



— BUREAU OF —
RECLAMATION

Niobrara, Lower Platte, and Kansas River Basins

Water Year 2022
Water Year 2023

Summary of Actual Operations
Annual Operating Plans

Annual Operating Plans



Glen Elder Dam, Kansas

Nebraska Kansas Area Office
Missouri Basin Region

Mission Statements

The U.S. Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated Island Communities.

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.

Overview

General

This year is the seventieth 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 that are located in Colorado, Nebraska, and Kansas. These reservoirs, together with nine diversion dams, nine pumping plants, and 22 canal systems, serve approximately 258,842 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 Bureau of Reclamation (Reclamation) districts. The reservoirs in the Kansas River Basin are operated by either Reclamation or the Army 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 under Reclamation's jurisdiction 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 water levels in streams, canals, and reservoirs and also gate openings. 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 https://www.usbr.gov/gp/hydromet/station_codes_by_state.html.

2022 Summary

Climatic Conditions

Precipitation at the project dams during 2022 ranged from 47 percent of normal at Trenton Dam to 96 percent of normal at Box Butte Dam. Annual precipitation was below normal for all 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 210 percent of average to 10 percent of average. February precipitation was below average at all project dams with 13 of

16 reporting zero precipitation for the month, March temperatures were typically around average. Precipitation was well below normal at all project dams except for Kirwin Dam which was 101 percent of average.

Temperatures in April and May were generally around normal. Precipitation during April was well below average at all project dams. May precipitation was below normal at 14 of the project dams.

June through December precipitation was well below normal at almost all the project dams. Many project dams recorded zero precipitation in November. Temperatures in June through October were typically much higher than normal throughout the project area, while November and December temperatures were lower than normal.

Storage Reservoirs

Conservation Operations: The 2022 inflows at Bonny, Enders, Swanson, Hugh Butler, and Cedar Bluff were below the dry-year forecasts. Inflows for Calamus, Harry Strunk, Keith Sebelius, Harlan County, Kirwin, Webster, and Waconda were between the dry-year and normal-year forecasts. The remaining reservoirs were between the normal-year and wet-year forecast

Of the 16 reservoirs, 11 had below average carryover storage from the 2021 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. Lovewell Reservoir, 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 14 of the 16 reservoirs at the end of the 2022 water year.

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

Table 1 shows a comparison of 2021 and 2022 carry-over storage conditions for all reservoirs in the Niobrara, Lower Platte, and Kansas River Basins as of September 30, 2022.

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

Reservoir/Lake	September 30, 2022, Storage (AF)	September 30, 2021, Storage (AF)	Change (AF)
Bonny	0	0	0
Swanson	26,641	48,324	-21,683
Enders	6,655	8,148	-1493
Hugh Butler	10,369	15,298	-4,929
Harry Strunk	13,743	21,522	-7,779
Keith Sebelius	12,924	18,270	-5,346
Harlan County	233,558	277,143	-43,585
Lovewell	16,260	26,008	-9,748

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

Reservoir/Lake	September 30, 2022, Storage (AF)	September 30, 2021, Storage (AF)	Change (AF)
Kirwin	72,153	84,301	-12,148
Webster	46,238	61,192	-14,954
Cedar Bluff	87,162	102,663	-15,501
Waconda	165,947	215,657	-49,710
Box Butte	7,306	8,022	-716
Merritt	39,858	59,797	-19,939
Calamus	52,375	63,908	-11,533
Davis Creek	13,913	14,083	-170

Flood Control Operations: Lovewell Reservoir, and Waconda, Harry Strunk, and Harlan County Lakes utilized flood pool storage in 2022. Waconda Lake flood releases totaled nearly 19,200 AF and occurred in June. All flood pool storage at Lovewell Reservoir, Harlan County Lake, and Harry Strunk Lake was utilized for irrigation and no flood releases were made.

The water year 2022 flood damages prevented by the operation of Reclamation’s Nebraska-Kansas Projects facilities was \$522,000 as determined by the Corps of Engineers. An additional benefit of \$130,400 was credited to Harlan County Lake. The cumulative total of flood control benefits for the years 1951 through 2022 by facilities in this report total \$3,004,771,800. 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 2022	Prior to 2022	Accumulated Total
Bonny	\$0	\$2,870,900	\$2,870,900
Enders	\$0	\$3,618,500	\$3,618,500
Swanson	\$0	\$51,551,600	\$51,551,600
Hugh Butler	\$0	\$13,489,900	\$13,489,900
Harry Strunk	\$0	\$26,992,500	\$26,992,500
Keith Sebelius	\$0	\$11,597,600	\$11,597,600
Harlan County	\$130,400	\$396,543,000	\$396,673,400
Lovewell	\$48,200	\$237,404,900	\$237,453,100
Kirwin	\$31,200	\$196,142,300	\$196,173,500
Webster	\$32,600	\$164,711,000	\$164,743,600
Waconda	\$410,000	\$1,710,882,700	\$1,711,292,700

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

Reservoir	During FY 2022	Prior to 2022	Accumulated Total
Cedar Bluff	\$0	\$188,314,500	\$188,314,500
Total	\$652,400	\$3,004,119,400	\$3,004,771,800

Note: Accumulated totals from 1951 through 2022. The reservoirs upstream of Harlan County Lake did not receive benefits 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 2022 can be found in Table A-2 in the Appendix A.

Water Service

There was 414,237 AF of water diverted to irrigate approximately 221,305 acres of project lands in the 11 irrigation districts. The project water supply was either inadequate or limited for 72,400 acres of the total project lands. This includes lands in Mirage Flats, Frenchman Valley, Frenchman-Cambridge, and Almena Irrigation Districts. The project water supplies for the other units mentioned in this report were adequate in 2022.

The water requirements of three municipalities, one rural water district, and two fish hatchery facilities were met in 2022. 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 2022 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 and the State administration of storage rights in southwest Nebraska reservoirs in past years diminished recreation benefits at these facilities.

2023 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 A-22 in Appendix A. 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, Hugh Butler, Harry Strunk, Harlan County, Webster, and Keith Sebelius. The irrigation districts affected are Mirage Flats, Frenchman Valley, Frenchman – Cambridge, Kansas Bostwick, Nebraska Bostwick, Webster, and Alma, respectively.

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

Even under reasonable maximum inflow conditions, Alma and Frenchman Valley Irrigation Districts are expected to experience irrigation demand shortages from Keith Sebelius Lake and Enders Reservoir, respectively.

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

Water is not expected to be stored in Bonny Reservoir during 2023 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.

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Chapter I – Introduction

Purpose of This Report

This Annual Operating Plan (AOP) advises water users, cooperating agencies, and other interested groups or persons of the actual operations during 2022 and serves as a guideline for the 2023 operations. This report also describes the responsibilities of Bureau of Reclamation (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 following 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 2003 through 2022 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 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

Eleven 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. The Almena Irrigation District's 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. The State of Colorado's contract with Reclamation expired in 2022 and Colorado did not request renewal.

State of Kansas Department of Wildlife, Parks, and Tourism (KDWPT)

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.

Subordination Agreement Considerations

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 2023 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 the Bureau of 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 be in effect in 2023.

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.

2022 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 16.53 inches, which is 96 percent of normal. The 2022 total inflow of 15,657 AF was between the most-probable and wet-year forecast.

The reservoir level began the year at elevation 3,993.39 feet (13.6 feet below the top of conservation). Irrigation diversions began on July 12 and ended on September 8. The reservoir peaked at elevation 3,998.16 (8.8 feet below top of conservation) on June 10. Diversions of 10,270 AF to the Mirage Flats Canal provided irrigation water for approximately 10,400 acres. The farm deliveries from the project water supply totaled 4,768 AF (delivery efficiency of 46 percent). Total reservoir storage was 6,860 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 3,990.52 feet (16.5 feet below the top of conservation).

2023 Outlook

The project water supply is expected to be inadequate in 2023 as it has been since the early 1960's, but based on statistical 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. 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.

2022 Summary

Precipitation, as recorded near Merritt Dam, totaled 14.72 inches, which was 69 percent of normal. The total yearly inflow of 201,345 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 85,450 AF diverted from Merritt Reservoir into Ainsworth Canal, with 49,076 AF delivered to the farm head gates (delivery efficiency of 57 percent). There were 34,626 acres of land irrigated in 2022. The reservoir elevation at the end of 2022 was 2,944.20 feet. The district also provided a total of 632 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/constructing these monitoring enhancements.

In 2022 an issue evaluation was completed to assess the continued sand migration into the spillway underdrains located beneath the upper spillway chute. The risk analysis indicated justification for moving into corrective actions to prevent further sand migration. In late 2023 or early 2024 repair alternatives will be identified during a Corrective Action Study.

2023 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). Releases from Merritt Reservoir are typically regulated to fill the conservation capacity during the early spring to alleviate erosive action to the lands around the reservoir and to maximize all benefits associated with the reservoir. This filling generally takes place during April. In 2023, 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 typically beginning 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 2023 for the irrigation of 34,626 acres.

North Loup Division in Nebraska

General

The North Loup Division is located in the Loup River drainage basin. Water is diverted from both the Calamus and North Loup Rivers for the irrigation of approximately 56,128 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 sufficient water is available in the storage reservoirs to deliver full water demands. During this time, inflows to Calamus Reservoir are to be bypassed as required in the authorizing legislation.

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. In 2016 the wintering elevation was increased by 8 feet to conduct a five-year groundwater study. In 2021 the study was extended three additional years. 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 2,050.0 feet or less. The carry-over content at this 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.

2022 Summary

Precipitation at Virginia Smith Dam was 14.09 inches which is 56 percent of normal for the year. The inflow totaled 267,875 AF which was between the dry and normal-year forecasts. The reservoir level at the first of the year was elevation 2,238.19 feet (5.8 feet below the top of conservation). The conservation pool filled on April 18. The water supply was more than adequate for the district's needs. There were 128,703 AF of water released into Mirdan Canal for district use and 10,747 AF diverted through Kent Canal from the North Loup River. A total of 59,312 AF was diverted for district use above Davis Creek Reservoir. The farm head-gate delivery was 36,488 AF (delivery efficiency of 62 percent). Land irrigated above Davis Creek Reservoir in 2022 totaled 34,748 acres. The Calamus Fish Hatchery used bypassed natural flows and storage from the reservoir totaling 1,668 AF. Calamus Reservoir inflows were bypassed during July, August, and September as required. The elevation at the end of the year was 2,239.11 feet.

The precipitation total of 14.92 inches near Davis Creek Dam was 57 percent of normal. Inflow to Davis Creek Reservoir totaled 65,259 AF during 2022. The reservoir elevation at the first of the year was 2,055.20 feet. Beginning in mid-March Davis Creek Reservoir was filled to a peak elevation of 2,076.43 feet on June 5 using diversions from Calamus Reservoir and the North Loup River. A release of 52,886 AF was made from Davis Creek Dam into Fullerton Canal, with 29,212 AF delivered to the farm headgates which is a 55 percent delivery efficiency. There were 21,380 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 five-year study period. The reservoir elevation at the end of 2022 was 2,054.90 feet, 21.1 feet below the top of conservation.

2023 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 2023.

Chapter III – Republican River Basin

Armel Unit, Upper Republican Division in Colorado

General

Historically Bonny Reservoir has been operated for recreation and fish and wildlife support, although water has been available for water rights administration and irrigation purposes. The State of Colorado’s contract with Reclamation expired in 2022 and Colorado did not request renewal.

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. In 2022, the district formally notified Reclamation that they no longer intend to operate Hale Ditch.

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.

2022 Summary

The annual precipitation total of 12.56 inches at Bonny Dam was 71 percent of average. The annual computed inflow of 1,492 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 2022.

As directed by the Colorado State Water Commissioner, water was to be bypassed through the reservoir into the South Fork Republican River as ordered by the Colorado State Engineer for compact compliance. Due to drought conditions, no water was available for bypass in 2022. No water was diverted into Hale Ditch in 2022.

2023 Outlook

The State of Colorado’s order to release all the storage in Bonny Reservoir for Republican River Compact compliance remains in effect. If the order continues throughout 2023, 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 2023.

Frenchman Unit, Frenchman-Cambridge Division in Nebraska

General

The Culbertson Canal serves 9,292 acres in the Frenchman Valley Irrigation District. 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.

2022 Summary

The annual precipitation total of 11.32 inches at Enders Dam was 59 percent of normal. The 2022 inflow into Enders Reservoir of 3,405 AF was below the dry year forecast and was the lowest inflow on record. The reservoir level began the year at a level of 3,080.81 feet (31.5 feet below the top of conservation). This was lowest start of the year elevation recorded since initial filling. The reservoir level increased gradually during the spring to a peak elevation of 3,081.59 feet on March 29.

Evaporation decreased the reservoir level from June through mid-November reaching elevation 3,077.83 feet on November 23. This was the lowest elevation observed since initial filling of the reservoir. 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 3,078.21 feet (34.1 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 5,369 AF of natural flow from Frenchman Creek in 2022. The district reports that approximately 140 acres received 23 AF of water. Farm delivery averaged about 2 inches per irrigated acre in the irrigation district. Several farmers supplemented their water supply with private irrigation wells. In 2022, H&RW Irrigation District, whose contract expired in 2021, notified Reclamation of their intent to disband the district.

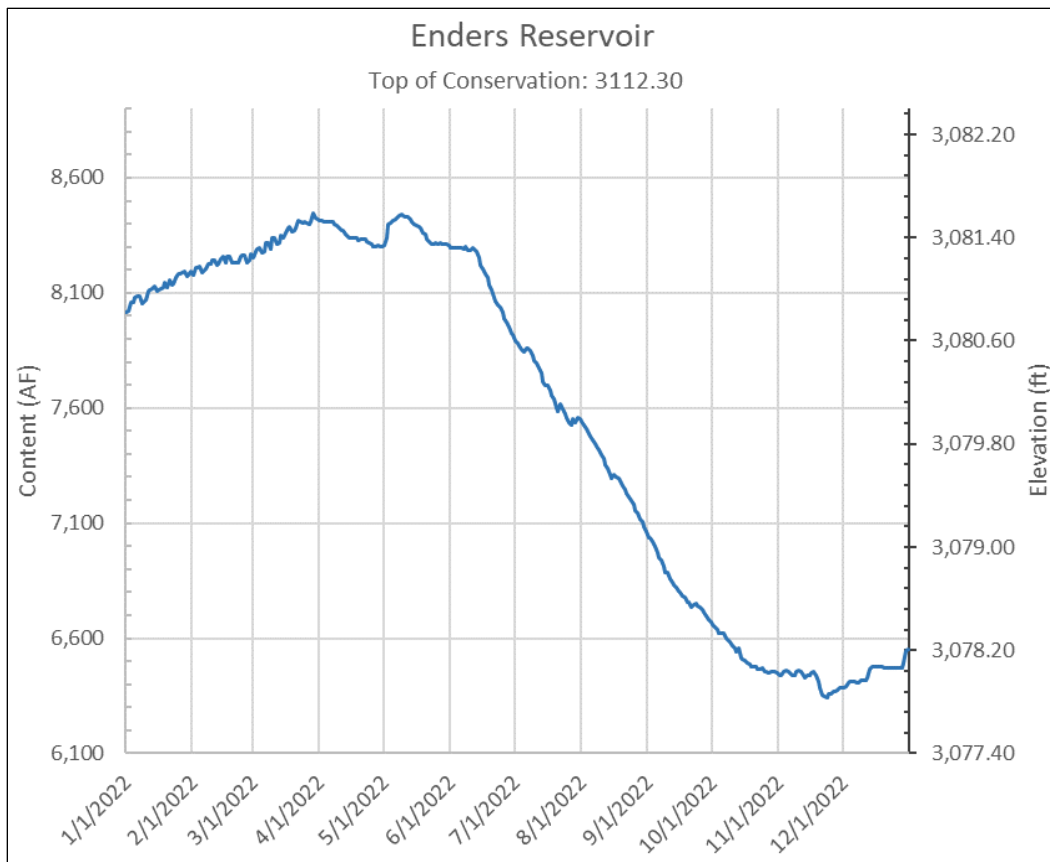


Figure 1.—Enders reservoir elevation and content.

2023 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 34,000 AF, to irrigate the 9,292 acres in the Frenchman Valley Irrigation District.

The Frenchman Valley Irrigation District is 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.

2022 Summary

The annual precipitation total of 9.56 inches at Trenton Dam was 47 percent of normal. This was the lowest recorded precipitation since 1956 and the second lowest on record. The inflow of 14,318 AF to Swanson Lake was below the dry year forecast and was the lowest since 2006. The lake level began the year at elevation 2,735.70 feet (16.4 feet below the top of conservation) and gradually increased throughout the late winter and spring. The peak elevation occurred on May 9 at 2,738.32 feet (13.7 feet below the top of conservation).

The reservoir level decreased throughout the irrigation season and reached an elevation of 2,727.51 feet on December 21. The district diverted 21,898 AF and delivered 8,381 AF to the farms (delivery efficiency of 38 percent). At the end of the year, the reservoir level was at 2,727.58 feet (24.4 feet below the top of conservation). 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 2022.

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 the spring of 2022 and late fall of 2021 for compact compliance.

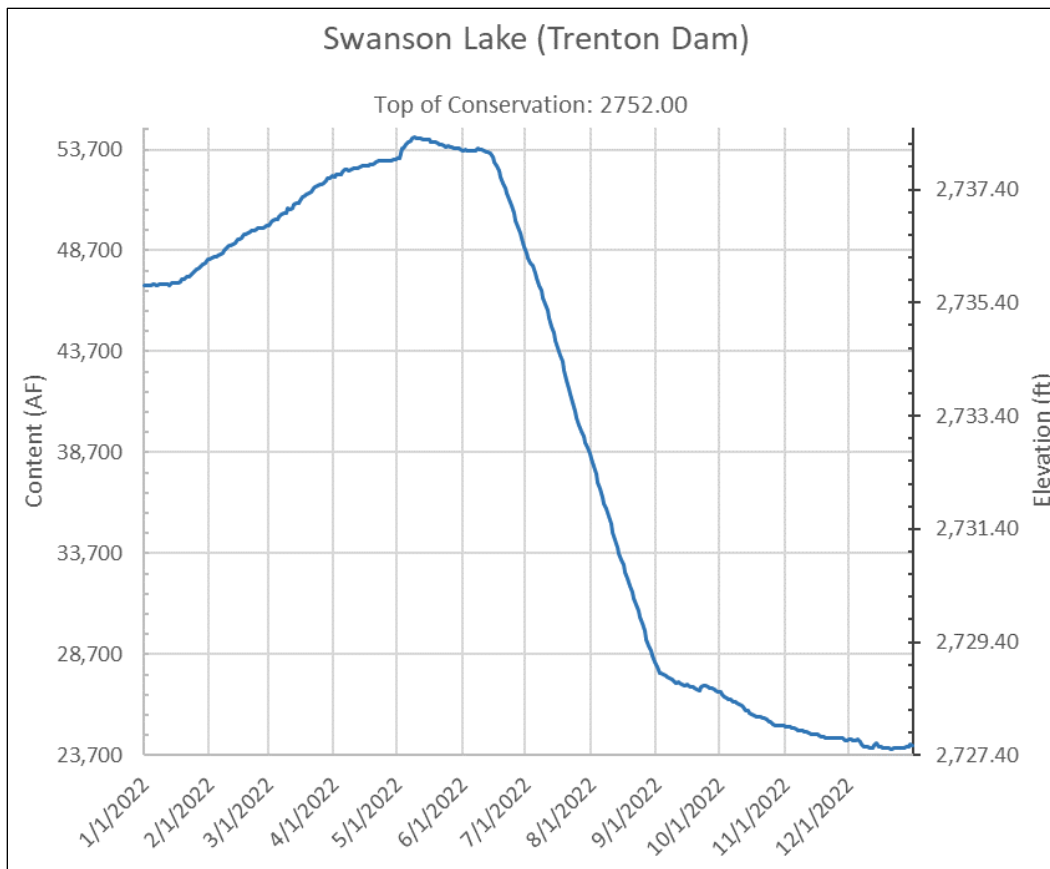


Figure 2.—Swanson Lake elevation and content.

The annual precipitation total at Red Willow Dam was 12.07 inches (61 percent of normal). The annual inflow of 6,355 AF into Hugh Butler Lake was below the dry year forecast and was the lowest on record. The reservoir level at the first of the year was 2,566.13 feet (15.7 feet below the top of conservation). Late winter, spring and summer inflows gradually increased the lake level to a summer peak of 2,567.89 feet on May 12. Due to extremely dry conditions, Reclamation approved the district's request to lower the irrigation pool elevation. The district diverted 5,451 AF into Red Willow Canal and delivered 1,699 AF to the farms (a delivery efficiency of 31 percent). Late summer and early fall evaporation exceeded inflows, decreasing the lake level to 2,559.87 feet on October 18. The end of year elevation was 2,560.72 feet (21.1 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 3.

