10.0	1.0	265	16.3	0.0	0.0	2356.1	20.2	-13.2
AUG	52	3.2	8.8	0.6	222	13.7	0.0	0.0	2344.7	9.1	-11.1
SEP	35	2.1	6.9	0.3	20	1.2	0.0	0.0	2345.5	9.7	0.6
OCT	42	2.6	4.5	0.2	2	0.1	0.0	0.0	2348.2	12.0	2.3
NOV	47	2.8	2.7	0.1	2	0.1	0.0	0.0	2351.0	14.6	2.6
DEC	45	2.8	1.4	0.1	2	0.1	0.0	0.0	2353.5	17.2	2.6
TOTAL		**40.3**	**61.7**	**5.2**		**36.4**	**9.1**	**0.0**			**-10.4**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	76	4.7	1.0	0.1	2	0.1	0.0	0.0	2364.6	32.1	4.5
FEB	97	5.4	1.1	0.1	2	0.1	2.7	0.0	2366.1	34.6	2.5
MAR	102	6.3	2.0	0.2	2	0.1	6.0	0.0	2366.1	34.6	0.0
APR	101	6.0	5.6	0.6	2	0.1	5.3	0.0	2366.1	34.6	0.0
MAY	109	6.7	6.5	0.7	2	0.1	5.9	0.0	2366.1	34.6	0.0
JUN	112	6.7	8.1	0.9	47	2.8	3.0	0.0	2366.1	34.6	0.0
JUL	104	6.4	8.9	1.0	182	11.2	0.0	0.0	2362.6	28.8	-5.8
AUG	83	5.1	7.9	0.7	154	9.5	0.0	0.0	2358.9	23.7	-5.1
SEP	54	3.2	6.2	0.5	2	0.1	0.0	0.0	2360.8	26.3	2.6
OCT	67	4.1	4.0	0.3	2	0.1	0.0	0.0	2363.3	30.0	3.7
NOV	75	4.5	2.4	0.2	2	0.1	0.0	0.0	2365.8	34.2	4.2
DEC	71	4.4	1.3	0.1	2	0.1	3.8	0.0	2366.1	34.6	0.4
TOTAL		**63.5**	**55.0**	**5.4**		**24.4**	**26.7**	**0.0**			**7.0**

Table 33: Keith Sebelius Lake Operation Estimates – 2022.

KEITH SEBELIUS LAKE OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	2	0.1	1.5	0.1	2	0.1	0.0	0.0	2294.8	17.7	-0.1
FEB	4	0.2	1.8	0.1	2	0.1	0.0	0.0	2294.8	17.7	0.0
MAR	6	0.4	3.0	0.2	2	0.1	0.0	0.0	2294.9	17.8	0.1
APR	7	0.4	7.8	0.6	2	0.1	0.0	0.0	2294.7	17.5	-0.3
MAY	10	0.6	8.7	0.7	6	0.4	0.0	0.0	2294.3	17.0	-0.5
JUN	12	0.7	11.0	0.9	57	3.4	0.0	0.0	2291.5	13.4	-3.6
JUL	8	0.5	12.3	0.8	146	9.0	0.0	6.0	2288.4	10.1	-3.3
AUG	8	0.5	11.0	0.6	138	8.5	0.0	8.4	2288.2	9.9	-0.2
SEP	3	0.2	8.7	0.5	27	1.6	0.0	1.5	2287.8	9.5	-0.4
OCT	2	0.1	6.0	0.3	2	0.1	0.0	0.0	2287.4	9.2	-0.3
NOV	2	0.1	3.3	0.2	2	0.1	0.0	0.0	2287.2	9.0	-0.2
DEC	2	0.1	1.7	0.1	2	0.1	0.0	0.0	2287.1	8.9	-0.1
TOTAL		**3.9**	**76.8**	**5.1**		**23.6**	**0.0**	**15.9**			**-8.9**
MOST PROBABLE INFLOW CONDITIONS											
JAN	3	0.2	1.4	0.1	2	0.1	0.0	0.0	2294.9	17.8	0.0
FEB	5	0.3	1.6	0.1	2	0.1	0.0	0.0	2295.0	17.9	0.1
MAR	10	0.6	2.7	0.2	2	0.1	0.0	0.0	2295.2	18.2	0.3
APR	10	0.6	6.9	0.6	2	0.1	0.0	0.0	2295.1	18.1	-0.1
MAY	15	0.9	7.7	0.6	3	0.2	0.0	0.0	2295.2	18.2	0.1
JUN	20	1.2	9.7	0.8	45	2.8	0.0	0.0	2293.4	15.8	-2.4
JUL	15	0.9	10.9	0.8	138	8.5	0.0	3	2288.4	10.1	-5.7
AUG	13	0.8	9.7	0.5	112	6.9	0.0	7	2288.4	10.1	0.0
SEP	7	0.4	7.7	0.4	21	1.3	0.0	1	2288.3	10.0	-0.1
OCT	3	0.2	5.3	0.3	2	0.1	0.0	0	2288.1	9.8	-0.2
NOV	3	0.2	2.9	0.2	2	0.1	0.0	0	2288.0	9.7	-0.1
DEC	3	0.2	1.5	0.1	2	0.1	0.0	0	2288.0	9.7	0.0
TOTAL		**6.5**	**68.0**	**4.7**		**20.4**	**0.0**	**10.5**			**-8.1**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	6	0.4	1.2	0.1	2	0.1	0.0	0.0	2295.0	18.0	0.2
FEB	11	0.6	1.5	0.1	2	0.1	0.0	0.0	2295.3	18.4	0.4
MAR	18	1.1	2.4	0.2	2	0.1	0.0	0.0	2295.8	19.2	0.8
APR	20	1.2	6.2	0.5	2	0.1	0.0	0.0	2296.2	19.8	0.6
MAY	29	1.8	6.9	0.6	3	0.2	0.0	0.0	2296.9	20.8	1.0
JUN	39	2.3	8.7	0.8	27	1.6	0.0	0.0	2296.8	20.7	-0.1
JUL	28	1.7	9.8	0.9	71	4.4	0.0	0.0	2294.4	17.1	-3.6
AUG	24	1.5	8.7	0.7	68	4.2	0.0	0.0	2291.8	13.7	-3.4
SEP	12	0.7	6.9	0.5	15	0.9	0.0	0.0	2291.2	13.0	-0.7
OCT	5	0.3	4.8	0.3	2	0.1	0.0	0.0	2291.1	12.9	-0.1
NOV	7	0.4	2.6	0.2	2	0.1	0.0	0.0	2291.2	13.0	0.1
DEC	6	0.4	1.3	0.1	2	0.1	0.0	0.0	2291.4	13.2	0.2
TOTAL		**12.4**	**61.0**	**5.0**		**12.0**	**0.0**	**0.0**			**-4.6**