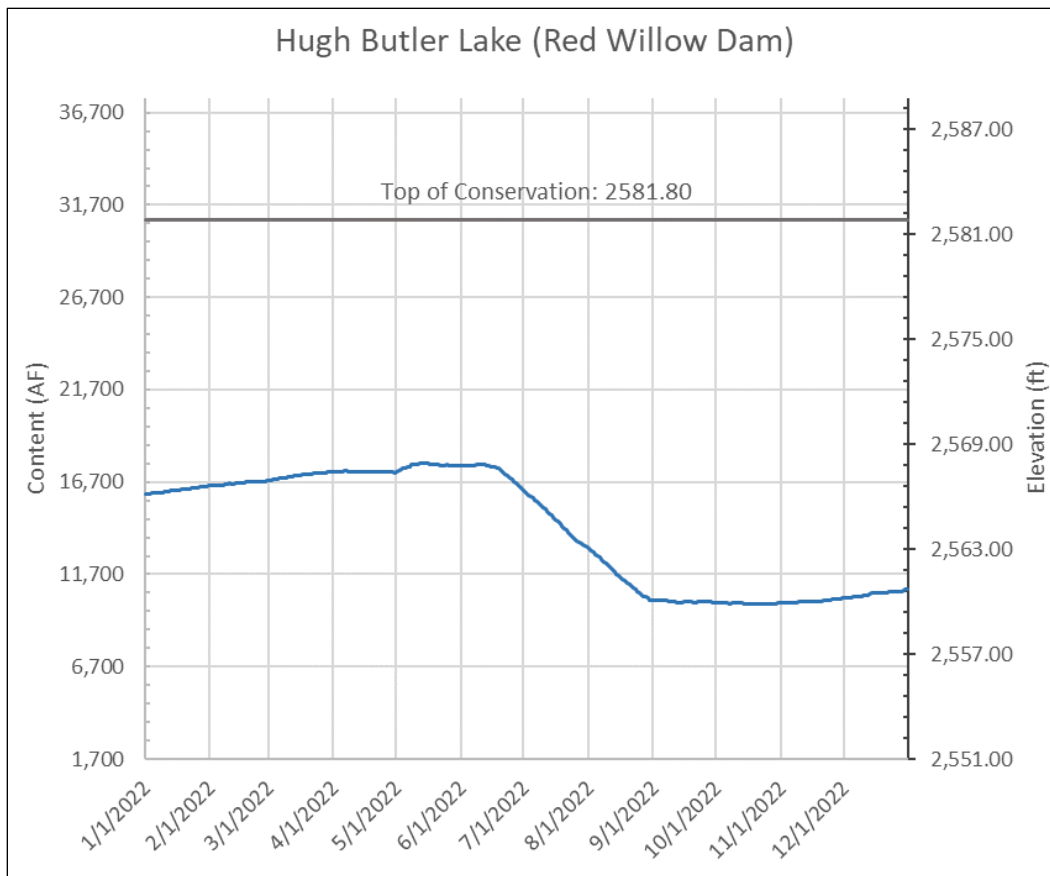


Figure 3.—Hugh Butler Lake elevation and content.

The annual precipitation total of 17.26 inches at Medicine Creek Dam was 82 percent of normal. The inflow of 29,388 AF was between the dry-year and average forecast. The reservoir level at the beginning the year was 2,361.83 feet (4.3 feet below the top of conservation). The reservoir filled to top of conservation on April 11. Irrigation releases started May 11. The reservoir level peaked at elevation 2,366.98 feet on May 13. A daily plot of the reservoir elevation is shown in Figure 4.

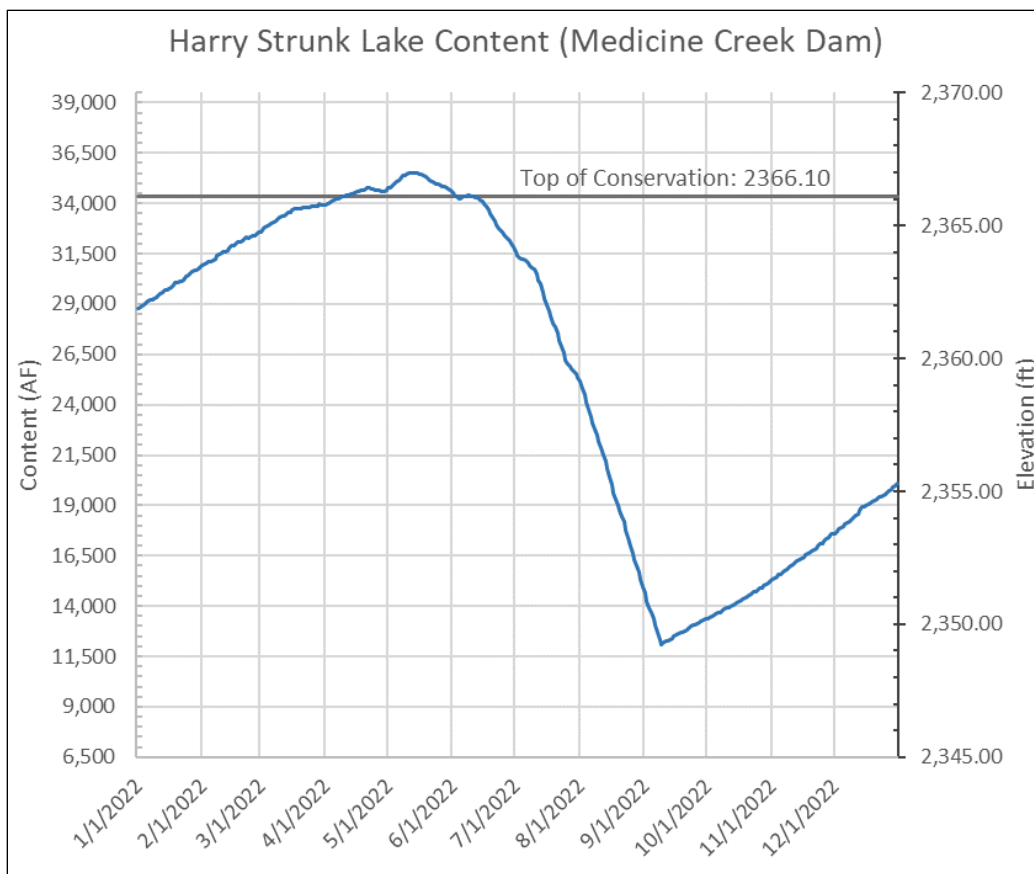


Figure 4.—Harry Strunk Lake elevation and content.

The district diverted 26,873 AF into Cambridge Canal and delivered 12,715 AF to 16,220 acres of district lands (a delivery efficiency of 47 percent). The end of year elevation was 2,361.83 feet at the end of the year (10.8 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 2022.

2023 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 64,100 AF. The water supply will be inadequate under normal- year irrigation requirement by 24,600 AF. The water supply will be adequate for the 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.

2022 Summary

The annual precipitation at Norton Dam totaled 14.15 inches, which is 57 percent of normal. The total inflow of 4,119 AF was between the dry and average year forecast. The reservoir elevation was 2,294.90 feet (9.4 feet below the top of conservation) at the first of the year. Late winter, spring and summer inflows gradually increased the lake level to a summer peak of 2,295.31 feet on June 9. Irrigation releases began July 3 and finished for the season on July 19. Approximately 3,023 AF was released from Norton Dam for irrigation. 2,108 AF was diverted into the Almena Canal, of which 915 AF was delivered to farms (efficiency of 43 percent). Inflows in December exceeded evaporation, gradually increasing the elevation to the end of year elevation of 2,290.62 feet (13.7 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 5.

The city of Norton used 368 AF of municipal water during 2022.

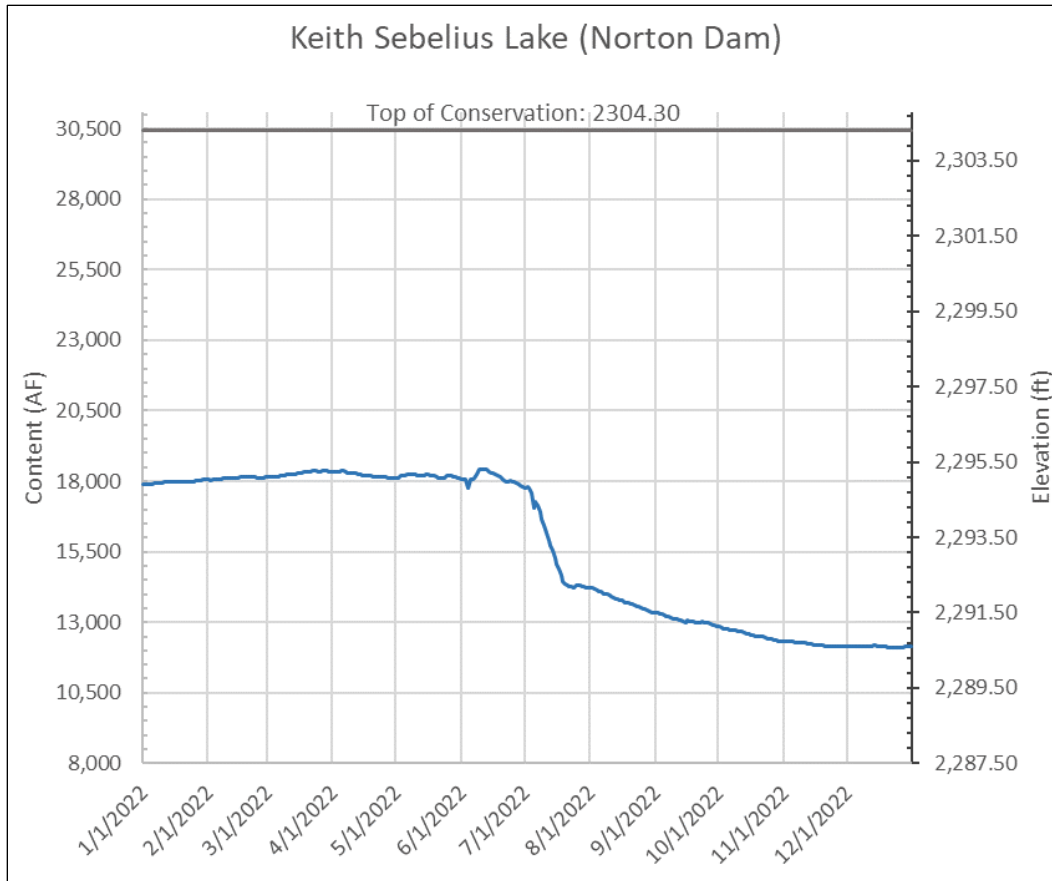


Figure 5.—Keith Sebelius Lake elevation and content.

2023 Outlook

If 2023 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 20,700 AF. If normal inflow into the lake and normal rainfall over the irrigated area occur in 2023 a shortage of 15,500 AF may be experienced. The water supply will be inadequate under wet-year conditions as well with a shortage of 1,300 AF. Requirements for the city of Norton will be met in full in 2023.

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. 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 - 2022 Summary

The annual precipitation at Harlan County Dam totaled 17.02 inches of rainfall, which is 73 percent of normal and the lowest observed since 2003. The 2022 inflow of 64,506 AF was between the minimum and average-year forecast. Harlan County Lake began 2022 at 1,943.11 feet (2.3 feet below the top of conservation).

The conservation pool was filled May 25. The conservation and accumulated flood pool were split June 11 as irrigation releases began.

Irrigation releases from Harlan County Lake into Franklin and Naponee Canals totaled 24,542 AF. The end of year elevation was 1,938.50 feet (7.2 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 perpetual agreement, based on the 2018 agreement, was signed.

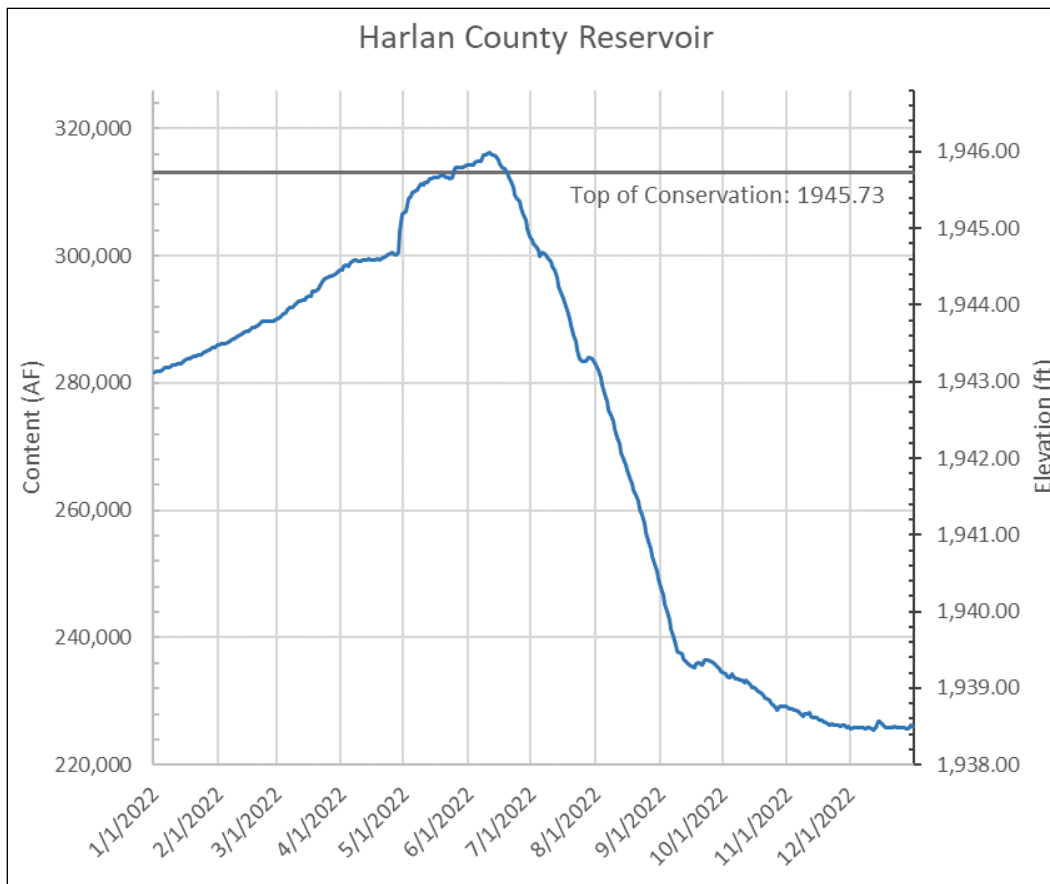


Figure 6.—Harlan County Lake elevation and content.

Harlan County Lake prevented \$130,400 of downstream flood damages during 2022 according to the Corps of Engineers.

There was 31,854 AF delivered to Lovewell Reservoir via the Courtland Canal during 2022. This was approximately 82 percent of the total Lovewell Reservoir inflow.

Bostwick Division – Nebraska - 2022 Summary

Irrigation diversions were made into Franklin, Naponee, Franklin Pump, Superior, and Courtland Canals in Nebraska in 2022. The district diverted 39,403 AF of water and delivered 13,126 AF to the farm head gates (33 percent delivery efficiency).

Bostwick Division – Kansas – 2022 Summary

The 2022 precipitation at Lovewell Dam totaled 20.59 inches, which was 74 percent of normal. The total annual inflow recorded at Lovewell Reservoir was 38,720 AF. Approximately 1,739 AF of the inflow was from White Rock Creek, which was below dry-year forecast. The reservoir elevation at the beginning of 2022 was 1,580.92 feet (1.7 foot below top of conservation). Rains in late May totaling 2.89 inches raised the lake elevation to a yearly peak of 1,583.41 (0.8 feet above top of conservation). All flood water accumulations were utilized for irrigation. Irrigation releases for canal seasoning/flushing began May 19 with releases in earnest beginning starting mid-June and continued until September 16. Irrigation releases lowered the lake to an annual low of 1,574.07 (8.5 feet below

conservation) on September 16. 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 1,578.59 feet (4.0 foot below top of conservation). A plot of the reservoir elevation is shown in Figure 7.

KBID diverted a total of 59,333 AF to serve 13,463 acres above Lovewell Dam and 27,181 acres below Lovewell Dam. District farm delivery totaled 34,953 AF (efficiency of 59 percent). Lovewell Reservoir prevented \$48,200 of downstream flood damages during 2022 according to the Corps of Engineers.

In 2022, KBID completed automation of the Courtland Canal from Guide Rock Diversion Dam to Lovewell Reservoir. This allows the district to minimize bypass at the diversion dam, while also taking advantage of additional flow in the Republican River during runoff events.

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 became 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 - 2023 Outlook

The storage in Harlan County Lake is expected to be inadequate in meeting the full dry-year irrigation requirement by 5,500 AF. 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.

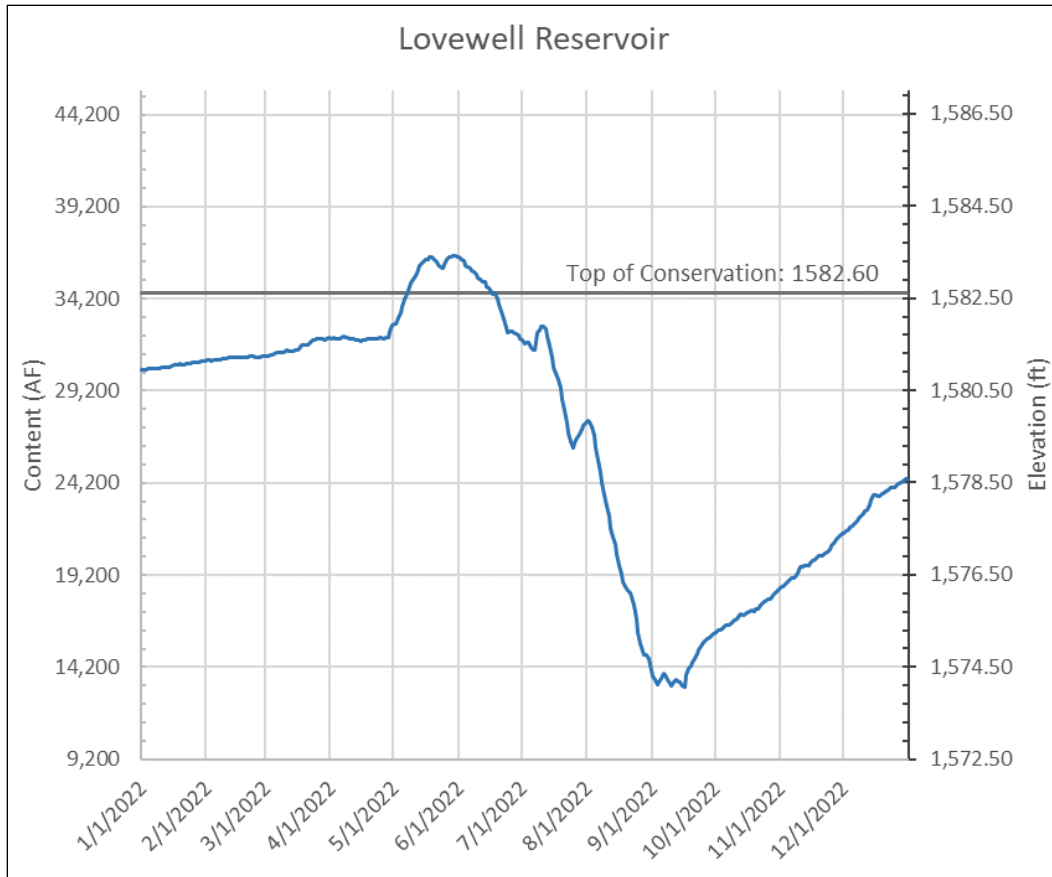


Figure 7.—Lovewell Reservoir elevation and content.

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.