Table 34: Harlan County Lake Operation Estimates – 2022.

HARLAN COUNTY LAKE OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	37	2.3	1.4	1.5	0	0.0	0.0	0.0	1943.1	281.2	0.8
FEB	59	3.3	1.6	1.7	0	0.0	0.0	0.0	1943.3	282.8	1.6
MAR	80	4.9	2.8	2.9	0	0.0	0.0	0.0	1943.4	284.8	2.0
APR	69	4.1	6.5	6.8	0	0.0	0.0	0.0	1943.2	282.1	-2.7
MAY	88	5.4	8.0	8.3	0	0.0	0.0	0.0	1943.0	279.2	-2.9
JUN	72	4.3	9.5	9.9	302	18.0	0.0	0.0	1941.1	255.6	-23.6
JUL	73	4.5	10.7	10.8	804	49.5	0.0	0.0	1936.1	199.8	-55.8
AUG	58	3.6	9.4	8.2	587	36.2	0.0	0.0	1931.9	159.0	-40.8
SEP	29	1.7	7.4	5.6	64	3.8	0.0	0.0	1931.0	151.2	-7.7
OCT	28	1.7	5.1	3.7	0	0.0	0.0	0.0	1930.8	149.2	-2.0
NOV	37	2.2	3.2	2.3	0	0.0	0.0	0.0	1930.8	149.1	-0.1
DEC	36	2.2	2.0	1.5	0	0.0	0.0	0.0	1930.9	149.8	0.7
TOTAL		**40.2**	**67.6**	**63.2**		**107.6**	**0.0**	**0.0**			**-130.6**
MOST PROBABLE INFLOW CONDITIONS											
JAN	97	6.0	1.2	1.3	0	0.0	0.0	0	1943.4	285.1	4.7
FEB	153	8.5	1.4	1.5	0	0.0	0.0	0	1944.0	292.1	7.0
MAR	205	12.6	2.4	2.5	0	0.0	0.0	0	1944.8	302.2	10.1
APR	178	10.6	5.7	6.1	0	0.0	0.0	0	1945.1	306.7	4.5
MAY	224	13.8	7.0	7.7	0	0.0	0.0	0	1945.6	312.8	6.1
JUN	186	11.1	8.3	9.2	49	2.9	0.0	0	1945.5	311.8	-1.0
JUL	188	11.6	9.3	10.3	521	32.1	0.0	0	1943.1	281.0	-30.8
AUG	151	9.3	8.2	8.5	388	23.9	0.0	0	1941.2	257.9	-23.1
SEP	75	4.5	6.5	6.6	27	1.6	0.0	0	1940.9	254.2	-3.7
OCT	70	4.3	4.4	4.4	0	0.0	0.0	0	1940.9	254.1	-0.1
NOV	94	5.6	2.8	2.8	0	0.0	0.0	0	1941.2	256.9	2.8
DEC	93	5.7	1.8	1.8	0	0.0	0.0	0	1941.5	260.8	3.9
TOTAL		**103.6**	**59.0**	**62.7**		**60.5**	**0.0**	**0.0**			**-19.6**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	234	14.4	1.1	1.1	0	0.0	0.0	0.0	1944.1	293.7	13.3
FEB	367	20.4	1.3	1.4	0	0.0	0.0	0.0	1945.6	312.7	19.0
MAR	492	30.3	2.1	2.3	0	0.0	26.6	0.0	1945.7	314.1	1.4
APR	426	25.4	5.0	5.5	0	0.0	19.9	0.0	1945.7	314.1	0.0
MAY	537	33.1	6.2	6.9	0	0.0	26.2	0.0	1945.7	314.1	0.0
JUN	446	26.6	7.4	8.2	37	2.2	16.2	0.0	1945.7	314.1	0.0
JUL	451	27.8	8.3	9.2	143	8.8	9.8	0.0	1945.7	314.1	0.0
AUG	364	22.4	7.3	8.1	136	8.4	5.9	0.0	1945.7	314.1	0.0
SEP	179	10.7	5.8	6.4	20	1.2	3.1	0.0	1945.7	314.1	0.0
OCT	169	10.4	3.9	4.3	0	0.0	6.1	0.0	1945.7	314.1	0.0
NOV	225	13.4	2.5	2.8	0	0.0	10.6	0.0	1945.7	314.1	0.0
DEC	222	13.7	1.6	1.8	0	0.0	11.9	0.0	1945.7	314.1	0.0
TOTAL		**248.6**	**52.5**	**58.0**		**20.6**	**136.3**	**0.0**			**33.7**

Table 35: Lovewell Reservoir Operation Estimates – 2022.

LOVEWELL RESERVOIR OPERATION ESTIMATES - 2022											
	WHITE ROCK CREEK INFLOW	COURTLAND CANAL INFLOW	EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	END OF MONTH CONT	RESERVOIR CHANGE
MONTH	KAF	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	0.4	0.0	1.2	0.0	0	0.0	0.0	0.0	1581.4	31.3	0.4
FEB	0.6	0.0	1.5	0.0	0	0.0	0.0	0.0	1581.6	31.9	0.6
MAR	1.5	0.0	2.6	0.0	0	0.0	0.0	0.0	1582.1	33.4	1.5
APR	1.3	0.0	5.4	0.1	0	0.0	0.0	0.0	1582.5	34.6	1.2
MAY	1.7	0.0	6.8	0.1	11	0.7	0.6	0.0	1582.6	34.9	0.3
JUN	1.8	8.3	8.8	0.1	134	8.0	2.0	0.0	1582.6	34.9	0.0
JUL	1.2	13.9	9.6	0.1	404	24.9	0.0	0.0	1579.1	25.0	-9.9
AUG	0.1	8.0	7.9	0.1	278	17.1	0.0	0.0	1575.0	15.9	-9.1
SEP	1.0	1.3	5.9	0.1	37	2.2	0.0	0.0	1575.0	15.9	0.0
OCT	0.7	1.9	4.1	0.0	0	0.0	0.0	0.0	1576.3	18.5	2.6
NOV	0.6	2.5	3.0	0.0	0	0.0	0.0	0.0	1577.7	21.6	3.1
DEC	0.4	2.6	1.5	0.0	0	0.0	0.0	0.0	1578.9	24.6	3.0
TOTAL	**11.3**	**38.5**	**58.3**	**0.6**		**52.9**	**2.6**	**0.0**			**-6.3**
MOST PROBABLE INFLOW CONDITIONS											
JAN	1.0	0.0	1.0	0.0	0	0.0	0.0	0.0	1581.6	31.9	1.0
FEB	1.4	0.0	1.3	0.0	0	0.0	0.0	0.0	1582.1	33.3	1.4
MAR	3.3	0.0	2.3	0.0	0	0.0	1.7	0.0	1582.6	34.9	1.6
APR	3.0	0.0	4.7	0.1	0	0.0	2.9	0.0	1582.6	34.9	0.0
MAY	3.7	0.0	5.9	0.1	10	0.6	3.0	0.0	1582.6	34.9	0.0
JUN	4.0	4.0	7.7	0.1	99	5.9	2.0	0.0	1582.6	34.9	0.0
JUL	2.7	6.0	8.4	0.1	304	18.7	0.0	0.0	1579.0	24.8	-10.1
AUG	0.3	3.6	6.8	0.1	208	12.8	0.0	0.0	1575.0	15.8	-9.0
SEP	2.2	0.8	5.2	0.1	29	1.7	0.0	0.0	1575.6	17.0	1.2
OCT	1.5	4.7	3.6	0.0	0	0.0	0.0	0.0	1578.4	23.2	6.2
NOV	1.3	4.1	2.6	0.0	0	0.0	0.0	0.0	1580.4	28.6	5.4
DEC	0.9	4.6	1.3	0.0	0	0.0	4.1	0.0	1580.9	30.0	1.4
TOTAL	**25.3**	**27.8**	**50.8**	**0.6**		**39.7**	**13.7**	**0.0**			**-0.9**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	2.5	0.0	0.9	0.0	0	0.0	0.0	0.0	1582.1	33.4	2.5
FEB	3.7	0.0	1.1	0.0	0	0.0	2.2	0.0	1582.6	34.9	1.5
MAR	8.5	0.0	2.0	0.0	0	0.0	8.5	0.0	1582.6	34.9	0.0
APR	7.7	0.0	4.0	0.0	0	0.0	7.7	0.0	1582.6	34.9	0.0
MAY	9.7	0.0	5.1	0.1	6	0.4	9.2	0.0	1582.6	34.9	0.0
JUN	10.5	0.0	6.6	0.1	79	4.7	5.7	0.0	1582.6	34.9	0.0
JUL	7.1	0.0	7.2	0.1	237	14.6	0.0	0.0	1579.9	27.3	-7.6
AUG	0.7	0.0	5.9	0.1	161	9.9	0.0	0.0	1576.1	18.0	-9.3
SEP	5.6	0.0	4.5	0.0	22	1.3	0.0	0.0	1578.0	22.3	4.3
OCT	3.8	0.0	3.1	0.0	0	0.0	0.0	0.0	1579.5	26.1	3.8
NOV	3.3	0.0	2.3	0.0	0	0.0	0.0	0.0	1580.7	29.4	3.3
DEC	2.2	0.0	1.1	0.0	0	0.0	1.6	0.0	1580.9	30.0	0.6
TOTAL	**65.3**	**0.0**	**43.8**	**0.4**		**30.9**	**34.9**	**0.0**			**-0.9**