2022 Summary

The annual precipitation total of 19.70 inches at Kirwin Dam was 82 percent of normal. The inflow of 21,128 AF was between the dry and average-year forecast. The reservoir level was 1,726.59 feet (2.7 feet below the top of conservation) at the first of the year. The reservoir peaked at elevation 1,728.77 feet on June 13, when irrigation releases began. Irrigation started June 20 and continued through September 1. The reservoir level gradually decreased throughout the fall and early winter to a minimum elevation of 1,723.17 feet on November 29. The reservoir level increased as inflow exceeded evaporation to elevation 1,723.26 feet on December 31 (6.0 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 18,788 AF was released into Kirwin Canal to irrigate 9,170 acres of project lands during 2022. Approximately 8,389 AF was delivered to farms (45 percent efficiency).

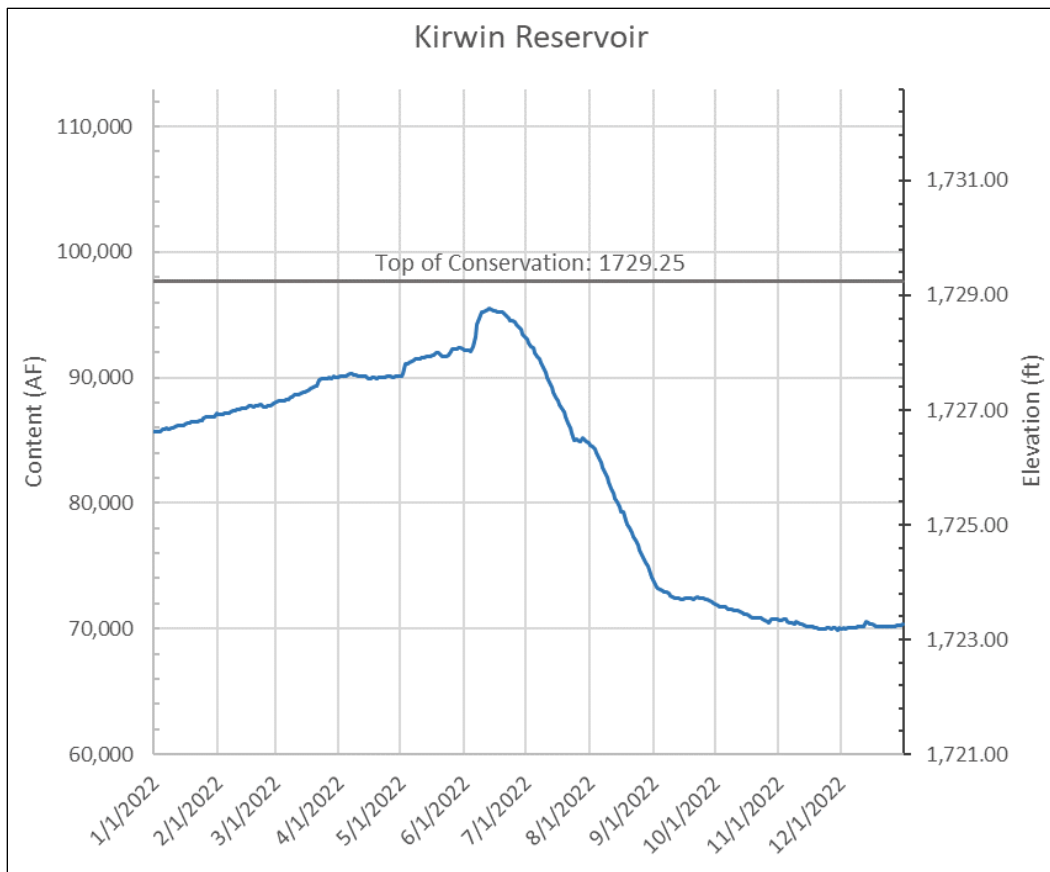


Figure 8.—Kirwin Reservoir elevation and content.

2023 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.

2022 Summary

In 2022 the precipitation at Webster Dam was 61 percent of normal (14.69 inches). The inflow of 12,766 AF was between the dry and average-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. The reservoir climbed a yearly peak of 1,890.93 feet (1.5 feet below top of conservation) on June 13. Irrigation releases started June 25 and continued until August 25.

The reservoir level gradually decreased throughout the fall to a minimum elevation of 1,882.54 feet on December 22. The reservoir level increased as inflow exceeded evaporation to elevation 1,882.57

feet on December 31 (9.8 feet below the top of conservation). A daily plot of the reservoir elevation is shown in Figure 9 below.

A total of 12,803 AF was diverted into Osborne Canal to irrigate 5,757 acres of project lands during 2022. Farm delivery was 6,161 AF (48 percent efficiency).

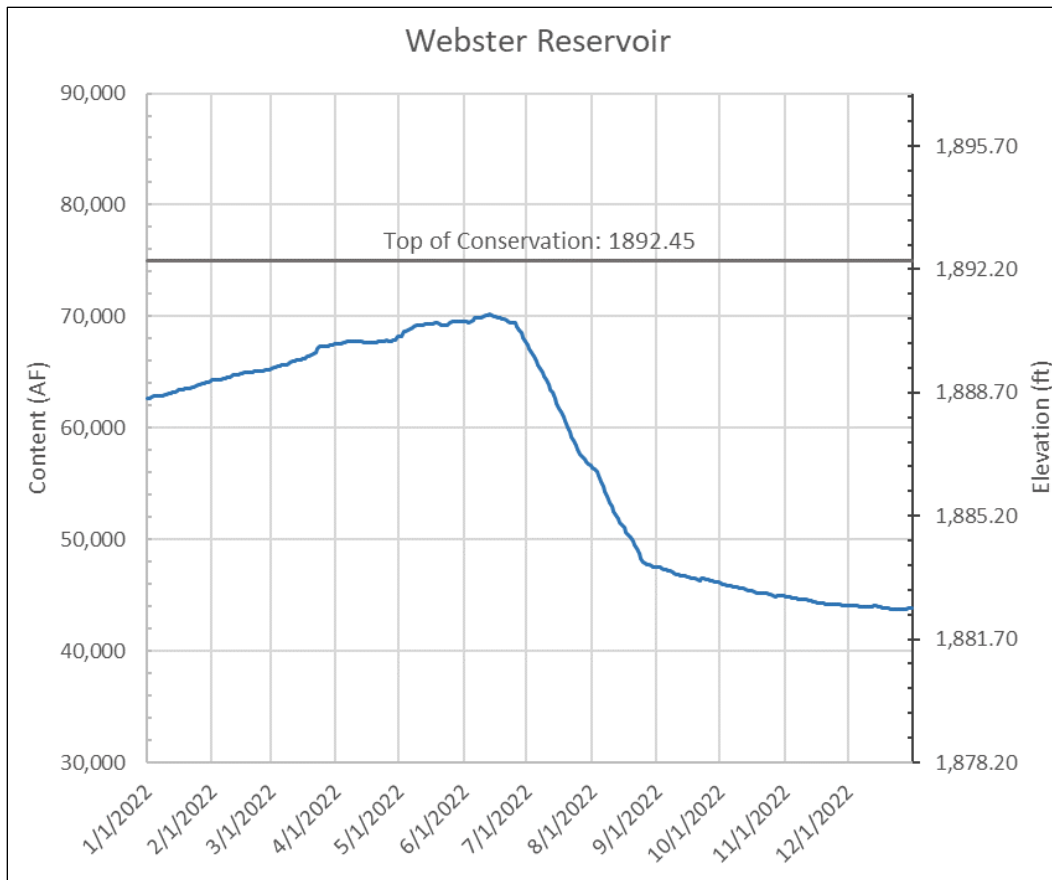


Figure 9.—Webster Reservoir elevation and content.

2023 Outlook

The carry-over storage and the flows in the South Fork Solomon River are expected to be inadequate in meeting the full dry-year irrigation requirement by 4,500 AF. Carry-over storage and natural flow are expected to be adequate to irrigate all district lands under the normal and wet-year forecasts.

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 provides 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.

2022 Summary

The annual precipitation total of 19.33 inches at Glen Elder Dam was 76 percent of normal. The inflow of 94,772 AF was between the dry and average-year forecast. The lake level at the beginning of the year was 1,455.66 feet (0.1 feet above the top of conservation). Releases were made early in the 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 April 5. Glen Elder Dam recorded over four and a half inches of precipitation during mid-May. This raised the lake elevation 1.0 feet to an elevation of 1456.67 (1.1 feet into the flood pool) on June 10.

Damage to the soil cement face of the dam in 2019 necessitated a drawdown of the reservoir pool level to a target of 1450.00 feet to begin repairs. Operational releases started June 6 and were ramped up to 500 cfs by June 7. Releases were adjusted over the summer and fall as necessary to maximize the benefit of the releases downstream. Approximately 77,200 AF was released to reach the target elevation by mid-October. Releases were staged down to 12 cfs on October 26 and maintained throughout the end of the year.

Waconda Lake ended the year at elevation 1,450.27 feet (5.3 feet above the top of conservation). Glen Elder Dam prevented \$410,000 of downstream flood damages during 2022 according to the Corps of Engineers.

Glen Elder Irrigation District irrigated 6,298 acres with natural flow diversion of 10,957 AF. No releases were required from the district’s storage account. The district delivered 4,771 AF to the farms (delivery efficiency of 44 percent.) Due to operational releases, no storage releases were necessary for the City of Beloit. Releases to the Mitchell County Rural Water District No. 2 totaled 392 AF. A daily plot of the reservoir elevation is shown in Figure 10.

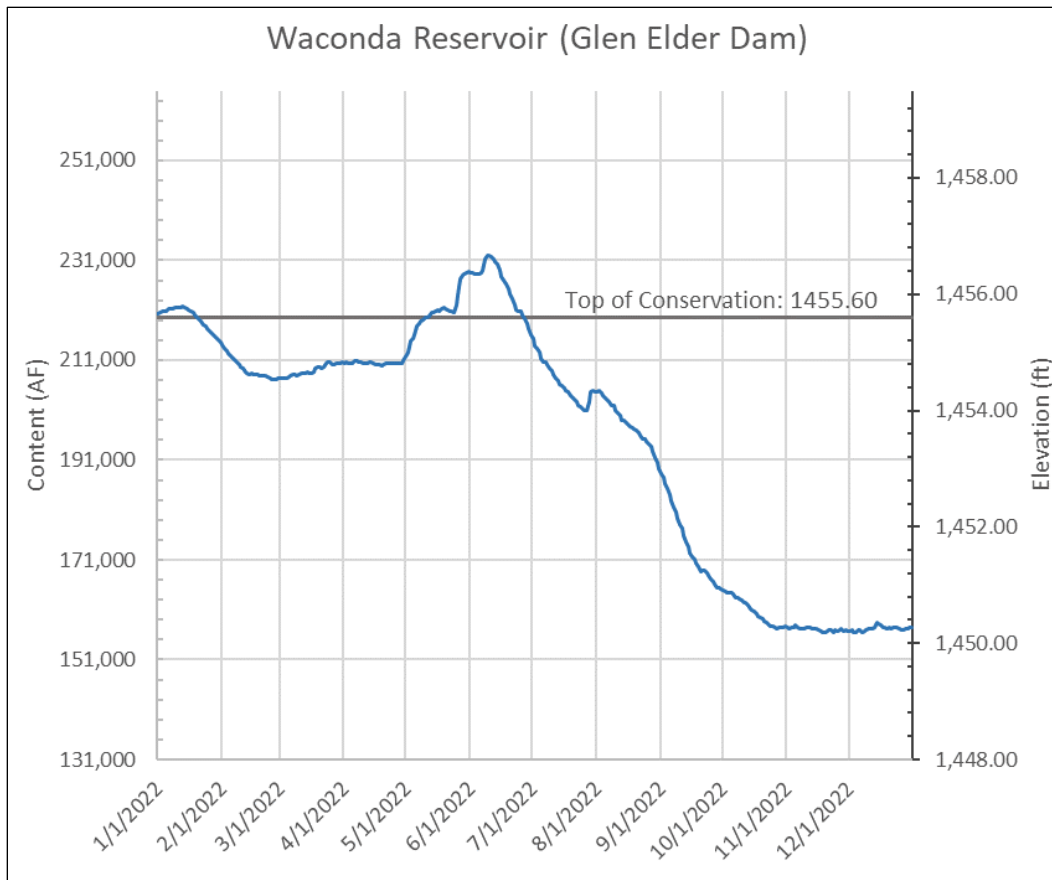


Figure 10.—Waconda Lake elevation and content.

2023 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.

2022 Summary

The annual precipitation total at Cedar Bluff Dam was 11.46 inches which is 54 percent of normal and was the lowest observed since 1956. The 2022 inflow of 6,024 AF was below the dry-year forecast. The reservoir level at the beginning of the year was 2,131.19 feet (12.80 feet below the top of conservation). For most of the year, evaporation exceeded inflow and the reservoir declined to a yearly low elevation of 2,127.42 feet on December 31 (16.6 feet below the top of conservation). Water was not released from the reservoir for the City of Russell or the Kansas Water Office in 2022. A plot of Cedar Bluff Reservoir daily elevation and content is shown in Figure 11.

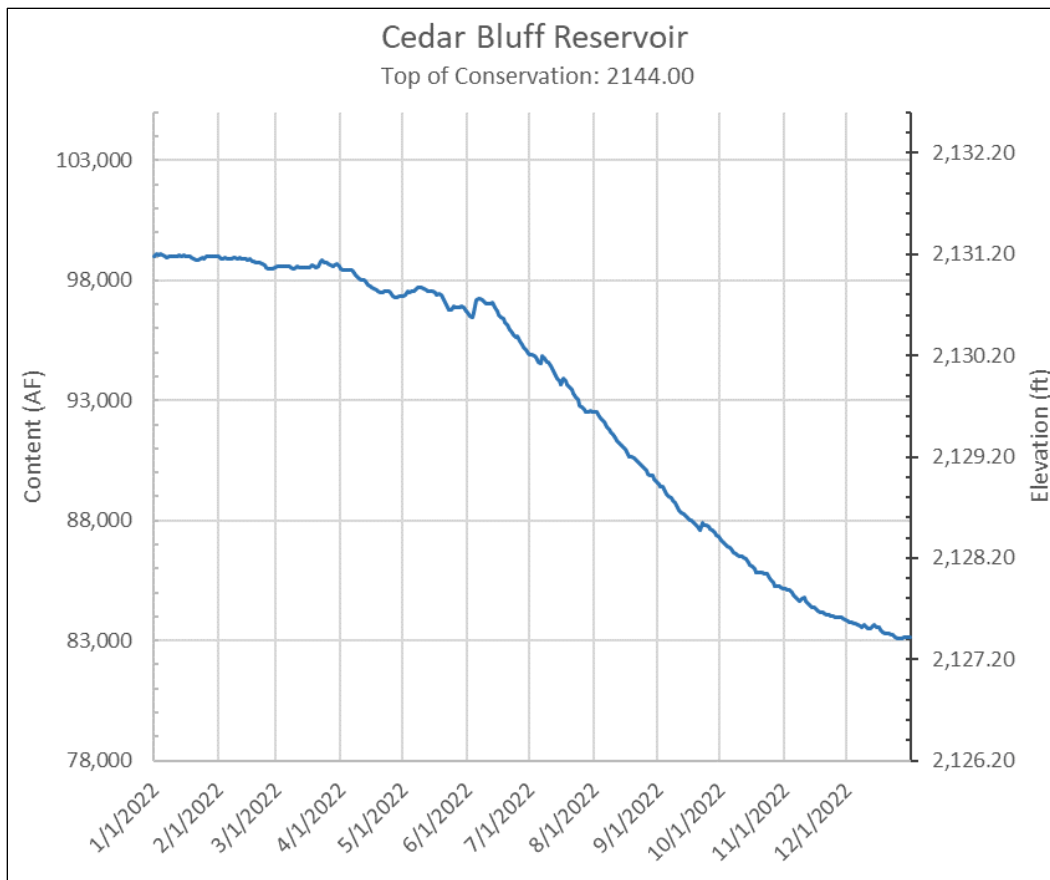


Figure 11.—Cedar Bluff Reservoir elevation and content.

The State of Kansas operates and maintains the fish hatchery facility located below Cedar Bluff Dam. There were no releases to the facility in 2022.

2023 Outlook

Storage in Cedar Bluff Reservoir, on December 31, 2022, was within the joint use pool. The KDWP is expected to use very little, if any, water for 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 2023.

Appendix A

Tables

Table A-1.—Reservoir Data – Niobrara, Lower Platte, and Kansas River Basins

Reservoir	Top of Dead Pool Elevation	Top of Dead Pool Capacity (AF)	Top of Inactive Elevation	Top of Inactive Capacity (AF)	Top of Conservation Elevation	Top of Conservation Capacity (AF)	Top of Flood Pool Elevation	Top of Flood Pool Capacity (AF)
Bonny	3,635.5	0	3,638.0	0	3,672.0	36,508	3,710.0	165,328
Swanson	2,710.0	1,027	2,720.0	10,329	2,752.0	110,175	2,773.0	244,362
Enders	3,080.0	7,516	3,082.4	8,948	3,112.3	42,910	3,127.0	72,958
Hugh Butler	2,552.0	5,185	2,558.0	8,921	2,581.8	36,224	2,604.9	85,070
Harry Strunk	2,335.0	3,408	2,343.0	7,897	2,366.1	34,647	2,386.2	87,361
Keith Sebelius	2,275.0	1,636	2,280.4	3,993	2,304.3	34,510	2,331.4	133,740
Harlan County	1,885.0	0	1,927.0	118,099	1,945.73	314,111	1,973.5	814,111
Lovewell	1,562.07	860	1,571.7	10,248	1,582.6	34,888	1,595.3	85,527
Kirwin	1,693.0	4,969	1,697.0	8,515	1,729.25	98,154	1,757.3	313,290
Webster	1,855.5	1,256	1,860.0	4,231	1,892.45	76,157	1,923.7	259,510
Cedar Bluff	2,090.0	4,402	2,107.8	28,574	2,144.0	172,452	2,166.0	364,342
Waconda	1,407.8	248	1,428.0	26,237	1,455.6	219,420	1,488.3	942,408
Box Butte	3,969.0	188	3,979.0	2,392	4,007.0	29,161	No Flood Pool	
Merritt	2,875.0	774	2,896.0	4,662	2,946.0	66,726	No Flood Pool	
Calamus	2,185.0	35	2,213.3	20,150	2,244.0	119,469	No Flood Pool	
Davis Creek	1,998.5	76	2,003.0	172	2,076.0	31,158	No Flood Pool	

Table A-2.—Summary of precipitation, reservoir storage and inflows, Calendar Year 2022

Reservoir	Total Precip. (Inches)	Percent of Average	Storage 12-31-21	Storage 12-31-22	Gain or Loss (AF)	Maximum Content (AF)	Date	Minimum Content (AF)	Date	Total Inflow (AF)	Percent of Most Probable
Box Butte	16.53	96	10,681	9,113	-1,568	16,831	10-Jul	6,860	7-Sep	15,657	102
Merritt	14.72	69	60,966	61,533	567	66,320	30-May	33,185	11-Sep	201,345	106
Calamus	14.09	56	92,689	96,605	3,916	123,571	2-May	51,478	18-Sep	267,875	99
Davis Creek	14.92	57	13,024	12,838	-186	31,651	5-Jun	12,133	21-Mar	65,259	135
Bonny	12.56	71	0	0	0	0	#N/A	0	#N/A	1,492	29
Enders	11.32	59	7,983	6,545	-1438	8,449	29-Mar	6,351	23-Nov	3,405	68
Swanson	9.56	47	46,186	24,473	-21,713	54,545	9-May	24,315	21-Dec	14,318	57
Hugh Butler	12.07	61	15,811	10,986	-4,825	17,599	12-May	10,315	18-Oct	6,355	62
Harry Strunk	17.26	82	27,646	19,165	-8,481	36,296	13-May	12,856	9-Sep	29,388	73
Keith Sebelius	14.15	57	17,753	12,322	-5,431	18,343	9-Jun	12,267	20-Dec	4,119	63
Harlan County	17.02	73	280,385	225,470	-54915	317,555	11-Jun	225,025	12-Dec	64,506	62
Lovewell	20.59	74	30,861	23,703	-7158	38,135	29-May	15,495	16-Sep	38,720	73
Kirwin	19.7	82	85,227	70,612	-14,615	95,738	13-Jun	70,240	29-Nov	21,128	73
Webster	14.69	61	62,254	44,193	-18,061	70,562	13-Jun	44,112	22-Dec	12,766	66
Waconda	19.33	76	220,177	159,307	-60,870	233,146	10-Jun	158,517	18-Nov	94,772	68
Cedar Bluff	11.46	54	98,996	83,230	-15,766	99,041	2-Jan	83,152	27-Dec	6,024	52