Table 36: Kirwin Reservoir Operation Estimates – 2022.

KIRWIN RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	5	0.3	1.3	0.4	0	0.0	0.0	0.0	1726.6	85.2	-0.1
FEB	7	0.4	1.6	0.4	0	0.0	0.0	0.0	1726.6	85.2	0.0
MAR	13	0.8	2.8	0.8	0	0.0	0.0	0.0	1726.6	85.2	0.0
APR	13	0.8	6.4	1.7	0	0.0	0.0	0.0	1726.3	84.3	-0.9
MAY	23	1.4	7.9	2.1	8	0.5	0.0	0.0	1726.1	83.1	-1.2
JUN	18	1.1	9.6	2.6	87	5.2	0.0	0.0	1724.6	76.4	-6.7
JUL	18	1.1	10.9	2.8	193	11.9	0.0	0.0	1721.3	62.8	-13.6
AUG	11	0.7	9.6	2.2	179	11.0	0.0	0.0	1717.9	50.3	-12.5
SEP	7	0.4	7.4	1.5	8	0.5	0.0	0.0	1717.3	48.7	-1.6
OCT	5	0.3	5.1	1.0	0	0.0	0.0	0.0	1717.2	48.0	-0.7
NOV	5	0.3	3.0	0.6	0	0.0	0.0	0.0	1717.1	47.7	-0.3
DEC	5	0.3	1.6	0.3	0	0.0	0.0	0.0	1717.1	47.7	0.0
TOTAL		**7.9**	**67.2**	**16.4**		**29.1**	**0.0**	**0.0**			**-37.6**
MOST PROBABLE INFLOW CONDITIONS											
JAN	18	1.1	1.2	0.3	0	0.0	0.0	0.0	1726.7	86.1	0.8
FEB	29	1.6	1.5	0.4	0	0.0	0.0	0.0	1727.0	87.3	1.2
MAR	47	2.9	2.5	0.7	0	0.0	0.0	0.0	1727.4	89.5	2.2
APR	52	3.1	5.8	1.6	0	0.0	0.0	0.0	1727.8	91.0	1.5
MAY	81	5.0	7.1	2.0	6	0.4	0.0	0.0	1728.3	93.6	2.6
JUN	67	4.0	8.7	2.5	71	4.4	0.0	0.0	1727.7	90.7	-2.9
JUL	63	3.9	9.8	2.8	193	11.9	0.0	0.0	1725.4	79.9	-10.8
AUG	44	2.7	8.7	2.3	149	9.2	0.0	0.0	1723.3	71.1	-8.8
SEP	23	1.4	6.7	1.6	8	0.5	0.0	0.0	1723.2	70.4	-0.7
OCT	15	0.9	4.6	1.1	0	0.0	0.0	0.0	1723.1	70.2	-0.2
NOV	20	1.2	2.7	0.6	0	0.0	0.0	0.0	1723.3	70.8	0.6
DEC	16	1.0	1.5	0.4	0	0.0	0.0	0.0	1723.4	71.4	0.6
TOTAL		**28.8**	**60.8**	**16.3**		**26.4**	**0.0**	**0.0**			**-13.9**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	55	3.4	1.0	0.3	0	0.0	0.0	0.0	1727.2	88.4	3.1
FEB	92	5.1	1.3	0.4	0	0.0	0.0	0.0	1728.2	93.1	4.7
MAR	146	9.0	2.3	0.7	0	0.0	3.2	0.0	1729.3	98.2	5.1
APR	163	9.7	5.2	1.5	0	0.0	8.2	0.0	1729.3	98.2	0.0
MAY	255	15.7	6.4	1.9	5	0.3	13.5	0.0	1729.3	98.2	0.0
JUN	211	12.6	7.8	2.3	59	3.5	6.8	0.0	1729.3	98.2	0.0
JUL	200	12.3	8.8	2.6	167	10.3	0.0	0.0	1729.1	97.6	-0.6
AUG	140	8.6	7.8	2.3	119	7.3	0.0	0.0	1728.9	96.6	-1.0
SEP	72	4.3	6.0	1.8	7	0.4	0.5	0.0	1729.3	98.2	1.6
OCT	47	2.9	4.1	1.2	0	0.0	1.7	0.0	1729.3	98.2	0.0
NOV	64	3.8	2.4	0.7	0	0.0	3.1	0.0	1729.3	98.2	0.0
DEC	50	3.1	1.3	0.4	0	0.0	2.7	0.0	1729.3	98.2	0.0
TOTAL		**90.5**	**54.4**	**16.1**		**21.8**	**39.7**	**0.0**			**12.9**

Table 37: Webster Reservoir Operation Estimates – 2022.

WEBSTER RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	3	0.2	1.3	0.3	0	0.0	0.0	0.0	1888.5	62.3	0.0
FEB	4	0.2	1.5	0.3	0	0.0	0.0	0.0	1888.4	62.2	-0.1
MAR	6	0.4	2.9	0.6	0	0.0	0.0	0.0	1888.4	62.0	-0.2
APR	10	0.6	6.4	1.2	0	0.0	0.0	0.0	1888.2	61.4	-0.6
MAY	15	0.9	8.1	1.6	16	1.0	0.0	0.0	1887.7	59.7	-1.7
JUN	10	0.6	10.3	2.0	107	6.4	0.0	0.0	1885.2	51.9	-7.8
JUL	10	0.6	11.3	2.0	253	15.6	0.0	0.0	1878.8	34.9	-17.0
AUG	5	0.3	10.5	1.4	227	14.0	0.0	0.0	1871.4	19.8	-15.1
SEP	3	0.2	7.7	0.8	10	0.6	0.0	0.0	1870.7	18.6	-1.2
OCT	2	0.1	5.1	0.5	0	0.0	0.0	0.0	1870.5	18.2	-0.4
NOV	3	0.2	3.2	0.3	0	0.0	0.0	0.0	1870.4	18.1	-0.1
DEC	2	0.1	1.7	0.2	0	0.0	0.0	0.0	1870.4	18.0	-0.1
TOTAL		**4.4**	**70.0**	**11.2**		**37.6**	**0.0**	**0.0**			**-44.4**
MOST PROBABLE INFLOW CONDITIONS											
JAN	11	0.7	1.1	0.2	0	0.0	0.0	0.0	1888.7	62.8	0.5
FEB	18	1.0	1.4	0.3	0	0.0	0.0	0.0	1888.9	63.5	0.7
MAR	29	1.8	2.6	0.5	0	0.0	0.0	0.0	1889.2	64.8	1.3
APR	42	2.5	5.8	1.2	0	0.0	0.0	0.0	1889.6	66.1	1.3
MAY	62	3.8	7.3	1.5	13	0.8	0.0	0.0	1890.0	67.6	1.5
JUN	45	2.7	9.3	1.9	71	4.4	0.0	0.0	1889.0	64.0	-3.6
JUL	42	2.6	10.2	2.0	208	12.8	0.0	0.0	1885.2	51.8	-12.2
AUG	24	1.5	9.5	1.7	161	9.9	0.0	0.0	1881.6	41.7	-10.1
SEP	15	0.9	6.9	1.1	5	0.3	0.0	0.0	1881.4	41.2	-0.5
OCT	8	0.5	4.6	0.7	0	0.0	0.0	0.0	1881.3	41.0	-0.2
NOV	12	0.7	2.8	0.4	0	0.0	0.0	0.0	1881.4	41.3	0.3
DEC	10	0.6	1.5	0.2	0	0.0	0.0	0.0	1881.6	41.7	0.4
TOTAL		**19.3**	**63.0**	**11.7**		**28.2**	**0.0**	**0.0**			**-20.6**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	57	3.5	1.0	0.2	0	0.0	0.0	0.0	1889.5	65.6	3.3
FEB	84	4.7	1.3	0.3	0	0.0	0.0	0.0	1890.7	70.0	4.4
MAR	133	8.2	2.4	0.5	0	0.0	1.5	0.0	1892.4	76.2	6.2
APR	191	11.4	5.3	1.2	0	0.0	10.2	0.0	1892.4	76.2	0.0
MAY	286	17.6	6.7	1.5	6	0.4	15.7	0.0	1892.4	76.2	0.0
JUN	206	12.3	8.5	1.9	42	2.5	7.9	0.0	1892.4	76.2	0.0
JUL	195	12.0	9.3	2.0	125	7.7	2.3	0.0	1892.4	76.2	0.0
AUG	115	7.1	8.7	1.9	101	6.2	0.0	0.0	1892.1	75.2	-1.0
SEP	69	4.1	6.3	1.4	2	0.1	1.6	0.0	1892.4	76.2	1.0
OCT	37	2.3	4.2	0.9	0	0.0	1.4	0.0	1892.4	76.2	0.0
NOV	52	3.1	2.6	0.6	0	0.0	2.5	0.0	1892.4	76.2	0.0
DEC	47	2.9	1.4	0.3	0	0.0	2.6	0.0	1892.4	76.2	0.0
TOTAL		**89.2**	**57.7**	**12.7**		**16.9**	**45.7**	**0.0**			**13.9**