Table A-3.—Acreage irrigated in 2022, and projections for 2023

Irrigation District and Canal	Acres With Service Available	Acres Irrigated in 2022	Estimated Acres to be Irrigated in 2023
Mirage Flats Irrigation District			
Mirage Flats Canal	11,662	10,400	9,000
Ainsworth Irrigation District			
Ainsworth Canal	35,000	34,626	34,000
Twin Loups Irrigation District			
Above Davis Creek	34,748	34,748	34,000
Below Davis Creek	21,380	21,380	21,000
Total Twin Loups Irrigation District	56,128	56,128	55,000
Frenchman Valley Irrigation District			
Culbertson Canal	9,292	140	0
Frenchman-Cambridge Irrigation District			
Meeker-Driftwood Canal	16,691	9,946	0
Red Willow Canal	4,643	2,629	0
Bartley Canal	6,130	3,249	0
Cambridge Canal	18,205	16,220	15,000
Total Frenchman-Cambridge Irrigation District	45,669	32,044	15,000
Almena Irrigation District			
Almena Canal	5,764	5,763	4,000
Bostwick Irrigation District in Nebraska			
Franklin Canal	11,031	10,745	10,000
Naponee Canal	1,607	830	750
Franklin Pump Canal	2,026	1,181	1,000
Superior Canal	6,056	5,945	5,500
Courtland Canal (Nebraska)	1,735	1,634	1,000
Total Bostwick Irrigation Dist. in Nebraska	22,455	20,335	18,250
Kansas-Bostwick Irrigation District			
Courtland Canal above Lovewell	13,378	13,463	13,000
Courtland Canal below Lovewell	29,122	27,181	27,000
Total Kansas-Bostwick Irrigation District	42,500	40,644	40,000
Kirwin Irrigation District			
Kirwin Canal	11,465	9,170	9,000
Webster Irrigation District			
Osborne Canal	8,537	5,757	6,000
Glen Elder Irrigation District	10,370	6,298	6,000
Total Project Uses	258,842	221,305	196,250
Hale Ditch	700	0	0
Total Project and Non-Project	259,542	221,305	196,250

Table A-4.—Water diverted in 2022, and estimated diversions in 2023

Irrigation District and Canal	Start Date	End Date	10-Year Average Diversion (AF)	2022 Diversions (AF)	Estimated Diversion in 2023 (AF)
Mirage Flats Irrigation District					
Mirage Flats Canal	7/12	9/8	12,563	10,270	10,000
Ainsworth Irrigation District					
Ainsworth Canal	5/22	9/20	68,107	85,460	75,000
Twin Loups Irrigation District					
Above Davis Creek	3/21	9/19	43,002	59,312	52,000
Below Davis Creek	4/18	9/19	43,524	52,886	48,000
Total Twin Loups Irrigation District			86,526	112,198	100,000
Frenchman Valley Irrigation District					
Culbertson Canal	5/3	10/14	5,369	3,788	0
Frenchman-Cambridge Irrigation District					
Meeker-Driftwood Canal	6/14	9/2	16,852	21,898	0
Red Willow Canal	6/20	9/2	1,616	5,451	0
Bartley Canal	4/15	8/28	6,704	4,904	0
Cambridge Canal	4/15	9/9	23,542	26,873	26,000
Total Frenchman-Cambridge Irrigation District			48,714	59,126	26,000
Almena Irrigation District					
Almena Canal	7/5	7/20	1,362	2,108	2,000
Bostwick Irrigation District in Nebraska					
Franklin Canal	6/20	9/10	18,448	24,542	18,000
Naponee Canal	6/27	9/9	1,178	1,288	1,000
Franklin Pump Canal	6/24	9/9	950	1,739	1,000
Superior Canal	6/15	9/9	7,176	9,827	8,000
Courtland Canal (Nebraska)	6/20	9/11	510	2,007	1,000
Total Bostwick Irrigation Dist. in Nebraska			28,263	39,403	29,000
Kansas-Bostwick Irrigation District					
Courtland Canal above Lovewell	4/22	9/16	19,154	22,667	22,000
Courtland Canal below Lovewell	5/19	9/16	33,409	36,666	36,000
Total Kansas-Bostwick Irrigation District			52,562	59,333	58,000
Kirwin Irrigation District					
Kirwin Canal	6/21	9/2	17,173	18,788	18,000
Webster Irrigation District					
Osborne Canal	6/26	8/29	7,947	12,806	12,000
Glen Elder Irrigation District					
	06/10	10/15	4,407	10,957	5,000
Total Project Diversions			332,992	414,237	335,000

Table A-5.—Summary of 2022 Operations - Mirage Flats Project

Month	BOX BUTTE RESERVOIR Inflow (AF)	BOX BUTTE RESERVOIR Outflow (AF)	BOX BUTTE RESERVOIR Gross Evap. (AF)	BOX BUTTE RESERVOIR Precip. (Inches)	BOX BUTTE RESERVOIR End of Month Content (AF)	MIRAGE FLATS CANAL Diversions to Canal (AF)	MIRAGE FLATS CANAL Delivered to Farms (AF)
Jan.	1,166	89	83	0.28	11,675	0	0
Feb.	1,099	81	109	0.31	12,584	0	0
Mar.	2,005	113	204	0.70	14,272	0	0
Apr.	1,658	103	352	1.68	15,475	0	0
May	1,433	115	437	2.78	16,356	0	0
June	1,117	143	702	1.39	16,628	0	0
July	3,786	6,746	656	3.33	13,012	4,312	1,543
Aug.	451	5,133	492	3.75	7,838	5,133	2,755
Sep.	582	863	251	0.71	7,306	825	470
Oct.	855	60	183	0.36	7,918	0	0
Nov.	812	69	106	0.25	8,555	0	0
Dec.	693	71	64	0.99	9,113	0	0
TOTAL	15,657	13,586	3,639	16.53	--	10,270	4,768

Note: Acres irrigated in 2022: Mirage Flats Canal: 10,400

Table A-6.—Summary of 2022 Operations - Sandhills Division, Ainsworth Unit

Month	MERRITT RESERVOIR Inflow (AF)	MERRITT RESERVOIR Outflow (AF)	Gross MERRITT RESERVOIR Evap. (AF)	MERRITT RESERVOIR Precip. (Inches)	MERRITT RESERVOIR End of Month Content (AF)	AINSWORTH CANAL Diversions to Canal (AF)	AINSWORTH CANAL Delivered to Farms (AF)
Jan.	16,485	16,116	235	0.08	61,100	0	0
Feb.	15,392	15,094	298	0.03	61,100	0	0
Mar.	17,731	17,316	415	0.44	61,100	0	0
Apr.	20,781	15,828	714	2.12	65,339	0	0
May	17,845	15,662	1,202	3.59	66,320	1,634	7
June	16,167	18,466	1,668	0.30	62,353	12,683	3,518
July	15,773	32,559	1,496	1.39	44,071	32,783	20,825
Aug.	18,595	24,943	977	3.21	36,746	25,732	16,499
Sep.	16,421	12,556	753	1.15	39,858	12,628	8,226
Oct.	14,898	1,289	586	0.24	52,881	0	0
Nov.	15,619	6,744	413	0.17	61,343	0	0
Dec.	15,638	15,134	314	2.00	61,533	0	0
TOTAL	201,345	191,707	9,071	14.72	--	85,460	49,076

Note: Acres irrigated 2022: Ainsworth Canal 34,626 acres.

Table A-7.—Summary of 2022 Operations - North Loup Division

Month	CALAMUS RESERVOIR Inflow (AF)	CALAMUS RESERVOIR Outflow (AF)	CALAMUS RESERVOIR Gross Evap. (AF)	CALAMUS RESERVOIR Precip. (Inches)	CALAMUS RESERVOIR End of Month Content (AF)	CALAMUS RESERVOIR Release to Calamus Fish Hatch. (AF)	ABOVE DAVIS CREEK MIRDAN CANAL Release to Canal (AF)	ABOVE DAVIS CREEK MIRDAN Canal Use (AF)	ABOVE DAVIS CREEK MIRDAN CANAL Delivered to Farms (AF)
Jan.	22,524	18,925	414	0.05	95,874	0	0	0	0
Feb.	20,483	13,819	532	0.00	102,006	0	0	0	0
Mar.	17,495	4,604	1,005	0.06	113,892	62	4,933	0	0
Apr.	25,921	14,436	1,754	2.24	123,623	544	10,702	750	0
May	28,280	30,250	1,116	3.01	120,537	74	17,260	3,936	73
June	22,347	21,826	3,153	1.07	117,905	166	15,066	7,725	3,631
July	25,570	45,297	2,861	3.38	95,317	258	28,830	14,058	8,679
Aug.	23,005	50,581	2,199	1.01	65,542	328	35,024	23,336	17,259
Sep.	20,747	32,366	1,548	2.37	52,375	190	16,888	9,507	6,846
Oct.	20,529	7,547	907	0.47	64,450	46	0	0	0
Nov.	19,738	746	568	0.01	82,874	0	0	0	0
Dec.	21,236	7,135	370	0.42	96,605	0	0	0	0
TOTAL	267,875	247,532	16,427	14.09	--	1,668	128,703	59,312	36,488

NOTE: Acres irrigated 2022: Mirdan Canal 34,748 acres.

Table A-8.—Summary of 2022 Operations - North Loup Division

Month	DAVIS CREEK RESERVOIR Inflow (AF)	DAVIS CREEK RESERVOIR Outflow (AF)	DAVIS CREEK RESERVOIR Gross Evap. (AF)	DAVIS CREEK RESERVOIR Precip. (Inches)	DAVIS CREEK RESERVOIR End of Month Content (AF)	BELOW DAVIS CREEK FULLERTON CANAL Release to Canal (AF)	BELOW DAVIS CREEK FULLERTON CANAL Delivered to Farms (AF)
Jan.	111	371	60	0.04	12,704	0	0
Feb.	34	317	74	0.04	12,347	0	0
Mar.	4,386	341	142	0.17	16,250	0	0
Apr.	10,081	849	299	1.54	25,183	1,589	0
May	12,804	6,060	380	3.16	31,547	4,463	18
June	8,120	8,904	641	1.48	30,122	7,034	2,413
July	12,621	16,876	545	4.59	25,322	14,660	9,870
Aug.	10,027	19,512	363	0.42	15,474	17,867	12,868
Sep.	6,629	7,877	313	1.37	13,913	7,273	4,043
Oct.	176	424	183	0.84	13,482	0	0
Nov.	111	385	97	0.35	13,111	0	0
Dec.	159	377	55	0.92	12,838	0	0
TOTAL	65,259	62,293	3,152	14.92	--	52,886	29,212

NOTE: Acres irrigated 2022: Fullerton Canal 21,380 acres.

Table A-9.—Summary of 2022 Operations - Upper Republican Division, Armel Unit

Month	BONNY RESERVOIR Inflow (AF)	BONNY RESERVOIR Outflow (AF)	BONNY RESERVOIR Gross Evap. (AF)	BONNY RESERVOIR Precip. (Inches)	BONNY RESERVOIR End of Month Content (AF)	HALE DITCH Outflow (AF)
Jan.	123	123	0	0.15	0	0
Feb.	111	111	0	0.00	0	0
Mar.	143	143	0	0.45	0	0
Apr.	127	127	0	0.01	0	0
May	139	139	0	2.73	0	0
June	119	119	0	1.14	0	0
July	123	123	0	4.79	0	0
Aug.	123	123	0	1.48	0	0
Sep.	119	119	0	1.44	0	0
Oct.	123	123	0	0.04	0	0
Nov.	119	119	0	0.00	0	0
Dec.	123	123	0	0.33	0	0
TOTAL	1,492	1,492	0	12.56	--	0

Table A-10.—Summary of 2022 Operations - Frenchman-Cambridge Division, Frenchman Unit

Month	ENDERS RESERVOIR Inflow (AF)	ENDERS RESERVOIR Outflow (AF)	ENDERS RESERVOIR Gross Evap. (AF)	ENDERS RESERVOIR Precip. (Inches)	ENDERS RESERVOIR End of Month Content (AF)	CULBERTSON CANAL Diverted To Canal (AF)	CULBERTSON CANAL Delivered To Farms (AF)
Jan.	409	184	48	0.38	8,160	0	0
Feb.	298	167	53	0.00	8,238	0	0
Mar.	434	184	88	0.84	8,400	0	0
Apr.	365	179	294	0.05	8,292	0	0
May	463	184	273	2.51	8,298	1,391	0
June	209	179	438	1.09	7,890	1,201	43
July	243	184	439	3.03	7,510	447	133
Aug.	98	184	396	0.70	7,028	258	0
Sep.	96	179	290	1.07	6,655	278	0
Oct.	202	184	226	0.02	6,447	213	0
Nov.	206	179	83	0.09	6,391	0	0
Dec.	382	184	44	1.54	6,545	0	0
TOTAL	3,405	2,171	2,672	11.32	--	3,788	176

NOTE: Acres irrigated 2022: Culbertson Canal 140 acres

Table A-11.—Summary of 2022 Operations - Frenchman-Cambridge Division, Meeker-Driftwood Unit

Month	SWANSON LAKE Inflow (AF)	SWANSON LAKE Outflow (AF)	SWANSON LAKE Gross Evap. (AF)	SWANSON LAKE Precip. (Inches)	SWANSON LAKE End of Month Content (AF)	MEEKER-DRIFTWOOD Release to Canal (AF)	MEEKER-DRIFTWOOD Delivered to Farms (AF)
Jan.	1,637	61	249	0.41	47,513	0	0
Feb.	2,348	56	284	0.00	49,521	0	0
Mar.	3,226	61	470	0.47	52,216	0	0
Apr.	2,754	60	1,618	0.05	53,292	0	0
May	2,045	61	1,425	3.10	53,851	0	0
June	1,201	4,508	2,220	1.03	48,324	4,245	1,126
July	648	9,555	1,894	1.50	37,523	9,438	3,545
Aug.	273	8,027	1,864	0.52	27,905	7,939	3,710
Sep.	130	486	908	1.29	26,641	276	0
Oct.	0	61	1,333	0.26	25,247	0	0
Nov.	0	60	511	0.00	24,676	0	0
Dec.	56	61	198	0.93	24,473	0	0
TOTAL	14,318	23,057	12,974	9.56	--	21,898	8,381

NOTE: Acres irrigated 2022: Meeker-Driftwood Canal 9,946 acres.

Table A-12.—Summary of 2022 Operations – Frenchman-Cambridge Division, Red Willow Unit

Month	HUGH BUTLER LAKE Inflow (AF)	HUGH BUTLER LAKE Outflow (AF)	HUGH BUTLER LAKE Gross Evap. (AF)	HUGH BUTLER LAKE Precip. (Inches)	HUGH BUTLER LAKE End of Month Content (AF)	RED WILLOW CANAL Diverted To Canal (AF)	RED WILLOW CANAL Delivered To Farms (AF)	BARTLEY CANAL Diverted To Canal (AF)	BARTLEY CANAL Delivered To Farms (AF)
Jan.	661	123	73	0.31	16,276	0	0	0	0
Feb.	498	111	85	0.00	16,578	0	0	0	0
Mar.	774	123	141	0.93	17,088	0	0	0	0
Apr.	592	119	494	0.22	17,067	0	0	811	9
May	1,008	123	458	3.45	17,494	0	0	1,360	87
June	275	1,027	644	1.67	16,098	815	204	1,069	282
July	443	2,751	791	1.03	12,999	2,566	713	1,613	907
Aug.	316	2,216	628	0.70	10,471	2,046	778	1,746	1,449
Sep.	384	119	367	2.00	10,369	24	4	41	0
Oct.	324	123	232	0.43	10,338	0	0	0	0
Nov.	464	119	126	0.00	10,557	0	0	0	0
Dec.	616	123	64	1.33	10,986	0	0	0	0
TOTAL	6,355	7,077	4,103	12.07	--	5,451	1,699	6,640	2,735

NOTE: Acres irrigated 2022: Red Willow Canal 2,626 acres; Bartley Canal 3,249 acres.

Table A-13.—Summary of 2022 Operations - Frenchman-Cambridge Division, Cambridge Unit

Month	HARRY STRUNK LAKE Inflow (AF)	HARRY STRUNK LAKE Outflow (AF)	HARRY STRUNK LAKE Gross Evap. (AF)	HARRY STRUNK LAKE Precip. (Inches)	HARRY STRUNK LAKE End of Month Content (AF)	CAMBRIDGE CANAL Diverted to Canal (AF)	CAMBRIDGE CANAL Delivered to Farms (AF)
Jan.	2,596	61	113	0.34	30,068	0	0
Feb.	2,405	56	135	0.00	32,282	0	0
Mar.	2,701	700	238	0.70	34,045	0	0
Apr.	2,586	704	874	0.36	35,053	1,073	140
May	3,469	2,456	1,031	4.71	35,035	2,973	92
June	2,916	5,530	1,119	3.21	31,302	5,394	1,827
July	2,865	8,821	1,213	3.84	24,133	7,172	3,824
Aug.	2,131	10,469	851	0.62	14,944	8,285	6,065
Sep.	1,590	2,404	387	1.95	13,743	1,976	768
Oct.	1,738	61	274	0.35	15,146	0	0
Nov.	2,087	60	165	0.07	17,008	0	0
Dec.	2,304	61	86	1.11	19,165	0	0
TOTAL	29,388	31,383	6,486	17.26	--	26,873	12,715

NOTE: Acres irrigated 2022: Cambridge Canal 16,220 acres.

Table A-14.—Summary of 2022 Operations - Kanaska Division, Almena Unit

Month	KEITH SEBELIUS LAKE Inflow (AF)	KEITH SEBELIUS LAKE Outflow (AF)	KEITH SEBELIUS LAKE Gross Evap. (AF)	KEITH SEBELIUS LAKE Precip. (Inches)	KEITH SEBELIUS LAKE End of Month Content (AF)	KEITH SEBELIUS LAKE Release to City of Norton (AF)	ALMENA CANAL Diverted To Canal (AF)	ALMENA CANAL Delivered To Farms (AF)
Jan.	350	48	102	0.35	17,953	17	0	0
Feb.	248	42	120	0.00	18,039	14	0	0
Mar.	453	47	204	0.60	18,241	16	0	0
Apr.	488	52	695	0.19	17,982	24	0	0
May	837	68	755	4.14	17,996	36	0	0
June	792	80	1,026	2.89	17,682	50	0	0
July	373	3,088	841	2.26	14,126	51	2,108	915
Aug.	91	61	836	0.61	13,320	28	0	0
Sep.	241	75	562	2.38	12,924	45	0	0
Oct.	0	73	394	0.34	12,457	42	0	0
Nov.	88	51	183	0.10	12,311	22	0	0
Dec.	158	54	93	0.29	12,322	23	0	0
TOTAL	4,119	3,739	5,811	14.15	--	368	2,108	915

NOTE: Acres irrigated 2022: Almena Canal 5,763 acres.

Table A-15.—Summary of 2022 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.									
Feb.	4,909	0	761	0.00	289,058	0	0	0	0
Mar.	9,620	0	1,320	0.81	297,358	0	0	0	0
Apr.	12,601	0	2,995	1.91	306,964	0	0	0	0
May	12,208	0	3,868	2.81	315,304	0	0	0	0
June	4,977	11,877	5,389	1.43	303,015	4,083	150	111	0
July	8,549	19,760	9,659	4.42	282,145	7,851	2,440	370	142
Aug.	857	28,400	7,205	1.38	247,397	10,136	2,894	687	186
Sep.	2,616	10,542	5,913	2.70	233,558	2,472	1,984	120	55
Oct.	1,583	0	6,780	0.69	228,361	0	0	0	0
Nov.	179	0	3,070	0.09	225,470	0	0	0	0
Dec.	1,109	0	1,109	0.56	225,470	0	0	0	0
TOTAL	64,506	70,579	48,842	17.02	--	24,542	7,468	1,288	383

NOTE: Acres irrigated 2022: Franklin Canal 10,745 acres; Naponee Canal 830 acres.