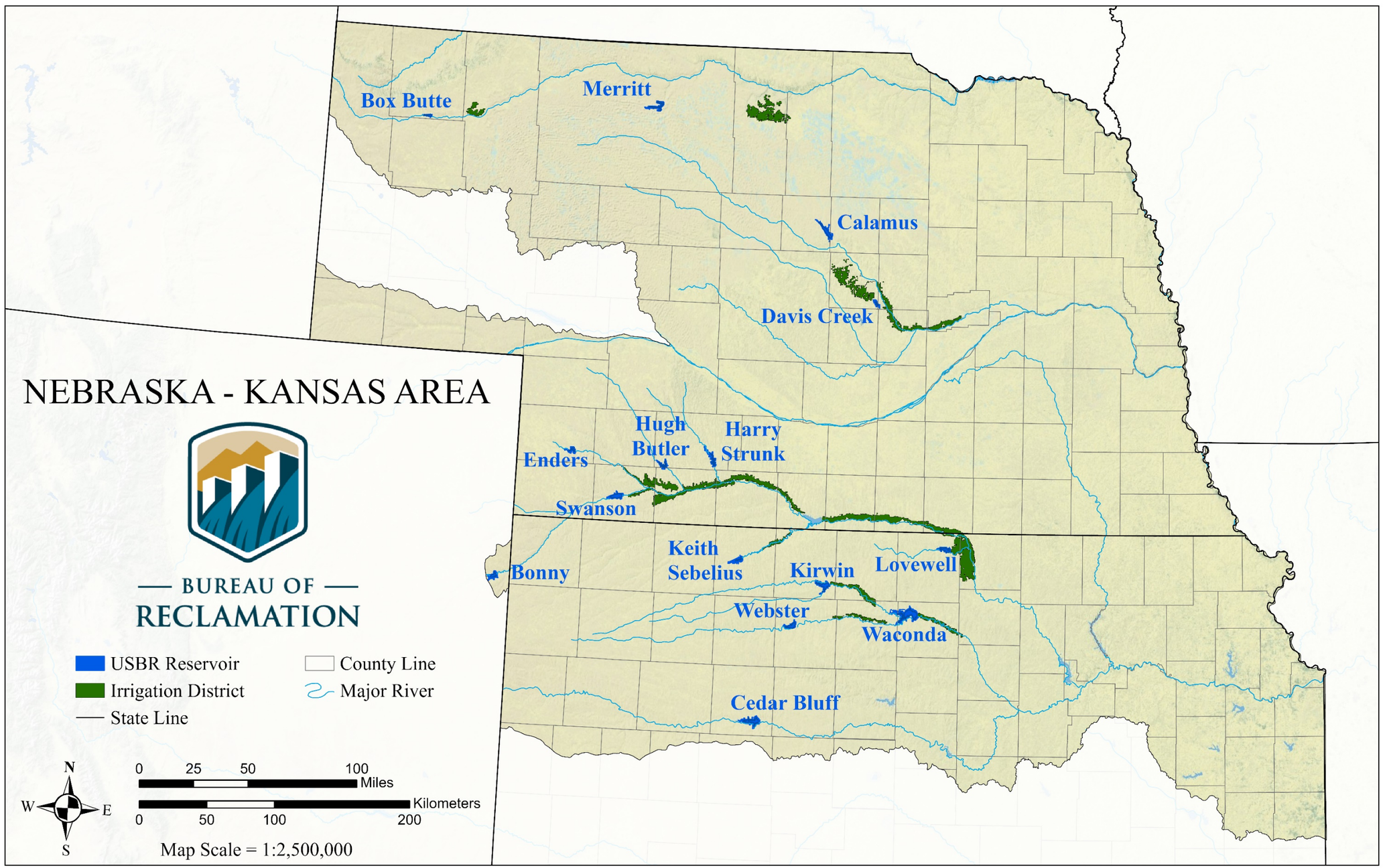
Table 38: Waconda Lake Operation Estimates – 2022

WACONDA LAKE OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	29	1.8	1.1	0.8	19	1.2	12.9	0.0	1454.6	207.1	-13.1
FEB	43	2.4	1.4	1.0	20	1.1	0.3	0.0	1454.6	207.1	0.0
MAR	83	5.1	2.6	1.8	18	1.1	0.0	0.0	1454.7	209.3	2.2
APR	87	5.2	6.7	4.8	17	1.0	0.0	0.0	1454.7	208.7	-0.6
MAY	99	6.1	8.3	5.9	18	1.1	0.0	0.0	1454.6	207.8	-0.9
JUN	86	5.1	10.4	7.4	45	2.7	0.0	0.0	1454.2	202.8	-5.0
JUL	138	8.5	12.2	8.5	156	9.6	0.0	0.0	1453.4	193.2	-9.6
AUG	50	3.1	10.5	7.1	125	7.7	0.0	0.0	1452.3	181.5	-11.7
SEP	39	2.3	8.4	5.4	35	2.1	0.0	0.0	1451.9	176.3	-5.2
OCT	31	1.9	5.4	3.4	21	1.3	0.0	0.0	1451.6	173.5	-2.8
NOV	34	2.0	2.9	1.8	27	1.6	0.0	0.0	1451.5	172.1	-1.4
DEC	28	1.7	1.4	0.9	24	1.5	0.0	0.0	1451.4	171.4	-0.7
TOTAL		**45.2**	**71.3**	**48.8**		**32.0**	**13.2**	**0.0**			**-48.8**
MOST PROBABLE INFLOW CONDITIONS											
JAN	91	5.6	1.0	0.7	10	0.6	17.4	0.0	1454.6	207.1	-13.1
FEB	137	7.6	1.3	0.9	10	0.6	6.1	0.0	1454.6	207.1	0.0
MAR	256	15.8	2.4	1.7	10	0.6	11.0	0.0	1454.8	209.6	2.5
APR	268	16.0	6.0	4.3	8	0.5	1.4	0.0	1455.6	219.4	9.8
MAY	308	19.0	7.5	5.5	10	0.6	12.9	0.0	1455.6	219.4	0.0
JUN	263	15.7	9.3	6.8	32	2.0	6.9	0.0	1455.6	219.4	0.0
JUL	427	26.3	11.0	8.1	112	6.9	11.3	0.0	1455.6	219.4	0.0
AUG	157	9.7	9.4	6.9	89	5.5	0.0	0.0	1455.4	216.7	-2.7
SEP	119	7.1	7.6	5.5	21	1.3	0.0	0.0	1455.4	217.0	0.3
OCT	93	5.7	4.9	3.6	10	0.6	0.0	0.0	1455.5	218.5	1.5
NOV	106	6.3	2.6	1.9	15	0.9	0.0	0.0	1455.8	222.0	3.5
DEC	84	5.2	1.3	1.0	13	0.8	18.3	0.0	1454.6	207.1	-14.9
TOTAL		**140.0**	**64.3**	**46.9**		**20.9**	**85.3**	**0.0**			**-13.1**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	307	18.9	0.9	0.7	3	0.2	31.1	0.0	1454.6	207.1	-13.1
FEB	458	25.5	1.2	0.9	4	0.2	24.4	0.0	1454.6	207.1	0.0
MAR	867	53.4	2.2	1.6	5	0.3	49.0	0.0	1454.8	209.6	2.5
APR	904	53.9	5.6	4.0	5	0.3	39.8	0.0	1455.6	219.4	9.8
MAY	1044	64.3	6.9	5.1	5	0.3	58.9	0.0	1455.6	219.4	0.0
JUN	887	52.9	8.6	6.3	22	1.3	45.3	0.0	1455.6	219.4	0.0
JUL	1441	88.8	10.1	7.4	70	4.3	77.1	0.0	1455.6	219.4	0.0
AUG	529	32.6	8.7	6.4	57	3.5	22.7	0.0	1455.6	219.4	0.0
SEP	404	24.1	7.0	5.1	12	0.7	5.5	0.0	1456.5	232.2	12.8
OCT	315	19.4	4.5	3.4	6	0.4	15.6	0.0	1456.5	232.2	0.0
NOV	357	21.3	2.4	1.8	5	0.3	19.2	0.0	1456.5	232.2	0.0
DEC	284	17.5	1.2	0.9	5	0.3	41.4	0.0	1454.6	207.1	-25.1
TOTAL		**472.6**	**59.3**	**43.6**		**12.1**	**430.0**	**0.0**			**-13.1**