Table A-16.—Summary of 2022 Operations - Bostwick Division, Superior-Courtland Unit

Month	Franklin Pump Canal Diverted to Canal (AF)	Franklin Pump Canal Delivered to Farms (AF)	Superior Canal Diverted to Canal (AF)	Superior Canal Delivered to Farms (AF)	Courtland Canal - Above Lovewell Nebraska Use Total Diversion (AF)	Courtland Canal Above Lovewell Nebraska Total Use (AF)	Courtland Canal - Above Lovewell Nebraska Use Delivered to Farms (AF)	Courtland Canal - Above Lovewell Kansas Use Diverted to Canal (AF)	Courtland Canal - Above Lovewell 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	1,932	0	0	0	0
May	0	0	0	0	7,508	0	0	0	0
June	267	0	2,134	68	8,425	0	0	5,181	1,018
July	534	289	2,400	658	16,145	620	476	6,175	2,407
Aug.	725	270	4,383	1,348	15,659	894	766	8,996	5,663
Sep.	213	166	910	786	11,033	493	448	2,315	1,637
Oct.	0	0	0	0	4,557	0	0	0	0
Nov.	0	0	0	0	5,142	0	0	0	0
Dec.	0	0	0	0	4,563	0	0	0	0
TOTAL	1,739	725	9,827	2,860	74,964	2,007	1,690	22,667	10,725

NOTE: Acres irrigated 2022: Courtland Canal-Nebraska 1,634 acres; Kansas 13,463 acres; Franklin Pump Canal 1,181 acres; Superior 5,945 acres.

Table A-17.—Summary of 2022 Operations - Bostwick Division, Courtland Unit

Month	Lovewell Reservoir Est. Flow from White Rock Creek (FB)	Lovewell Reservoir Inflow from Courtland 34.8 (AF)	Lovewell Reservoir Total Inflow (AF)	Lovewell Reservoir Outflow (FB)	Lovewell Reservoir Gross Evap. (AF)	Lovewell Reservoir Precip. (Inches)	Lovewell Reservoir End of Month Content (AF)	Courtland (Below) Release to Canal (AF)	Courtland (Below) Delivered to Farms (AF)
Jan.	809	0	809	12	171	0.43	30,636	0	0
Feb.	536	0	536	11	210	0.00	30,951	0	0
Mar.	1,505	0	1,505	12	371	1.45	32,073	0	0
Apr.	1,281	658	1,939	12	1,173	1.10	32,827	0	0
May	3,007	3,849	6,856	1,226	1,148	5.85	37,309	1,326	0
June	206	1,244	1,450	5,371	1,402	2.63	31,986	5,460	1,780
July	1,269	5,092	6,361	10,041	1,417	3.54	26,889	10,079	7,304
Aug.	0	4,523	3,511	14,391	1,046	0.83	14,963	14,863	12,016
Sep.	0	7,429	7,295	5,292	706	3.36	16,260	4,938	3,128
Oct.	0	2,873	2,441	12	475	0.72	18,214	0	0
Nov.	0	3,210	2,977	12	333	0.13	20,846	0	0
Dec.	64	2,976	3,040	12	171	0.55	23,703	0	0
TOTAL	6,866	31,854	38,720	36,404	8,623	20.59	--	36,666	24,228

NOTE: Acres irrigated 2022: Courtland Canal below Lovewell 27,181 acres.

Table A-18.—Summary of 2022 Operations - Solomon Division, Kirwin Unit

Month	KIRWIN RESERVOIR Inflow (AF)	KIRWIN RESERVOIR Outflow (AF)	KIRWIN RESERVOIR Gross Evap. (AF)	KIRWIN RESERVOIR Precip. (Inches)	KIRWIN RESERVOIR End of Month Content (AF)	KIRWIN CANAL Release to Canal (AF)	KIRWIN CANAL Delivered to Farms (AF)
Jan.	1,857	0	314	0.89	86,770	0	0
Feb.	1,395	0	405	0.00	87,760	0	0
Mar.	2,719	0	668	1.84	89,811	0	0
Apr.	2,300	0	2,156	0.36	89,955	0	0
May	4,514	0	2,188	5.05	92,281	0	0
June	5,523	1,402	3,141	3.00	93,261	1,586	53
July	1,606	8,166	2,262	4.43	84,439	8,153	3,216
Aug.	32	8,452	1,964	0.48	74,055	8,612	4,776
Sep.	289	670	1,521	2.58	72,153	437	344
Oct.	273	0	1,441	0.80	70,985	0	0
Nov.	80	0	660	0.06	70,405	0	0
Dec.	540	0	333	0.21	70,612	0	0
TOTAL	21,128	18,690	17,053	19.70	--	18,788	8,389

NOTE: Acres irrigated 2022: Kirwin Canal 9,170 acres.

Table A-19.—Summary of 2022 Operations - Solomon Division, Webster Unit

Month	WEBSTER RESERVOIR Inflow (AF)	WEBSTER RESERVOIR Outflow (AF)	WEBSTER RESERVOIR Gross Evap. (AF)	WEBSTER RESERVOIR Precip. (Inches)	WEBSTER RESERVOIR End of Month Content (AF)	OSBORNE CANAL Diverted to Canal (AF)	OSBORNE CANAL Delivered to Farms (AF)
Jan.	1,922	0	241	0.48	63,935	0	0
Feb.	1,478	0	286	0.00	65,127	0	0
Mar.	3,000	0	509	1.96	67,618	0	0
Apr.	2,144	0	1,442	0.15	68,320	0	0
May	2,886	0	1,361	6.75	69,845	0	0
June	1,230	1,246	2,000	2.06	67,829	559	8
July	47	9,459	2,347	0.90	56,070	7,028	3,150
Aug.	44	6,514	2,120	0.26	47,480	5,216	3,003
Sep.	13	0	1,255	1.57	46,238	0	0
Oct.	0	0	1,085	0.40	45,153	0	0
Nov	1	0	715	0.00	44,439	0	0
Dec.	1	0	247	0.16	44,193	0	0
TOTAL	12,766	17,219	13,608	14.69	--	12,803	6,161

NOTE: Acres irrigated 2022: Osborne Canal 5,757 acres.

Table A-20.—Summary of 2022 Operations - Solomon Division, Glen Elder Unit

Month	Waconda Lake Inflow (AF)	Waconda Lake Outflow (AF)	Waconda Lake Gross Evap. (AF)	Waconda Lake Precip. (Inches)	Waconda Lake End of Month Content (AF)	Outflow to River City of Beloit Storage Release (AF)	Outflow to River City of Beloit Quality Bypass (AF)	Outflow to River Irrig. District Storage Release (AF)	Outflow to River Other Controlled Releases (AF)	Outflow to River Release To Mitchell Co. RWD No. 2 (AF)
Jan.	6,406	11,638	782	0.52	214,163	0	238	0	11,365	35
Feb.	4,702	11,491	953	0.00	206,421	0	0	0	11,460	31
Mar.	8,209	3,106	1,687	0.92	209,837	0	0	0	3,075	31
Apr.	8,343	1,130	6,353	0.70	210,697	0	601	0	495	34
May	25,056	808	5,566	7.44	229,379	0	780	0	0	30
June	17,497	23,399	7,695	1.69	215,782	0	179	0	23,188	32
July	11,320	15,776	7,560	3.93	203,766	0	0	0	15,741	35
Aug.	3,925	12,545	7,008	0.33	188,138	0	0	0	12,507	38
Sep.	2,706	19,618	5,279	2.36	165,947	0	0	0	19,591	27
Oct.	2,980	6,322	3,101	0.49	159,504	0	95	0	6,192	35
Nov.	1,511	745	1,556	0.42	158,714	0	714	0	0	31
Dec.	2,117	770	754	0.53	159,307	0	738	0	0	33
TOTAL	94,772	107,348	48,294	19.33	--	0	3,345	0	103,613	392

NOTE: Acres irrigated 2022: Glen Elder District 6,298 acres.

Table A-21.—Summary of 2022 Operations - Smoky Hill Division, Cedar Bluff Unit

Month	Cedar Bluff Reservoir Inflow (AF)	Cedar Bluff Reservoir Outflow (AF)	Cedar Bluff Reservoir Gross Evap. (AF)	Cedar Bluff Reservoir Precip. (Inches)	Cedar Bluff Reservoir End of Month Content (AF)	Release to: City of Russell (AF)	Release to: Fish Hatchery (AF)	Release to: Kansas Water Office (AF)
Jan.	328	0	373	0.61	98,951	0	0	0
Feb.	36	0	485	0.00	98,502	0	0	0
Mar.	711	0	711	0.99	98,502	0	0	0
Apr.	943	0	2,235	0.65	97,210	0	0	0
May	1,737	0	2,399	2.19	96,548	0	0	0
June	1,334	0	3,164	2.60	94,718	0	0	0
July	915	0	3,389	2.16	92,244	0	0	0
Aug.	6	0	2,843	0.79	89,407	0	0	0
Sep.	11	0	2,256	1.28	87,162	0	0	0
Oct.	1	0	2,045	0.16	85,118	0	0	0
Nov.	0	0	1,223	0.00	83,895	0	0	0
Dec.	2	0	667	0.03	83,230	0	0	0
TOTAL	6,024	0	21,790	11.46	--	0	0	0

Table A-22.—Box Butte Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIREMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
	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	3,991.1	9.8	0.7
FEB	18	1.0	1.9	0.1	2	0.1	0.0	0.0	3,992.2	10.6	0.8
MAR	24	1.5	3.8	0.2	2	0.1	0.0	0.0	3,993.5	11.8	1.2
APR	20	1.2	5.4	0.3	2	0.1	0.0	0.0	3,994.3	12.6	0.8
MAY	16	1.0	6.6	0.4	2	0.1	0.0	0.0	3,994.8	13.1	0.5
JUN	10	0.6	8.8	0.5	89	5.3	0.0	0.0	3,988.9	7.9	-5.2
JUL	6	0.4	10.1	0.4	226	13.9	0.0	8.4	3,979.0	2.4	-5.5
AUG	11	0.7	8.8	0.2	213	13.1	0.0	12.6	3,979.0	2.4	0.0
SEP	12	0.7	6.6	0.1	40	2.4	0.0	1.8	3,979.0	2.4	0.0
OCT	15	0.9	5.0	0.1	2	0.1	0.0	0.0	3,980.9	3.1	0.7
NOV	18	1.1	2.5	0.1	2	0.1	0.0	0.0	3,982.5	4.0	0.9
DEC	15	0.9	1.9	0.1	2	0.1	0.0	0.0	3,983.9	4.7	0.7
TOTAL		10.9	63.0	2.6		35.5	0.0	22.8			-4.4
MOST PROBABLE INFLOW CONDITIONS											
JAN	19	1.2	1.5	0.1	2	0.1	0.0	0.0	3,991.6	10.1	1.0
FEB	27	1.5	1.8	0.1	2	0.1	0.0	0.0	3,993.1	11.4	1.3
MAR	34	2.1	3.5	0.2	2	0.1	0.0	0.0	3,994.9	13.2	1.8
APR	30	1.8	5.0	0.3	2	0.1	0.0	0.0	3,996.2	14.6	1.4
MAY	23	1.4	6.1	0.4	2	0.1	0.0	0.0	3,997.0	15.5	0.9
JUN	13	0.8	8.2	0.5	70	4.2	0.0	0.0	3,993.2	11.6	-3.9
JUL	10	0.6	9.4	0.5	209	12.9	0.0	3.6	3,979.0	2.4	-9.2
AUG	16	1.0	8.2	0.2	164	10.1	0.0	9.3	3,979.0	2.4	0.0
SEP	17	1.0	6.1	0.1	29	1.7	0.0	0.8	3,979.0	2.4	0.0
OCT	19	1.2	4.7	0.1	2	0.1	0.0	0.0	3,981.3	3.4	1.0
NOV	25	1.5	2.3	0.1	2	0.1	0.0	0.0	3,983.9	4.7	1.3
DEC	21	1.3	1.8	0.1	2	0.1	0.0	0.0	3,985.8	5.8	1.1
TOTAL		15.4	58.6	2.7		29.7	0.0	13.7			-3.3
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	29	1.8	1.3	0.1	2	0.1	0.0	0.0	3,992.3	10.7	1.6
FEB	40	2.2	1.6	0.1	2	0.1	0.0	0.0	3,994.4	12.7	2.0
MAR	50	3.1	3.2	0.2	2	0.1	0.0	0.0	3,997.0	15.5	2.8
APR	44	2.6	4.6	0.3	2	0.1	0.0	0.0	3,998.7	17.7	2.2
MAY	34	2.1	5.6	0.4	2	0.1	0.0	0.0	4,000.1	19.3	1.6
JUN	20	1.2	7.5	0.6	47	2.8	0.0	0.0	3,998.3	17.1	-2.2
JUL	13	0.8	8.6	0.6	135	8.3	0.0	0.0	3,990.3	9.0	-8.1
AUG	23	1.4	7.5	0.4	104	6.4	0.0	0.0	3,981.7	3.6	-5.4
SEP	25	1.5	5.6	0.2	18	1.1	0.0	0.0	3,982.1	3.8	0.2
OCT	29	1.8	4.3	0.1	2	0.1	0.0	0.0	3,985.1	5.4	1.6
NOV	37	2.2	2.1	0.1	2	0.1	0.0	0.0	3,988.2	7.4	2.0
DEC	31	1.9	1.6	0.1	2	0.1	0.0	0.0	3,990.5	9.1	1.7
TOTAL		22.6	53.5	3.2		19.4	0.0	0.0			0.0

Table A-23.—Merritt Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR	SHORTAGE	END of	MONTH	RESERVOIR
	CFS	KAF	IN.	KAF	CFS	KAF	SPILL KAF	KAF	ELEV FT	CONT KAF	CHANGE KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	224	13.8	1.9	0.3	16	1.0	12.9	0.0	2,944.0	61.1	-0.4
FEB	246	13.7	2.6	0.4	18	1.0	12.3	0.0	2,944.0	61.1	0.0
MAR	253	15.6	3.2	0.5	16	1.0	11.3	0.0	2,945.0	63.9	2.8
APR	258	15.4	5.2	0.9	17	1.0	10.7	0.0	2,946.0	66.7	2.8
MAY	250	15.4	6.4	1.1	71	4.4	9.9	0.0	2,946.0	66.7	0.0
JUN	238	14.2	8.4	1.4	144	8.6	4.2	0.0	2,946.0	66.7	0.0
JUL	239	14.7	9.7	1.6	558	34.4	0.0	0.0	2,937.0	45.4	-21.3
AUG	245	15.1	8.4	1.0	519	32.0	0.0	0.0	2,925.9	27.5	-17.9
SEP	242	14.4	7.1	0.5	159	9.5	0.0	0.0	2,929.1	31.9	4.4
OCT	245	15.1	6.4	0.5	41	2.5	0.0	0.0	2,936.3	44.0	12.1
NOV	238	14.2	3.2	0.4	67	4.0	0.0	0.0	2,941.0	53.8	9.8
DEC	222	13.7	1.9	0.3	16	1.0	5.1	0.0	2,944.0	61.1	7.3
TOTAL		175.3	64.4	8.9		100.4	66.4	0.0			-0.4
MOST PROBABLE INFLOW CONDITIONS											
JAN	247	15.2	1.7	0.3	16	1.0	14.3	0.0	2,944.0	61.1	-0.4
FEB	270	15.0	2.3	0.4	18	1.0	13.6	0.0	2,944.0	61.1	0.0
MAR	278	17.1	2.8	0.4	16	1.0	12.9	0.0	2,945.0	63.9	2.8
APR	283	16.9	4.6	0.8	17	1.0	12.3	0.0	2,946.0	66.7	2.8
MAY	274	16.9	5.7	1.0	63	3.9	12.0	0.0	2,946.0	66.7	0.0
JUN	260	15.5	7.4	1.3	126	7.5	6.7	0.0	2,946.0	66.7	0.0
JUL	261	16.1	8.5	1.4	479	29.5	0.0	0.0	2,940.2	51.9	-14.8
AUG	268	16.5	7.4	0.9	448	27.6	0.0	0.0	2,934.1	39.9	-12.0
SEP	263	15.7	6.3	0.7	139	8.3	0.0	0.0	2,937.6	46.6	6.7
OCT	268	16.5	5.7	0.7	41	2.5	0.0	0.0	2,943.5	59.9	13.3
NOV	260	15.5	2.8	0.4	67	4.0	9.9	0.0	2,944.0	61.1	1.2
DEC	243	15.0	1.7	0.3	16	1.0	13.7	0.0	2,944.0	61.1	0.0
TOTAL		191.9	56.9	8.6		88.3	95.4	0.0			-0.4
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	284	17.5	1.5	0.2	16	1.0	16.7	0.0	2,944.0	61.1	-0.4
FEB	311	17.3	2.0	0.3	18	1.0	16.0	0.0	2,944.0	61.1	0.0
MAR	320	19.7	2.5	0.4	16	1.0	15.5	0.0	2,945.0	63.9	2.8
APR	327	19.5	4.0	0.7	17	1.0	15.0	0.0	2,946.0	66.7	2.8
MAY	317	19.5	5.1	0.9	55	3.4	15.2	0.0	2,946.0	66.7	0.0
JUN	302	18.0	6.6	1.1	106	6.3	10.6	0.0	2,946.0	66.7	0.0
JUL	302	18.6	7.6	1.3	394	24.3	0.0	0.0	2,943.4	59.7	-7.0
AUG	310	19.1	6.6	1.0	370	22.8	0.0	0.0	2,941.5	55.0	-4.7
SEP	305	18.2	5.6	0.8	116	6.9	0.0	0.0	2,945.5	65.5	10.5
OCT	310	19.1	5.1	0.9	41	2.5	20.1	0.0	2,944.0	61.1	-4.4
NOV	302	18.0	2.5	0.4	67	4.0	13.6	0.0	2,944.0	61.1	0.0
DEC	281	17.3	1.5	0.2	16	1.0	16.1	0.0	2,944.0	61.1	0.0
TOTAL		221.8	50.6	8.2		75.2	138.8	0.0			-0.4

Table A-24.—Calamus Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIREMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH		RESERVOIR CHANGE
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	ELEV FT	CONT KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	294	18.1	1.9	0.5	58	3.6	10.1	0.0	2,240.0	100.5	3.9
FEB	313	17.4	2.3	0.6	59	3.3	13.5	0.0	2,240.0	100.5	0.0
MAR	349	21.5	4.2	1.1	58	3.6	7.6	0.0	2,242.0	109.7	9.2
APR	361	21.5	6.7	1.9	59	3.5	6.3	0.0	2,244.0	119.5	9.8
MAY	399	24.6	6.9	2.0	94	5.8	16.8	0.0	2,244.0	119.5	0.0
JUN	364	21.7	8.4	2.5	144	8.6	10.6	0.0	2,244.0	119.5	0.0
JUL	341	21.0	9.6	2.8	954	58.8	0.0	0.0	2,234.7	78.9	-40.6
AUG	321	19.8	9.6	2.2	815	50.2	0.0	0.0	2,224.9	46.3	-32.6
SEP	304	18.1	7.4	1.2	470	28.0	0.0	0.0	2,220.6	35.2	-11.1
OCT	302	18.6	5.7	0.8	58	3.6	0.0	0.0	2,226.0	49.4	14.2
NOV	327	19.5	3.0	0.5	59	3.5	0.0	0.0	2,230.9	64.9	15.5
DEC	317	19.5	1.8	0.4	58	3.6	0.0	0.0	2,235.1	80.4	15.5
TOTAL		241.3	67.5	16.5		176.1	64.9	0.0			-16.2
MOST PROBABLE INFLOW CONDITIONS											
JAN	350	19.5	2.0	0.5	54	3.3	15.7	0.0	2,240.0	100.5	0.0
FEB	391	24.1	3.7	1.0	58	3.6	10.3	0.0	2,242.0	109.7	9.2
MAR	404	24.1	5.9	1.6	57	3.5	9.2	0.0	2,244.0	119.5	9.8
APR	448	27.6	6.1	1.8	88	5.4	20.4	0.0	2,244.0	119.5	0.0
MAY	409	24.4	7.5	2.2	125	7.7	14.5	0.0	2,244.0	119.5	0.0
JUN	381	23.5	8.5	2.5	872	53.7	0.0	0.0	2,236.7	86.8	-32.7
JUL	360	22.2	8.5	2.0	747	46.0	0.0	0.0	2,229.7	61.0	-25.8
AUG	341	20.3	6.6	1.3	422	26.0	0.0	0.0	2,227.5	54.0	-7.0
SEP	338	20.8	5.0	0.9	58	3.6	0.0	0.0	2,232.4	70.3	16.3
OCT	367	21.9	2.7	0.6	57	3.5	0.0	0.0	2,237.0	88.1	17.8
NOV	356	21.9	1.6	0.4	58	3.6	5.5	0.0	2,240.0	100.5	12.4
DEC	0	270.6	59.8	15.2	0	163.5	88.0	0	0.0	0.0	3.9
TOTAL		520.9	117.9	30.0		323.4	163.6	0.0			3.9
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	489	30.1	3.3	0.9	58	3.6	16.4	0.0	2,242.0	109.7	9.2
FEB	505	30.1	5.3	1.5	59	3.5	15.3	0.0	2,244.0	119.5	9.8
MAR	560	34.5	5.5	1.6	81	5.0	27.9	0.0	2,244.0	119.5	0.0
APR	510	30.4	6.6	2.0	114	6.8	21.6	0.0	2,244.0	119.5	0.0
MAY	477	29.4	7.5	2.2	834	51.4	0.0	0.0	2,238.8	95.3	-24.2
JUN	450	27.7	7.5	1.9	734	45.2	0.0	0.0	2,233.9	75.9	-19.4
JUL	424	25.3	5.8	1.3	493	29.4	0.0	0.0	2,232.5	70.5	-5.4
AUG	422	26.0	4.5	0.9	58	3.6	0.0	0.0	2,238.0	92.0	21.5
SEP	460	27.4	2.4	0.6	59	3.5	14.8	0.0	2,240.0	100.5	8.5
OCT	445	27.4	1.4	0.4	58	3.6	23.4	0.0	2,240.0	100.5	0.0
NOV	0	337.9	53.1	14.2	0	162.5	157.3	0.0	0.0	0.0	3.9
DEC	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		626.2	102.9	27.5		318.1	276.7	0.0			3.9