Table 39: Cedar Bluff Reservoir Operation Estimates – 2022

CEDAR BLUFF RESERVOIR OPERATION ESTIMATES - 2022											
	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
MONTH	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	3	0.2	1.6	0.4	0	0.0	0.0	0.0	2131.1	98.8	-0.2
FEB	4	0.2	1.7	0.4	0	0.0	0.0	0.0	2131.0	98.6	-0.2
MAR	6	0.4	3.0	0.8	0	0.0	0.0	0.0	2131.0	98.2	-0.4
APR	10	0.6	7.7	2.0	0	0.0	0.0	0.0	2130.6	96.8	-1.4
MAY	15	0.9	9.2	2.4	3	0.2	0.0	0.0	2130.3	95.1	-1.7
JUN	17	1.0	11.3	2.9	3	0.2	0.0	0.0	2129.8	93.0	-2.1
JUL	21	1.3	13.6	3.4	11	0.7	0.0	0.0	2129.1	90.2	-2.8
AUG	15	0.9	11.7	2.8	11	0.7	0.0	0.0	2128.5	87.6	-2.6
SEP	7	0.4	10.0	2.4	3	0.2	0.0	0.0	2127.9	85.4	-2.2
OCT	2	0.1	7.1	1.6	0	0.0	0.0	0.0	2127.5	83.9	-1.5
NOV	3	0.2	3.3	0.8	0	0.0	0.0	0.0	2127.4	83.3	-0.6
DEC	2	0.1	1.9	0.4	0	0.0	0.0	0.0	2127.3	83.0	-0.3
TOTAL		**6.3**	**82.1**	**20.3**		**2.0**	**0.0**	**0.0**			**-16.0**
MOST PROBABLE INFLOW CONDITIONS											
JAN	5	0.3	1.4	0.4	0	0.0	0.0	0.0	2131.1	98.9	-0.1
FEB	7	0.4	1.6	0.4	0	0.0	0.0	0.0	2131.1	98.9	0.0
MAR	11	0.7	2.7	0.7	0	0.0	0.0	0.0	2131.1	98.9	0.0
APR	18	1.1	6.9	1.8	0	0.0	0.0	0.0	2131.0	98.2	-0.7
MAY	28	1.7	8.3	2.2	2	0.1	0.0	0.0	2130.8	97.6	-0.6
JUN	30	1.8	10.2	2.6	2	0.1	0.0	0.0	2130.6	96.7	-0.9
JUL	37	2.3	12.3	3.1	10	0.6	0.0	0.0	2130.3	95.3	-1.4
AUG	26	1.6	10.5	2.7	6	0.4	0.0	0.0	2130.0	93.8	-1.5
SEP	10	0.6	9.0	2.2	2	0.1	0.0	0.0	2129.6	92.1	-1.7
OCT	5	0.3	6.4	1.6	0	0.0	0.0	0.0	2129.2	90.8	-1.3
NOV	7	0.4	3.0	0.7	0	0.0	0.0	0.0	2129.2	90.5	-0.3
DEC	5	0.3	1.7	0.4	0	0.0	0.0	0.0	2129.2	90.4	-0.1
TOTAL		**11.5**	**74.0**	**18.8**		**1.3**	**0.0**	**0.0**			**-8.6**
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	11	0.7	1.3	0.3	0	0.0	0.0	0.0	2131.2	99.4	0.4
FEB	16	0.9	1.4	0.4	0	0.0	0.0	0.0	2131.3	99.9	0.5
MAR	28	1.7	2.4	0.6	0	0.0	0.0	0.0	2131.6	101.0	1.1
APR	45	2.7	6.2	1.7	0	0.0	0.0	0.0	2131.8	102.0	1.0
MAY	67	4.1	7.4	2.0	3	0.2	0.0	0.0	2132.2	103.9	1.9
JUN	72	4.3	9.1	2.5	3	0.2	0.0	0.0	2132.5	105.5	1.6
JUL	93	5.7	11.0	3.1	3	0.2	0.0	0.0	2133.0	107.9	2.4
AUG	63	3.9	9.4	2.7	0	0.0	0.0	0.0	2133.3	109.1	1.2
SEP	27	1.6	8.1	2.3	0	0.0	0.0	0.0	2133.1	108.4	-0.7
OCT	10	0.6	5.7	1.6	0	0.0	0.0	0.0	2132.9	107.4	-1.0
NOV	15	0.9	2.6	0.7	0	0.0	0.0	0.0	2133.0	107.6	0.2
DEC	10	0.6	1.5	0.4	0	0.0	0.0	0.0	2133.0	107.8	0.2
TOTAL		**27.7**	**66.1**	**18.3**		**0.6**	**0.0**	**0.0**			**8.8**

NEBRASKA - KANSAS AREA



BUREAU OF RECLAMATION

USBR Reservoir
Irrigation District
State Line
County Line
Major River

N
W
E
S

0 25 50 100 Miles
0 50 100 200 Kilometers

Map Scale = 1:2,500,000