Table A-25.—Davis Creek Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL		SHORTAGE	END OF MONTH		RESERVOIR
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	CONT	CHANGE	
REASONABLE MINIMUM INFLOW CONDITIONS												
JAN	0	0.0	1.9	0.1	6	0.4	0.0	0.0	2,054.0	12.3	-0.5	
FEB	0	0.0	2.3	0.1	7	0.4	0.0	0.0	2,053.1	11.8	-0.5	
MAR	0	0.0	4.1	0.1	6	0.4	0.0	0.0	2,052.2	11.3	-0.5	
APR	57	3.4	6.6	0.2	7	0.4	0.0	0.0	2,056.8	14.1	2.8	
MAY	239	14.7	7.0	0.3	57	3.5	0.0	0.0	2,070.2	25.0	10.9	
JUN	240	14.3	8.5	0.5	127	7.6	0.0	0.0	2,076.0	31.2	6.2	
JUL	239	14.7	9.0	0.6	297	18.3	0.0	0.0	2,072.1	27.0	-4.2	
AUG	162	10.0	7.0	0.4	273	16.8	0.0	0.0	2,064.5	19.8	-7.2	
SEP	59	3.5	6.1	0.3	133	7.9	0.0	0.0	2,058.3	15.1	-4.7	
OCT	0	0.0	5.5	0.2	6	0.4	0.0	0.0	2,057.4	14.5	-0.6	
NOV	0	0.0	2.9	0.1	7	0.4	0.0	0.0	2,056.7	14.0	-0.5	
DEC	0	0.0	1.7	0.1	6	0.4	0.0	0.0	2,055.9	13.5	-0.5	
TOTAL		60.6	62.6	3.0		56.9	0.0	0.0			0.7	
MOST PROBABLE INFLOW CONDITIONS												
JAN	0	0.0	1.8	0.1	6	0.4	0.0	0.0	2,054.0	12.3	-0.5	
FEB	0	0.0	2.2	0.1	7	0.4	0.0	0.0	2,053.1	11.8	-0.5	
MAR	0	0.0	3.9	0.1	6	0.4	0.0	0.0	2,052.2	11.3	-0.5	
APR	59	3.5	6.1	0.2	6	0.4	0.0	0.0	2,057.0	14.2	2.9	
MAY	239	14.7	6.6	0.3	42	2.6	0.0	0.0	2,071.2	26.0	11.8	
JUN	198	11.8	7.9	0.5	99	6.1	0.0	0.0	2,076.0	31.2	5.2	
JUL	179	11.0	8.4	0.6	231	14.2	0.0	0.0	2,072.5	27.4	-3.8	
AUG	112	6.9	6.6	0.4	211	13.0	0.0	0.0	2,065.8	20.9	-6.5	
SEP	10	0.6	5.7	0.3	99	6.1	0.0	0.0	2,058.3	15.1	-5.8	
OCT	0	0.0	5.1	0.2	6	0.4	0.0	0.0	2,057.4	14.5	-0.6	
NOV	0	0.0	2.7	0.1	6	0.4	0.0	0.0	2,056.7	14.0	-0.5	
DEC	0	0.0	1.6	0.1	6	0.4	0.0	0.0	2,055.9	13.5	-0.5	
TOTAL		48.5	58.6	3.0		44.8	0.0	0.0			0.7	
REASONABLE MAXIMUM INFLOW CONDITIONS												
JAN	0	0.0	1.7	0.1	6	0.4	0.0	0.0	2,054.0	12.3	-0.5	
FEB	0	0.0	2.0	0.1	7	0.4	0.0	0.0	2,053.1	11.8	-0.5	
MAR	0	0.0	3.6	0.1	6	0.4	0.0	0.0	2,052.2	11.3	-0.5	
APR	12	0.7	5.8	0.2	7	0.4	0.0	0.0	2,052.4	11.4	0.1	
MAY	239	14.7	6.2	0.2	32	2.0	0.0	0.0	2,069.0	23.9	12.5	
JUN	206	12.3	7.4	0.4	77	4.6	0.0	0.0	2,076.0	31.2	7.3	
JUL	114	7.0	7.9	0.5	172	10.6	0.0	0.0	2,072.2	27.1	-4.1	
AUG	67	4.1	6.2	0.4	156	9.6	0.0	0.0	2,066.1	21.2	-5.9	
SEP	0	0.0	5.4	0.3	97	5.8	0.0	0.0	2,058.3	15.1	-6.1	
OCT	0	0.0	4.8	0.2	6	0.4	0.0	0.0	2,057.4	14.5	-0.6	
NOV	0	0.0	2.5	0.1	7	0.4	0.0	0.0	2,056.7	14.0	-0.5	
DEC	0	0.0	1.5	0.1	6	0.4	0.0	0.0	2,055.9	13.5	-0.5	
TOTAL		38.8	55.0	2.7		35.4	0.0	0.0			0.7	

Table A-26.—Bonny Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
	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	3,638.0	0.0	0.0
FEB	3	0.2	3.1	0.0	2	0.1	0.1	0.0	3,638.0	0.0	0.0
MAR	3	0.2	3.9	0.0	2	0.1	0.1	0.0	3,638.0	0.0	0.0
APR	5	0.3	6.2	0.0	2	0.1	0.2	0.0	3,638.0	0.0	0.0
MAY	5	0.3	7.7	0.0	2	0.1	0.2	0.0	3,638.0	0.0	0.0
JUN	5	0.3	10.0	0.0	2	0.1	0.2	0.0	3,638.0	0.0	0.0
JUL	2	0.1	11.6	0.0	2	0.1	0.0	0.0	3,638.0	0.0	0.0
AUG	2	0.1	10.0	0.0	2	0.1	0.0	0.0	3,638.0	0.0	0.0
SEP	2	0.1	8.5	0.0	2	0.1	0.0	0.0	3,638.0	0.0	0.0
OCT	2	0.1	7.7	0.0	2	0.1	0.0	0.0	3,638.0	0.0	0.0
NOV	3	0.2	3.9	0.0	2	0.1	0.1	0.0	3,638.0	0.0	0.0
DEC	3	0.2	2.3	0.0	2	0.1	0.1	0.0	3,638.0	0.0	0.0
TOTAL		2.3	77.2	0.0		1.2	1.1	0.0			0.0
MOST PROBABLE INFLOW CONDITIONS											
JAN	8	0.5	2.1	0.0	2	0.1	0.4	0.0	3,638.0	0.0	0.0
FEB	7	0.4	2.7	0.0	2	0.1	0.3	0.0	3,638.0	0.0	0.0
MAR	8	0.5	3.4	0.0	2	0.1	0.4	0.0	3,638.0	0.0	0.0
APR	10	0.6	5.5	0.0	2	0.1	0.5	0.0	3,638.0	0.0	0.0
MAY	11	0.7	6.9	0.0	2	0.1	0.6	0.0	3,638.0	0.0	0.0
JUN	10	0.6	8.9	0.0	2	0.1	0.5	0.0	3,638.0	0.0	0.0
JUL	5	0.3	10.3	0.0	2	0.1	0.2	0.0	3,638.0	0.0	0.0
AUG	3	0.2	8.9	0.0	2	0.1	0.1	0.0	3,638.0	0.0	0.0
SEP	2	0.1	7.6	0.0	2	0.1	0.0	0	3,638.0	0.0	0.0
OCT	3	0.2	6.9	0.0	2	0.1	0.1	0.0	3,638.0	0.0	0.0
NOV	7	0.4	3.4	0.0	2	0.1	0.3	0.0	3,638.0	0.0	0.0
DEC	6	0.4	2.1	0.0	2	0.1	0.3	0.0	3,638.0	0.0	0.0
TOTAL		4.9	68.7	0.0		1.2	3.7	0.0			0.0
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	18	1.1	1.8	0.0	2	0.1	1.0	0.0	3,638.0	0.0	0.0
FEB	17	1.0	2.5	0.0	2	0.1	0.9	0.0	3,638.0	0.0	0.0
MAR	19	1.2	3.1	0.0	2	0.1	1.1	0.0	3,638.0	0.0	0.0
APR	22	1.3	4.9	0.0	2	0.1	1.2	0.0	3,638.0	0.0	0.0
MAY	24	1.5	6.1	0.0	2	0.1	1.4	0.0	3,638.0	0.0	0.0
JUN	22	1.3	8.0	0.0	2	0.1	1.2	0.0	3,638.0	0.0	0.0
JUL	11	0.7	9.2	0.0	2	0.1	0.6	0.0	3,638.0	0.0	0.0
AUG	8	0.5	8.0	0.0	2	0.1	0.4	0.0	3,638.0	0.0	0.0
SEP	5	0.3	6.8	0.0	2	0.1	0.2	0.0	3,638.0	0.0	0.0
OCT	8	0.5	6.1	0.0	2	0.1	0.4	0.0	3,638.0	0.0	0.0
NOV	15	0.9	3.1	0.0	2	0.1	0.8	0.0	3,638.0	0.0	0.0
DEC	15	0.9	1.8	0.0	2	0.1	0.8	0.0	3,638.0	0.0	0.0
TOTAL		11.2	61.4	0.0		1.2	10.0	0.0			0.0

Table A-27.—Enders Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIREMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	END OF MONTH CONT	RESERVOIR CHANGE
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	5	0.3	1.5	0.0	3	0.2	0.0	0.0	3,078.2	6.6	0.1
FEB	5	0.3	1.7	0.1	4	0.2	0.0	0.0	3,078.2	6.6	0.0
MAR	5	0.3	2.9	0.1	3	0.2	0.0	0.0	3,078.2	6.6	0.0
APR	5	0.3	6.2	0.2	3	0.2	0.0	0.0	3,078.0	6.5	-0.1
MAY	5	0.3	7.9	0.2	3	0.2	0.0	0.0	3,077.8	6.4	-0.1
JUN	5	0.3	10.0	0.3	176	10.5	0.0	10.3	3,077.4	6.2	-0.2
JUL	6	0.4	11.0	0.3	532	32.8	0.0	32.6	3,077.2	6.1	-0.1
AUG	5	0.3	9.3	0.3	505	31.1	0.0	30.9	3,076.8	5.9	-0.2
SEP	5	0.3	6.9	0.2	75	4.5	0.0	4.3	3,076.6	5.8	-0.1
OCT	5	0.3	4.4	0.1	3	0.2	0.0	0.0	3,076.6	5.8	0.0
NOV	5	0.3	3.2	0.1	3	0.2	0.0	0.0	3,076.6	5.8	0.0
DEC	5	0.3	1.8	0.1	3	0.2	0.0	0.0	3,076.6	5.8	0.0
TOTAL		3.7	66.8	2.0		80.5	0.0	78.1			-0.7
MOST PROBABLE INFLOW CONDITIONS											
JAN	6	0.4	1.3	0.0	3	0.2	0.0	0	3,078.5	6.7	0.2
FEB	7	0.4	1.5	0.0	3	0.2	0.0	0	3,078.8	6.9	0.2
MAR	6	0.4	2.5	0.1	3	0.2	0.0	0	3,079.0	7.0	0.1
APR	7	0.4	5.4	0.2	3	0.2	0.0	0	3,079.0	7.0	0.0
MAY	6	0.4	6.9	0.2	3	0.2	0.0	0	3,079.0	7.0	0.0
JUN	7	0.4	8.7	0.3	114	7.0	0.0	7	3,078.8	6.9	-0.1
JUL	8	0.5	9.6	0.3	487	30.0	0.0	30	3,078.8	6.9	0.0
AUG	6	0.4	8.1	0.3	388	23.9	0.0	24	3,078.6	6.8	-0.1
SEP	7	0.4	6.0	0.2	36	2.2	0.0	2	3,078.6	6.8	0.0
OCT	6	0.4	3.8	0.1	3	0.2	0.0	0	3,078.8	6.9	0.1
NOV	7	0.4	2.8	0.1	3	0.2	0.0	0	3,079.0	7.0	0.1
DEC	6	0.4	1.6	0.1	3	0.2	0.0	0	3,079.2	7.1	0.1
TOTAL		4.9	58.2	1.9		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	3,079.0	7.0	0.5
FEB	11	0.6	1.3	0.0	4	0.2	0.0	0.0	3,079.7	7.4	0.4
MAR	11	0.7	2.3	0.1	3	0.2	0.0	0.0	3,080.4	7.8	0.4
APR	12	0.7	4.9	0.2	3	0.2	0.0	0.0	3,081.0	8.1	0.3
MAY	11	0.7	6.2	0.2	3	0.2	0.0	0.0	3,081.5	8.4	0.3
JUN	12	0.7	7.9	0.3	40	2.4	0.0	2.2	3,081.8	8.6	0.2
JUL	13	0.8	8.7	0.3	297	18.3	0.0	18.1	3,082.4	8.9	0.3
AUG	11	0.7	7.4	0.3	229	14.1	0.0	13.7	3,082.4	8.9	0.0
SEP	10	0.6	5.5	0.2	3	0.2	0.0	0.0	3,082.6	9.1	0.2
OCT	10	0.6	3.5	0.1	3	0.2	0.0	0.0	3,083.1	9.4	0.3
NOV	10	0.6	2.5	0.1	3	0.2	0.0	0.0	3,083.6	9.7	0.3
DEC	10	0.6	1.4	0.1	3	0.2	0.0	0.0	3,084.0	10.0	0.3
TOTAL		8.0	52.8	1.9		36.6	0.0	34.0			3.5

Table A-28.—Swanson Lake Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE		RESERVOIR		END OF MONTH		RESERVOIR
	CFS	KAF	IN.	KAF	CFS	KAF	SPILL	SHORTAGE	ELEV	CONT	CHANGE
							KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	19	1.2	1.5	0.2	2	0.1	0.0	0.0	2,727.9	25.4	0.9
FEB	31	1.7	1.6	0.2	2	0.1	0.0	0.0	2,728.5	26.8	1.4
MAR	34	2.1	3.0	0.4	2	0.1	0.0	0.0	2,729.2	28.4	1.6
APR	37	2.2	6.5	0.9	2	0.1	0.0	0.0	2,729.7	29.6	1.2
MAY	32	2.0	7.7	1.1	3	0.2	0.0	0.0	2,730.0	30.3	0.7
JUN	27	1.6	9.9	1.5	89	5.3	0.0	0.0	2,727.8	25.1	-5.2
JUL	15	0.9	9.9	1.3	377	23.2	0.0	17.5	2,725.0	19.0	-6.1
AUG	8	0.5	9.9	1.2	323	19.9	0.0	19.8	2,724.6	18.2	-0.8
SEP	3	0.2	7.7	0.9	69	4.1	0.0	4.0	2,724.2	17.4	-0.8
OCT	5	0.3	4.7	0.5	2	0.1	0.0	0.0	2,724.0	17.1	-0.3
NOV	13	0.8	3.2	0.4	2	0.1	0.0	0.0	2,724.2	17.4	0.3
DEC	16	1.0	1.8	0.2	2	0.1	0.0	0.0	2,724.5	18.1	0.7
TOTAL		14.5	67.4	8.8		53.4	0.0	41.3			-6.4
MOST PROBABLE INFLOW CONDITIONS											
JAN	32	2.0	1.3	0.2	2	0.1	0.0	0.0	2,728.3	26.2	1.7
FEB	52	2.9	1.4	0.2	2	0.1	0.0	0.0	2,729.4	28.8	2.6
MAR	58	3.6	2.7	0.4	2	0.1	0.0	0.0	2,730.6	31.9	3.1
APR	64	3.8	5.8	0.9	2	0.1	0.0	0.0	2,731.7	34.7	2.8
MAY	57	3.5	6.9	1.1	3	0.2	0.0	0.0	2,732.5	36.9	2.2
JUN	45	2.7	8.9	1.4	63	3.9	0.0	0.0	2,731.5	34.3	-2.6
JUL	24	1.5	8.9	1.4	299	18.4	0.0	3	2,725.0	19.0	-15.3
AUG	13	0.8	8.9	1.0	256	15.8	0.0	16	2,724.9	18.7	-0.3
SEP	7	0.4	6.9	0.8	29	1.8	0.0	2	2,724.6	18.2	-0.5
OCT	10	0.6	4.2	0.5	2	0.1	0.0	0	2,724.6	18.2	0.0
NOV	23	1.4	2.9	0.3	2	0.1	0.0	0.0	2,725.1	19.2	1.0
DEC	26	1.6	1.6	0.2	2	0.1	0.0	0.0	2,725.7	20.5	1.3
TOTAL		24.8	60.4	8.4		40.8	0.0	20.4			-4.0
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	54	3.3	1.2	0.2	2	0.1	0.0	0.0	2,728.8	27.5	3.0
FEB	83	4.6	1.3	0.2	2	0.1	0.0	0.0	2,730.6	31.8	4.3
MAR	93	5.7	2.4	0.4	2	0.1	0.0	0.0	2,732.5	37.0	5.2
APR	102	6.1	5.3	0.9	2	0.1	0.0	0.0	2,734.3	42.1	5.1
MAY	93	5.7	6.3	1.1	3	0.2	0.0	0.0	2,735.7	46.5	4.4
JUN	74	4.4	8.1	1.4	54	3.2	0.0	0.0	2,735.7	46.3	-0.2
JUL	39	2.4	8.1	1.4	208	12.8	0.0	0.0	2,731.6	34.5	-11.8
AUG	21	1.3	8.1	1.3	183	11.3	0.0	0.0	2,726.9	23.2	-11.3
SEP	10	0.6	6.3	0.8	25	1.5	0.0	0.0	2,726.2	21.5	-1.7
OCT	16	1.0	3.9	0.5	2	0.1	0.0	0.0	2,726.4	21.9	0.4
NOV	39	2.3	2.6	0.3	2	0.1	0.0	0.0	2,727.3	23.8	1.9
DEC	42	2.6	1.4	0.2	2	0.1	0.0	0.0	2,728.2	26.1	2.3
TOTAL		40.0	55.0	8.7		29.7	0.0	0.0			1.6

Table A-29.—Hugh Butler Lake Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIREMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH		RESERVOIR CHANGE	
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	ELEV FT	CONT KAF	KAF	
REASONABLE MINIMUM INFLOW CONDITIONS												
JAN	8	0.5	1.3	0.1	2	0.1	0.0	0.0	2,561.1	11.3	0.3	
FEB	11	0.6	1.4	0.1	2	0.1	0.0	0.0	2,561.6	11.7	0.4	
MAR	11	0.7	2.6	0.1	2	0.1	0.0	0.0	2,562.2	12.2	0.5	
APR	12	0.7	7.2	0.4	2	0.1	0.0	0.0	2,562.4	12.4	0.2	
MAY	11	0.7	8.5	0.4	2	0.1	0.0	0.0	2,562.6	12.6	0.2	
JUN	12	0.7	10.4	0.5	28	1.6	0.0	0.0	2,560.9	11.2	-1.4	
JUL	10	0.6	11.5	0.5	71	4.4	0.0	4.3	2,560.9	11.2	0.0	
AUG	10	0.6	10.3	0.5	61	3.7	0.0	3.6	2,560.9	11.2	0.0	
SEP	7	0.4	7.9	0.4	13	0.8	0.0	0.7	2,560.8	11.1	-0.1	
OCT	6	0.4	5.0	0.2	2	0.1	0.0	0.0	2,560.9	11.2	0.1	
NOV	8	0.5	3.0	0.1	2	0.1	0.0	0.0	2,561.3	11.5	0.3	
DEC	8	0.5	1.6	0.1	2	0.1	0.0	0.0	2,561.7	11.8	0.3	
TOTAL		6.9	70.7	3.4		11.3	0.0	8.6			0.8	
MOST PROBABLE INFLOW CONDITIONS												
JAN	11	0.7	1.1	0.1	2	0.1	0.0	0.0	2,561.3	11.5	0.5	
FEB	14	0.8	1.2	0.1	2	0.1	0.0	0.0	2,562.0	12.1	0.6	
MAR	16	1.0	2.3	0.1	2	0.1	0.0	0.0	2,562.9	12.9	0.8	
APR	17	1.0	6.4	0.3	2	0.1	0.0	0.0	2,563.6	13.5	0.6	
MAY	18	1.1	7.5	0.4	2	0.1	0.0	0.0	2,564.3	14.1	0.6	
JUN	18	1.1	9.2	0.5	22	1.3	0.0	0.0	2,563.5	13.4	-0.7	
JUL	13	0.8	10.2	0.5	61	3.7	0.0	1	2,560.9	11.2	-2.2	
AUG	15	0.9	9.1	0.4	50	3.1	0.0	3	2,560.9	11.2	0.0	
SEP	10	0.6	7.0	0.3	11	0.7	0.0	0	2,560.9	11.2	0.0	
OCT	10	0.6	4.4	0.2	2	0.1	0.0	0.0	2,561.3	11.5	0.3	
NOV	12	0.7	2.7	0.1	2	0.1	0.0	0.0	2,561.9	12.0	0.5	
DEC	11	0.7	1.4	0.1	2	0.1	0.0	0.0	2,562.5	12.5	0.5	
TOTAL		10.0	62.5	3.1		9.6	0.0	4.2			1.5	
REASONABLE MAXIMUM INFLOW CONDITIONS												
JAN	18	1.1	1.0	0.0	2	0.1	0.0	0.0	2,561.9	12.0	1.0	
FEB	23	1.3	1.1	0.1	2	0.1	0.0	0.0	2,563.2	13.1	1.1	
MAR	28	1.7	2.1	0.1	2	0.1	0.0	0.0	2,564.8	14.6	1.5	
APR	27	1.6	5.8	0.3	2	0.1	0.0	0.0	2,566.1	15.8	1.2	
MAY	29	1.8	6.9	0.4	2	0.1	0.0	0.0	2,567.4	17.1	1.3	
JUN	29	1.7	8.4	0.5	16	1.0	0.0	0.0	2,567.6	17.3	0.2	
JUL	23	1.4	9.3	0.6	44	2.7	0.0	0.0	2,565.6	15.4	-1.9	
AUG	23	1.4	8.3	0.5	37	2.3	0.0	0.0	2,564.1	14.0	-1.4	
SEP	15	0.9	6.4	0.3	7	0.4	0.0	0.0	2,564.3	14.2	0.2	
OCT	16	1.0	4.1	0.2	2	0.1	0.0	0.0	2,565.1	14.9	0.7	
NOV	18	1.1	2.5	0.1	2	0.1	0.0	0.0	2,566.0	15.8	0.9	
DEC	18	1.1	1.3	0.1	2	0.1	0.0	0.0	2,566.9	16.7	0.9	
TOTAL		16.1	57.2	3.2		7.3	0.0	0.0			5.7	

Table A-30.—Harry Strunk Lake Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE		RESERVOIR		END OF MONTH		RESERVOIR
	CFS	KAF	IN.	KAF	CFS	KAF	SPILL	SHORTAGE	ELEV	CONT	CHANGE
							KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	34	2.1	1.3	0.1	2	0.1	0.0	0.0	2,356.9	21.1	1.9
FEB	43	2.4	1.4	0.1	2	0.1	0.0	0.0	2,358.6	23.3	2.2
MAR	45	2.8	2.6	0.2	2	0.1	0.0	0.0	2,360.5	25.8	2.5
APR	44	2.6	7.1	0.6	2	0.1	0.0	0.0	2,361.8	27.7	1.9
MAY	49	3.0	8.2	0.7	2	0.1	0.0	0.0	2,363.3	29.9	2.2
JUN	49	2.9	10.2	0.9	89	5.3	0.0	0.0	2,361.1	26.6	-3.3
JUL	45	2.8	11.3	0.9	318	19.6	0.0	0.0	2,344.4	8.9	-17.7
AUG	36	2.2	10.0	0.4	268	16.5	0.0	13.7	2,343.0	7.9	-1.0
SEP	23	1.4	7.8	0.3	27	1.6	0.0	0.5	2,343.0	7.9	0.0
OCT	29	1.8	5.1	0.2	2	0.1	0.0	0.0	2,345.1	9.4	1.5
NOV	32	1.9	3.1	0.1	2	0.1	0.0	0.0	2,347.2	11.1	1.7
DEC	31	1.9	1.6	0.1	2	0.1	0.0	0.0	2,349.1	12.8	1.7
TOTAL		27.8	69.7	4.6		43.8	0.0	14.2			-6.4
MOST PROBABLE INFLOW CONDITIONS											
JAN	49	3.0	1.2	0.1	2	0.1	0.0	0.0	2,357.6	22.0	2.8
FEB	61	3.4	1.2	0.1	2	0.1	0.0	0.0	2,360.0	25.2	3.2
MAR	65	4.0	2.3	0.2	2	0.1	0.0	0.0	2,362.6	28.9	3.7
APR	64	3.8	6.3	0.6	2	0.1	0.0	0.0	2,364.6	32.0	3.1
MAY	70	4.3	7.3	0.7	2	0.1	0.9	0.0	2,366.1	34.6	2.6
JUN	72	4.3	9.1	1.0	74	4.4	0.0	0.0	2,365.4	33.5	-1.1
JUL	67	4.1	10.0	1.0	265	16.3	0.0	0.0	2,356.2	20.3	-13.2
AUG	52	3.2	8.9	0.6	222	13.7	0.0	0.0	2,344.8	9.2	-11.1
SEP	35	2.1	6.9	0.3	20	1.2	0.0	0.0	2,345.6	9.8	0.6
OCT	42	2.6	4.5	0.2	2	0.1	0.0	0.0	2,348.4	12.1	2.3
NOV	47	2.8	2.7	0.1	2	0.1	0.0	0.0	2,351.1	14.7	2.6
DEC	45	2.8	1.4	0.1	2	0.1	0.0	0.0	2,353.6	17.3	2.6
TOTAL		40.4	61.8	5.0		36.4	0.9	0.0			-1.9
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	76	4.7	1.0	0.1	2	0.1	0.0	0.0	2,358.9	23.7	4.5
FEB	97	5.4	1.1	0.1	2	0.1	0.0	0.0	2,362.6	28.9	5.2
MAR	102	6.3	2.0	0.2	2	0.1	0.3	0.0	2,366.1	34.6	5.7
APR	101	6.0	5.6	0.6	2	0.1	5.3	0.0	2,366.1	34.6	0.0
MAY	109	6.7	6.5	0.7	2	0.1	5.9	0.0	2,366.1	34.6	0.0
JUN	112	6.7	8.1	0.9	47	2.8	3.0	0.0	2,366.1	34.6	0.0
JUL	104	6.4	9.0	1.0	182	11.2	0.0	0.0	2,362.6	28.8	-5.8
AUG	83	5.1	7.9	0.7	154	9.5	0.0	0.0	2,358.9	23.7	-5.1
SEP	54	3.2	6.2	0.5	2	0.1	0.0	0.0	2,360.8	26.3	2.6
OCT	67	4.1	4.0	0.3	2	0.1	0.0	0.0	2,363.3	30.0	3.7
NOV	75	4.5	2.4	0.2	2	0.1	0.0	0.0	2,365.8	34.2	4.2
DEC	71	4.4	1.3	0.1	2	0.1	3.8	0.0	2,366.1	34.6	0.4
TOTAL		63.5	55.1	5.4		24.4	18.3	0.0			15.4

Table A-31.—Keith Sebelius Lake Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	END OF MONTH CONT	RESERVOIR CHANGE
	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	2,290.5	12.2	-0.1
FEB	4	0.2	1.8	0.1	2	0.1	0.0	0.0	2,290.5	12.2	0.0
MAR	5	0.3	3.0	0.2	2	0.1	0.0	0.0	2,290.5	12.2	0.0
APR	7	0.4	7.9	0.5	2	0.1	0.0	0.0	2,290.3	12.0	-0.2
MAY	10	0.6	8.7	0.6	6	0.4	0.0	0.0	2,289.9	11.6	-0.4
JUN	12	0.7	11.0	0.7	57	3.4	0.0	1.9	2,288.4	10.1	-1.5
JUL	8	0.5	12.3	0.7	146	9.0	0.0	8.9	2,288.1	9.8	-0.3
AUG	8	0.5	11.0	0.6	138	8.5	0.0	8.4	2,287.9	9.6	-0.2
SEP	3	0.2	8.7	0.5	27	1.6	0.0	1.5	2,287.4	9.2	-0.4
OCT	2	0.1	6.0	0.3	2	0.1	0.0	0.0	2,287.1	8.9	-0.3
NOV	2	0.1	3.3	0.2	2	0.1	0.0	0.0	2,286.9	8.7	-0.2
DEC	2	0.1	1.7	0.1	2	0.1	0.0	0.0	2,286.8	8.6	-0.1
TOTAL		3.8	76.9	4.6		23.6	0.0	20.7			-3.7
MOST PROBABLE INFLOW CONDITIONS											
JAN	3	0.2	1.4	0.1	2	0.1	0.0	0.0	2,290.6	12.3	0.0
FEB	5	0.3	1.6	0.1	2	0.1	0.0	0.0	2,290.7	12.4	0.1
MAR	10	0.6	2.7	0.2	2	0.1	0.0	0.0	2,290.9	12.7	0.3
APR	10	0.6	7.0	0.5	2	0.1	0.0	0.0	2,290.9	12.7	0.0
MAY	15	0.9	7.7	0.5	3	0.2	0.0	0.0	2,291.1	12.9	0.2
JUN	20	1.2	9.8	0.7	45	2.8	0.0	0.0	2,288.9	10.6	-2.3
JUL	15	0.9	10.9	0.6	138	8.5	0.0	8	2,288.4	10.1	-0.5
AUG	13	0.8	9.8	0.5	112	6.9	0.0	7	2,288.4	10.1	0.0
SEP	7	0.4	7.7	0.4	21	1.3	0.0	1	2,288.3	10.0	-0.1
OCT	3	0.2	5.3	0.3	2	0.1	0.0	0	2,288.1	9.8	-0.2
NOV	3	0.2	2.9	0.2	2	0.1	0.0	0	2,288.0	9.7	-0.1
DEC	3	0.2	1.5	0.1	2	0.1	0.0	0	2,288.0	9.7	0.0
TOTAL		6.5	68.3	4.2		20.4	0.0	15.5			-2.6
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	6	0.4	1.2	0.1	2	0.1	0.0	0.0	2,290.8	12.5	0.2
FEB	11	0.6	1.5	0.1	2	0.1	0.0	0.0	2,291.1	12.9	0.4
MAR	18	1.1	2.4	0.2	2	0.1	0.0	0.0	2,291.8	13.7	0.8
APR	20	1.2	6.2	0.4	2	0.1	0.0	0.0	2,292.3	14.4	0.7
MAY	29	1.8	6.9	0.5	3	0.2	0.0	0.0	2,293.3	15.5	1.1
JUN	39	2.3	8.8	0.7	27	1.6	0.0	0.0	2,293.3	15.5	0.0
JUL	28	1.7	9.8	0.7	71	4.4	0.0	0.0	2,290.4	12.1	-3.4
AUG	24	1.5	8.8	0.6	68	4.2	0.0	1.3	2,288.4	10.1	-2.0
SEP	12	0.7	6.9	0.4	15	0.9	0.0	0.0	2,287.8	9.5	-0.6
OCT	5	0.3	4.8	0.3	2	0.1	0.0	0.0	2,287.7	9.4	-0.1
NOV	7	0.4	2.6	0.1	2	0.1	0.0	0.0	2,287.9	9.6	0.2
DEC	6	0.4	1.3	0.1	2	0.1	0.0	0.0	2,288.1	9.8	0.2
TOTAL		12.4	61.2	4.2		12.0	0.0	1.3			-2.5

Table A-32.—Harlan County Lake Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIREMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	CONT	RESERVOIR CHANGE
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	FT	KAF	KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	39	2.4	1.4	1.3	0	0.0	0.0	0.0	1,938.8	229.9	1.1
FEB	59	3.3	1.6	1.5	0	0.0	0.0	0.0	1,939.0	231.7	1.8
MAR	80	4.9	2.8	2.6	0	0.0	0.0	0.0	1,939.2	234.0	2.3
APR	69	4.1	6.5	6.1	0	0.0	0.0	0.0	1,939.0	232.0	-2.0
MAY	88	5.4	8.0	7.5	5	0.3	0.0	0.0	1,938.8	229.6	-2.4
JUN	72	4.3	9.6	9.0	274	16.4	0.0	0.0	1,936.9	208.5	-21.1
JUL	73	4.5	10.7	9.5	694	42.8	0.0	0.0	1,932.1	160.7	-47.8
AUG	58	3.6	9.4	7.2	587	36.2	0.0	2.2	1,927.6	123.2	-37.5
SEP	29	1.7	7.5	4.8	55	3.3	0.0	3.3	1,927.2	120.1	-3.1
OCT	28	1.7	5.1	3.2	0	0.0	0.0	0.0	1,927.1	118.6	-1.5
NOV	37	2.2	3.2	2.0	0	0.0	0.0	0.0	1,927.1	118.8	0.2
DEC	36	2.2	2.0	1.2	0	0.0	0.0	0.0	1,927.2	119.8	1.0
TOTAL		40.3	67.8	55.9		98.9	0.0	5.5			-109.0
MOST PROBABLE INFLOW CONDITIONS											
JAN	97	6.0	1.2	1.1	0	0.0	0.0	0	1,939.2	233.7	4.9
FEB	153	8.5	1.4	1.3	0	0.0	0.0	0	1,939.8	240.9	7.2
MAR	206	12.7	2.4	2.3	0	0.0	0.0	0	1,940.7	251.3	10.4
APR	178	10.6	5.7	5.7	0	0.0	0.0	0	1,941.1	256.2	4.9
MAY	224	13.8	7.0	7.1	0	0.0	0.0	0	1,941.6	262.9	6.7
JUN	186	11.1	8.4	8.6	49	2.9	0.0	0	1,941.6	262.5	-0.4
JUL	188	11.6	9.4	9.6	448	27.6	0.0	0	1,939.5	236.9	-25.6
AUG	153	9.4	8.3	7.9	388	23.9	0.0	0	1,937.4	214.5	-22.4
SEP	75	4.5	6.5	5.9	27	1.6	0.0	0	1,937.2	211.5	-3.0
OCT	71	4.4	4.5	4.0	0	0.0	0.0	0	1,937.2	211.9	0.4
NOV	94	5.6	2.8	2.5	0	0.0	0.0	0	1,937.5	215.0	3.1
DEC	93	5.7	1.8	1.6	0	0.0	0.0	0	1,937.9	219.1	4.1
TOTAL		103.9	59.4	57.6		56.0	0.0	0.0			-9.7
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	234	14.4	1.1	1.0	0	0.0	0.0	0.0	1,939.9	242.2	13.4
FEB	367	20.4	1.3	1.2	0	0.0	0.0	0.0	1,941.5	261.4	19.2
MAR	492	30.3	2.1	2.1	0	0.0	0.0	0.0	1,943.8	289.6	28.2
APR	424	25.3	5.0	5.3	0	0.0	0.0	0.0	1,945.3	309.6	20.0
MAY	536	33.0	6.2	6.8	0	0.0	21.7	0.0	1,945.7	314.1	4.5
JUN	446	26.6	7.4	8.2	37	2.2	16.2	0.0	1,945.7	314.1	0.0
JUL	451	27.8	8.3	9.2	143	8.8	9.8	0.0	1,945.7	314.1	0.0
AUG	364	22.4	7.3	8.1	136	8.4	5.9	0.0	1,945.7	314.1	0.0
SEP	179	10.7	5.8	6.4	20	1.2	3.1	0.0	1,945.7	314.1	0.0
OCT	169	10.4	3.9	4.3	0	0.0	6.1	0.0	1,945.7	314.1	0.0
NOV	225	13.4	2.5	2.8	0	0.0	10.6	0.0	1,945.7	314.1	0.0
DEC	222	13.7	1.6	1.8	0	0.0	11.9	0.0	1,945.7	314.1	0.0
TOTAL		248.4	52.5	57.2		20.6	85.3	0.0			85.3

Table A-33.—Lovewell Reservoir Operation Estimates – 2023

MONTH	WHITE ROCK CREEK INFLOW	COURTLAND CANAL INFLOW	EVAPORATION		RELEASE REQUIREMENT		RESERVOIR		END OF MONTH		RESERVOIR
	KAF	KAF	IN.	KAF	CFS	KAF	SPILL KAF	SHORTAGE KAF	ELEV FT	CONT KAF	CHANGE KAF
REASONABLE MINIMUM INFLOW CONDITIONS											
JAN	0.4	2.2	1.2	0.0	0	0.0	0.0	0.0	1,579.6	26.3	2.6
FEB	0.6	2.5	1.5	0.0	0	0.0	0.0	0.0	1,580.7	29.4	3.1
MAR	1.3	3.3	2.6	0.0	0	0.0	0.0	0.0	1,582.3	34.0	4.6
APR	1.2	2.3	5.4	0.1	0	0.0	0.0	0.0	1,583.4	37.4	3.4
MAY	1.5	2.7	6.8	0.1	11	0.7	0.0	0.0	1,584.5	40.8	3.4
JUN	1.6	6.8	8.9	0.1	134	8.0	0.0	0.0	1,584.6	41.1	0.3
JUL	1.1	7.8	9.6	0.1	404	24.9	0.0	0.0	1,579.1	25.0	-16.1
AUG	0.1	8.0	7.9	0.1	278	17.1	0.0	0.0	1,575.0	15.9	-9.1
SEP	0.9	0.8	5.9	0.1	37	2.2	0.0	0.0	1,574.7	15.3	-0.6
OCT	0.6	1.9	4.1	0.0	0	0.0	0.0	0.0	1,576.0	17.8	2.5
NOV	0.5	2.5	3.0	0.0	0	0.0	0.0	0.0	1,577.4	20.8	3.0
DEC	0.3	2.6	1.5	0.0	0	0.0	0.0	0.0	1,578.6	23.7	2.9
TOTAL	10.1	43.4	58.4	0.6		52.9	0.0	0.0			0.0
MOST PROBABLE INFLOW CONDITIONS											
JAN	0.9	3.8	1.0	0.0	0	0.0	0.0	0.0	1,580.3	28.4	4.7
FEB	1.4	4.9	1.3	0.0	0	0.0	0.0	0.0	1,582.5	34.7	6.3
MAR	3.2	0.0	2.3	0.0	0	0.0	0.0	0.0	1,583.6	37.9	3.2
APR	2.9	0.0	4.7	0.1	0	0.0	0.0	0.0	1,584.5	40.7	2.8
MAY	3.7	0.0	6.0	0.1	10	0.6	2.6	0.0	1,584.6	41.1	0.4
JUN	4.0	0.0	7.7	0.1	99	5.9	0.0	0.0	1,584.0	39.1	-2.0
JUL	2.7	2.0	8.4	0.1	304	18.7	0.0	0.0	1,579.1	25.0	-14.1
AUG	0.3	3.6	6.9	0.1	208	12.8	0.0	0.0	1,575.1	16.0	-9.0
SEP	2.1	0.8	5.2	0.1	29	1.7	0.0	0.0	1,575.7	17.1	1.1
OCT	1.4	4.7	3.6	0.0	0	0.0	0.0	0.0	1,578.4	23.2	6.1
NOV	1.2	4.1	2.6	0.0	0	0.0	0.0	0.0	1,580.4	28.5	5.3
DEC	0.8	0.7	1.3	0.0	0	0.0	0.0	0.0	1,580.9	30.0	1.5
TOTAL	24.6	24.6	51.0	0.6		39.7	2.6	0.0			6.3
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	2.5	0.0	0.9	0.0	0	0.0	0.0	0.0	1,579.5	26.2	2.5
FEB	3.8	0.0	1.1	0.0	0	0.0	0.0	0.0	1,580.9	30.0	3.8
MAR	8.7	0.0	2.0	0.0	0	0.0	0.0	0.0	1,583.8	38.7	8.7
APR	7.9	0.0	4.0	0.0	0	0.0	5.5	0.0	1,584.6	41.1	2.4
MAY	9.9	0.0	5.1	0.1	6	0.4	9.4	0.0	1,584.6	41.1	0.0
JUN	10.7	0.0	6.7	0.1	79	4.7	5.9	0.0	1,584.6	41.1	0.0
JUL	7.3	0.0	7.2	0.1	237	14.6	0.0	0.0	1,582.2	33.7	-7.4
AUG	0.7	0.0	5.9	0.1	161	9.9	0.0	0.0	1,578.9	24.4	-9.3
SEP	5.7	0.0	4.5	0.0	22	1.3	0.0	0.0	1,580.5	28.8	4.4
OCT	3.9	0.0	3.1	0.0	0	0.0	0.0	0.0	1,581.9	32.7	3.9
NOV	3.3	0.0	2.3	0.0	0	0.0	6.0	0.0	1,580.9	30.0	-2.7
DEC	2.3	0.0	1.1	0.0	0	0.0	2.3	0.0	1,580.9	30.0	0.0
TOTAL	66.7	0.0	43.9	0.4		30.9	29.1	0.0			6.3

Table A-34.—Kirwin Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIREMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH		RESERVOIR CHANGE	
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	ELEV FT	CONT KAF	KAF	
REASONABLE MINIMUM INFLOW CONDITIONS												
JAN	5	0.3	1.3	0.3	0	0.0	0.0	0.0	1,723.2	70.6	0.0	
FEB	9	0.5	1.6	0.4	0	0.0	0.0	0.0	1,723.2	70.7	0.1	
MAR	13	0.8	2.8	0.7	0	0.0	0.0	0.0	1,723.3	70.8	0.1	
APR	15	0.9	6.4	1.5	0	0.0	0.0	0.0	1,723.1	70.2	-0.6	
MAY	23	1.4	7.9	1.9	8	0.5	0.0	0.0	1,722.9	69.2	-1.0	
JUN	18	1.1	9.6	2.3	87	5.2	0.0	0.0	1,721.3	62.8	-6.4	
JUL	18	1.1	10.9	2.4	193	11.9	0.0	0.0	1,717.6	49.6	-13.2	
AUG	13	0.8	9.6	1.9	179	11.0	0.0	0.0	1,713.8	37.5	-12.1	
SEP	7	0.4	7.4	1.2	8	0.5	0.0	0.0	1,713.3	36.2	-1.3	
OCT	5	0.3	5.1	0.8	0	0.0	0.0	0.0	1,713.2	35.7	-0.5	
NOV	5	0.3	3.0	0.5	0	0.0	0.0	0.0	1,713.1	35.5	-0.2	
DEC	5	0.3	1.6	0.3	0	0.0	0.0	0.0	1,713.1	35.5	0.0	
TOTAL		8.2	67.2	14.2		29.1	0.0	0.0			-35.1	
MOST PROBABLE INFLOW CONDITIONS												
JAN	18	1.1	1.2	0.3	0	0.0	0.0	0.0	1,723.4	71.4	0.8	
FEB	31	1.7	1.5	0.4	0	0.0	0.0	0.0	1,723.7	72.7	1.3	
MAR	49	3.0	2.6	0.6	0	0.0	0.0	0.0	1,724.3	75.1	2.4	
APR	54	3.2	5.8	1.5	0	0.0	0.0	0.0	1,724.7	76.8	1.7	
MAY	84	5.2	7.1	1.8	6	0.4	0.0	0.0	1,725.3	79.8	3.0	
JUN	70	4.2	8.7	2.3	71	4.4	0.0	0.0	1,724.8	77.3	-2.5	
JUL	67	4.1	9.8	2.5	193	11.9	0.0	0.0	1,722.3	67.0	-10.3	
AUG	47	2.9	8.7	2.0	149	9.2	0.0	0.0	1,720.2	58.7	-8.3	
SEP	23	1.4	6.7	1.4	8	0.5	0.0	0.0	1,720.0	58.2	-0.5	
OCT	16	1.0	4.6	1.0	0	0.0	0.0	0.0	1,720.0	58.2	0.0	
NOV	22	1.3	2.7	0.6	0	0.0	0.0	0.0	1,720.2	58.9	0.7	
DEC	16	1.0	1.5	0.3	0	0.0	0.0	0.0	1,720.4	59.6	0.7	
TOTAL		30.1	60.9	14.7		26.4	0.0	0.0			-11.0	
REASONABLE MAXIMUM INFLOW CONDITIONS												
JAN	55	3.4	1.0	0.2	0	0.0	0.0	0.0	1,724.0	73.8	3.2	
FEB	90	5.0	1.3	0.3	0	0.0	0.0	0.0	1,725.1	78.5	4.7	
MAR	144	8.9	2.3	0.6	0	0.0	0.0	0.0	1,726.9	86.8	8.3	
APR	161	9.6	5.2	1.4	0	0.0	0.0	0.0	1,728.6	95.0	8.2	
MAY	255	15.7	6.4	1.9	5	0.3	10.3	0.0	1,729.3	98.2	3.2	
JUN	210	12.5	7.8	2.3	59	3.5	6.7	0.0	1,729.3	98.2	0.0	
JUL	198	12.2	8.8	2.6	167	10.3	0.0	0.0	1,729.1	97.5	-0.7	
AUG	138	8.5	7.8	2.3	119	7.3	0.0	0.0	1,728.9	96.4	-1.1	
SEP	72	4.3	6.0	1.8	7	0.4	0.3	0.0	1,729.3	98.2	1.8	
OCT	47	2.9	4.1	1.2	0	0.0	1.7	0.0	1,729.3	98.2	0.0	
NOV	64	3.8	2.5	0.7	0	0.0	3.1	0.0	1,729.3	98.2	0.0	
DEC	50	3.1	1.3	0.4	0	0.0	2.7	0.0	1,729.3	98.2	0.0	
TOTAL		89.9	54.5	15.7		21.8	24.8	0.0			27.6	

Table A-35.—Webster Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL		SHORTAGE	END OF MONTH		RESERVOIR
	CFS	KAF	IN.	KAF	CFS	KAF	KAF	KAF	KAF	ELEV FT	CONT KAF	CHANGE KAF
REASONABLE MINIMUM INFLOW CONDITIONS												
JAN	3	0.2	1.3	0.2	0	0.0	0.0	0.0	0.0	1,882.5	44.2	0.0
FEB	4	0.2	1.6	0.3	0	0.0	0.0	0.0	0.0	1,882.5	44.1	-0.1
MAR	6	0.4	2.9	0.5	0	0.0	0.0	0.0	0.0	1,882.4	44.0	-0.1
APR	10	0.6	6.5	1.0	0	0.0	0.0	0.0	0.0	1,882.3	43.6	-0.4
MAY	15	0.9	8.2	1.3	16	1.0	0.0	0.0	0.0	1,881.8	42.2	-1.4
JUN	10	0.6	10.4	1.6	107	6.4	0.0	0.0	0.0	1,878.8	34.8	-7.4
JUL	10	0.6	11.4	1.6	253	15.6	0.0	0.0	0.0	1,870.6	18.2	-16.6
AUG	5	0.3	10.6	1.0	227	14.0	0.0	3.9	0.0	1,863.0	7.4	-10.8
SEP	3	0.2	7.8	0.5	10	0.6	0.0	0.6	0.0	1,862.8	7.1	-0.3
OCT	2	0.1	5.1	0.3	0	0.0	0.0	0.0	0.0	1,862.6	6.9	-0.2
NOV	3	0.2	3.2	0.2	0	0.0	0.0	0.0	0.0	1,862.6	6.9	0.0
DEC	2	0.1	1.7	0.1	0	0.0	0.0	0.0	0.0	1,862.6	6.9	0.0
TOTAL		4.4	70.7	8.6		37.6	0.0		4.5			-37.3
MOST PROBABLE INFLOW CONDITIONS												
JAN	13	0.8	1.1	0.2	0	0.0	0.0	0.0	0.0	1,882.7	44.8	0.6
FEB	18	1.0	1.4	0.2	0	0.0	0.0	0.0	0.0	1,883.0	45.6	0.8
MAR	29	1.8	2.6	0.4	0	0.0	0.0	0.0	0.0	1,883.5	47.0	1.4
APR	42	2.5	5.8	1.0	0	0.0	0.0	0.0	0.0	1,884.1	48.5	1.5
MAY	62	3.8	7.3	1.2	13	0.8	0.0	0.0	0.0	1,884.7	50.3	1.8
JUN	45	2.7	9.3	1.6	71	4.4	0.0	0.0	0.0	1,883.5	47.0	-3.3
JUL	42	2.6	10.2	1.7	208	12.8	0.0	0.0	0.0	1,878.9	35.1	-11.9
AUG	24	1.5	9.5	1.3	161	9.9	0.0	0.0	0.0	1,874.5	25.4	-9.7
SEP	15	0.9	7.0	0.8	5	0.3	0.0	0.0	0.0	1,874.4	25.2	-0.2
OCT	8	0.5	4.6	0.5	0	0.0	0.0	0.0	0.0	1,874.4	25.2	0.0
NOV	12	0.7	2.8	0.3	0	0.0	0.0	0.0	0.0	1,874.6	25.6	0.4
DEC	10	0.6	1.5	0.2	0	0.0	0.0	0.0	0.0	1,874.8	26.0	0.4
TOTAL		19.4	63.1	9.4		28.2	0.0		0.0			-18.2
REASONABLE MAXIMUM INFLOW CONDITIONS												
JAN	57	3.5	1.0	0.2	0	0.0	0.0	0.0	0.0	1,883.7	47.5	3.3
FEB	84	4.7	1.3	0.2	0	0.0	0.0	0.0	0.0	1,885.2	52.0	4.5
MAR	133	8.2	2.4	0.4	0	0.0	0.0	0.0	0.0	1,887.7	59.8	7.8
APR	193	11.5	5.3	1.0	0	0.0	0.0	0.0	0.0	1,890.8	70.3	10.5
MAY	286	17.6	6.7	1.4	6	0.4	9.9	0.0	0.0	1,892.4	76.2	5.9
JUN	206	12.3	8.5	1.9	42	2.5	7.9	0.0	0.0	1,892.4	76.2	0.0
JUL	195	12.0	9.4	2.1	125	7.7	2.2	0.0	0.0	1,892.4	76.2	0.0
AUG	115	7.1	8.7	1.9	101	6.2	0.0	0.0	0.0	1,892.1	75.2	-1.0
SEP	69	4.1	6.3	1.4	2	0.1	1.6	0.0	0.0	1,892.4	76.2	1.0
OCT	37	2.3	4.2	0.9	0	0.0	1.4	0.0	0.0	1,892.4	76.2	0.0
NOV	52	3.1	2.6	0.6	0	0.0	2.5	0.0	0.0	1,892.4	76.2	0.0
DEC	49	3.0	1.4	0.3	0	0.0	2.7	0.0	0.0	1,892.4	76.2	0.0
TOTAL		89.4	57.8	12.3		16.9	28.2		0.0			32.0

Table 3.—Waconda Lake Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR	SHORTAGE	END OF MONTH		RESERVOIR	
	CFS	KAF	IN.	KAF	CFS	KAF	SPILL KAF	KAF	ELEV FT	CONT KAF	CHANGE KAF	
REASONABLE MINIMUM INFLOW CONDITIONS												
JAN	31	1.9	1.1	0.6	19	1.2	0.0	0.0	1,450.3	159.4	0.1	
FEB	45	2.5	1.4	0.8	20	1.1	0.0	0.0	1,450.3	160.0	0.6	
MAR	86	5.3	2.7	1.6	18	1.1	0.0	0.0	1,450.6	162.6	2.6	
APR	89	5.3	6.7	3.9	17	1.0	0.0	0.0	1,450.6	163.0	0.4	
MAY	104	6.4	8.3	4.9	18	1.1	0.0	0.0	1,450.6	163.4	0.4	
JUN	87	5.2	10.4	6.1	45	2.7	0.0	0.0	1,450.3	159.8	-3.6	
JUL	143	8.8	12.3	7.1	156	9.6	0.0	0.0	1,449.5	151.9	-7.9	
AUG	52	3.2	10.5	5.8	125	7.7	0.0	0.0	1,448.3	141.6	-10.3	
SEP	40	2.4	8.5	4.4	35	2.1	0.0	0.0	1,447.9	137.5	-4.1	
OCT	31	1.9	5.4	2.7	21	1.3	0.0	0.0	1,447.6	135.4	-2.1	
NOV	35	2.1	2.9	1.4	27	1.6	0.0	0.0	1,447.5	134.5	-0.9	
DEC	28	1.7	1.4	0.7	24	1.5	0.0	0.0	1,447.5	134.0	-0.5	
TOTAL		46.7	71.6	40.0		32.0	0.0	0.0			-25.3	
MOST PROBABLE INFLOW CONDITIONS												
JAN	93	5.7	1.0	0.6	10	0.6	0.0	0.0	1,450.7	163.8	4.5	
FEB	140	7.8	1.3	0.8	10	0.6	0.0	0.0	1,451.3	170.2	6.4	
MAR	263	16.2	2.4	1.5	10	0.6	0.0	0.0	1,452.6	184.3	14.1	
APR	275	16.4	6.1	4.0	8	0.5	0.0	0.0	1,453.6	196.2	11.9	
MAY	317	19.5	7.5	5.1	10	0.6	0.0	0.0	1,454.8	210.0	13.8	
JUN	270	16.1	9.3	6.6	32	2.0	0.0	0.0	1,455.5	217.5	7.5	
JUL	438	27.0	11.0	8.0	112	6.9	10.2	0.0	1,455.6	219.4	1.9	
AUG	161	9.9	9.5	7.0	89	5.5	0.0	0.0	1,455.4	216.8	-2.6	
SEP	122	7.3	7.6	5.5	21	1.3	0.0	0.0	1,455.4	217.3	0.5	
OCT	96	5.9	4.9	3.6	10	0.6	0.0	0.0	1,455.5	219.0	1.7	
NOV	109	6.5	2.6	1.9	15	0.9	0.0	0.0	1,455.8	222.7	3.7	
DEC	86	5.3	1.3	1.0	13	0.8	19.1	0.0	1,454.6	207.1	-15.6	
TOTAL		143.6	64.5	45.6		20.9	29.3	0.0			47.8	
REASONABLE MAXIMUM INFLOW CONDITIONS												
JAN	307	18.9	0.9	0.5	3	0.2	0.0	0.0	1,452.0	177.5	18.2	
FEB	458	25.5	1.2	0.8	4	0.2	0.0	0.0	1,454.1	202.0	24.5	
MAR	865	53.3	2.2	1.5	5	0.3	43.9	0.0	1,454.8	209.6	7.6	
APR	902	53.8	5.6	4.0	5	0.3	39.7	0.0	1,455.6	219.4	9.8	
MAY	1042	64.2	6.9	5.1	5	0.3	58.8	0.0	1,455.6	219.4	0.0	
JUN	887	52.9	8.6	6.3	22	1.3	45.3	0.0	1,455.6	219.4	0.0	
JUL	1440	88.7	10.1	7.4	70	4.3	77.0	0.0	1,455.6	219.4	0.0	
AUG	529	32.6	8.7	6.4	57	3.5	22.7	0.0	1,455.6	219.4	0.0	
SEP	404	24.1	7.0	5.1	12	0.7	5.5	0.0	1,456.5	232.2	12.8	
OCT	313	19.3	4.5	3.4	6	0.4	15.5	0.0	1,456.5	232.2	0.0	
NOV	356	21.2	2.4	1.8	5	0.3	19.1	0.0	1,456.5	232.2	0.0	
DEC	284	17.5	1.2	0.9	5	0.3	41.4	0.0	1,454.6	207.1	-25.1	
TOTAL		472.0	59.3	43.2		12.1	368.9	0.0			47.8	

Table A-37.—Cedar Bluff Reservoir Operation Estimates – 2023

MONTH	INFLOW		EVAPORATION		RELEASE REQUIRMENT		RESERVOIR SPILL	SHORTAGE	END OF MONTH ELEV	END OF MONTH CONT	RESERVOIR CHANGE
	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	2,127.3	83.0	-0.2
FEB	4	0.2	1.7	0.4	0	0.0	0.0	0.0	2,127.3	82.8	-0.2
MAR	6	0.4	3.1	0.7	0	0.0	0.0	0.0	2,127.2	82.5	-0.3
APR	10	0.6	7.8	1.8	0	0.0	0.0	0.0	2,126.9	81.3	-1.2
MAY	15	0.9	9.3	2.1	3	0.2	0.0	0.0	2,126.5	79.9	-1.4
JUN	15	0.9	11.4	2.5	3	0.2	0.0	0.0	2,126.0	78.1	-1.8
JUL	19	1.2	13.8	3.0	11	0.7	0.0	0.0	2,125.3	75.6	-2.5
AUG	15	0.9	11.8	2.5	11	0.7	0.0	0.0	2,124.7	73.3	-2.3
SEP	5	0.3	10.1	2.1	3	0.2	0.0	0.0	2,124.1	71.3	-2.0
OCT	2	0.1	7.1	1.4	0	0.0	0.0	0.0	2,123.8	70.0	-1.3
NOV	3	0.2	3.3	0.7	0	0.0	0.0	0.0	2,123.6	69.5	-0.5
DEC	2	0.1	1.9	0.4	0	0.0	0.0	0.0	2,123.6	69.2	-0.3
TOTAL		6.0	82.9	18.0		2.0	0.0	0.0			-14.0
MOST PROBABLE INFLOW CONDITIONS											
JAN	5	0.3	1.4	0.3	0	0.0	0.0	0.0	2,127.4	83.2	0.0
FEB	7	0.4	1.6	0.4	0	0.0	0.0	0.0	2,127.4	83.2	0.0
MAR	11	0.7	2.7	0.6	0	0.0	0.0	0.0	2,127.4	83.3	0.1
APR	18	1.1	7.0	1.6	0	0.0	0.0	0.0	2,127.3	82.8	-0.5
MAY	28	1.7	8.3	1.9	2	0.1	0.0	0.0	2,127.2	82.5	-0.3
JUN	29	1.7	10.2	2.3	2	0.1	0.0	0.0	2,127.0	81.8	-0.7
JUL	37	2.3	12.3	2.8	10	0.6	0.0	0.0	2,126.7	80.7	-1.1
AUG	26	1.6	10.5	2.3	6	0.4	0.0	0.0	2,126.4	79.6	-1.1
SEP	10	0.6	9.0	2.0	2	0.1	0.0	0.0	2,126.0	78.1	-1.5
OCT	5	0.3	6.4	1.4	0	0.0	0.0	0.0	2,125.7	77.0	-1.1
NOV	5	0.3	3.0	0.6	0	0.0	0.0	0.0	2,125.6	76.7	-0.3
DEC	5	0.3	1.7	0.4	0	0.0	0.0	0.0	2,125.6	76.6	-0.1
TOTAL		11.3	74.1	16.6		1.3	0.0	0.0			-6.6
REASONABLE MAXIMUM INFLOW CONDITIONS											
JAN	11	0.7	1.3	0.3	0	0.0	0.0	0.0	2,127.5	83.6	0.4
FEB	16	0.9	1.4	0.3	0	0.0	0.0	0.0	2,127.6	84.2	0.6
MAR	28	1.7	2.4	0.5	0	0.0	0.0	0.0	2,127.9	85.4	1.2
APR	47	2.8	6.2	1.4	0	0.0	0.0	0.0	2,128.3	86.8	1.4
MAY	67	4.1	7.4	1.7	3	0.2	0.0	0.0	2,128.8	89.0	2.2
JUN	72	4.3	9.1	2.2	3	0.2	0.0	0.0	2,129.3	90.9	1.9
JUL	93	5.7	11.0	2.7	3	0.2	0.0	0.0	2,129.9	93.7	2.8
AUG	63	3.9	9.4	2.3	0	0.0	0.0	0.0	2,130.3	95.3	1.6
SEP	27	1.6	8.1	2.0	0	0.0	0.0	0.0	2,130.3	94.9	-0.4
OCT	10	0.6	5.7	1.4	0	0.0	0.0	0.0	2,130.1	94.1	-0.8
NOV	15	0.9	2.6	0.6	0	0.0	0.0	0.0	2,130.1	94.4	0.3
DEC	10	0.6	1.5	0.4	0	0.0	0.0	0.0	2,130.1	94.6	0.2
TOTAL		27.8	66.1	15.8		0.6	0.0	0.0			11.4

