

2020 Forecast of Allowable Depletions in the Republican River Basin

*Nebraska Department of Natural Resources
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Background

The State of Nebraska is party to an interstate compact for the management of the Republican River Basin with the states of Colorado and Kansas, administered by the Republican River Compact Administration (RRCA). Pursuant to the current integrated management plans (IMPs) and Neb. Rev. Stat. § 46-715(6), the Nebraska Department of Natural Resources (NeDNR) in consultation with the Lower Republican Natural Resources District, Middle Republican Natural Resources District, and Upper Republican Natural Resources District (Districts) is required to provide an annual short-term and long-term forecast of maximum allowable depletions to streamflow that will ensure compliance with interstate compacts. The NeDNR has determined that the short-term forecast applies to the upcoming year (2020) and that the long-term forecast estimates what conditions may be ten years into the future. Therefore, this document includes the dry-year forecast of allowable depletions to streamflow in 2020 and 2030.

The States of Nebraska, Colorado, and Kansas, acting through the RRCA, adopted a “*Resolution Approving Long-Term Agreements Related to the Operation of Harlan County Lake for Compact Call Years*” (Resolution). The August 24, 2016, Resolution outlines certain actions that Nebraska will take toward Republican River Compact (Compact) compliance during years forecast as Compact Call Years as outlined in the Monitoring sections of the District IMPs. Compliance with the terms of the Resolution constitutes compliance with the Final Settlement Stipulation and Compact.

Short-Term Forecast

The outcome of Nebraska’s short-term forecast is largely dependent on three key elements, much of which are from data secured through the RRCA Compact accounting procedures. These three elements are detailed in the following sections.

1. Applicable compliance tests for 2020

The first key element of the short-term forecast is the identification of the averaging period that will be utilized for assessing compliance for the upcoming year. The compliance tests use five-year averaging upstream of Hardy in every year and may also include an additional test based on two-year averaging upstream of Guide Rock. The averaging period and applicable accounting points are determined based on projections of the total irrigation water supplies available to the Nebraska Bostwick Irrigation District and Kansas Bostwick Irrigation District pursuant to the Resolution. The current projection is that 2020 will require the use of five-year averaging to measure Nebraska’s Compact compliance upstream of Hardy, but that the additional test of two-year averaging upstream of Guide Rock will not apply.

2. Previous year balances

The second key element in the short-term forecast is an evaluation of the recent Compact accounting balances for the State of Nebraska as determined using the current RRCA accounting procedures. These procedures allow for the determination of Nebraska's Compact balance for years through the current year (2019). Nebraska's Compact balances through 2018 have been approved and finalized by the RRCA. The 2019 balances are provisional. The information used to estimate the 2019 Compact balances are presented in Table 1. Nebraska's 2016 and 2017 RRCA-approved balances upstream of Hardy and Nebraska's 2018 RRCA-approved balances and 2019 provisional balances upstream of Guide Rock and Hardy are presented in Table 2.

Table 1. Information Used (acre-feet) for 2019 provisional Accounting.

Item	Information Source
Groundwater Use	2018 Pumping records
Surface Water Use	Estimated from preliminary data and previous years values
Stream Flow	Provisional records, end-of-year estimated
Evaporation	T-1 and provisional, end-of-year estimated records

Table 2. Nebraska's 2016, 2017, and 2018 RRCA-approved balances and 2019 provisional balances upstream of Guide Rock and Hardy, as applicable to the forecast.

Year	RRCA Status	Upstream of Guide Rock Balance*	Upstream of Hardy Balance
2016	Approved	-	23,600
2017	Approved	-	35,800
2018	Approved	-	1,500
2019	Nebraska Provisional	-	143,500
2018-2019 Balance		-	-
2016-2019 Balance		-	204,500

Note: Values are rounded to the nearest one hundred acre-feet. 2019 values are preliminary and have not been approved by the RRCA.

* Previous-year balances for upstream of Guide Rock are not applicable to the 2020 forecast.

3. Forecast of available water supplies and consumption for 2020

The third key element is the forecast of available water supplies and consumption within Nebraska for the upcoming year. To carry out this forecast, NeDNR uses a simplified method of estimating the streamflow-related available water supply of the Republican River Basin for Nebraska’s use. The water supply is related to eight variables:

- Surface water consumptive use in Colorado,
- Surface water consumptive use in Kansas,
- Surface water consumptive use in Nebraska,
- Groundwater consumptive use in Colorado,
- Groundwater consumptive use in Kansas,
- Groundwater consumptive use in Nebraska,
- Nebraska’s Imported Water Supply Credit, and
- Surface water flow at the Kansas – Nebraska state line.

These eight variables may be estimated for the next year:

- Surface water consumption in Colorado is estimated using a two-year average,
- Surface water consumption in Kansas is related to the water available for irrigation in Harlan County Lake at the end of each year,
- Surface water consumption in Nebraska is related to water available for irrigation in the five Bureau of Reclamation project reservoirs in Nebraska at the start of each year,
- Groundwater consumption and the Imported Water Supply Credit are estimated in all three states using a two-year average, and
- Streamflow is estimated assuming that the upcoming year is a dry year and is based on the volume of water in Harlan County Lake and the most recent five years of streamflow.

Historically, Nebraska’s share of the available water supply has been approximately half of the total water supply calculated using these methods. The information used to estimate the forecast of the available water supply and allowable depletions for 2020 are summarized in Table 3.

Table 3. Information Used (acre-feet) for 2020 Forecast of Allowable Depletions.

Year	Item	Information Source
2020 Forecast	Groundwater Consumptive Use and Imported Water Supply Credit	Average of 2018 and 2019
	Surface Water Consumptive Use	Colorado: Previous two-year average
		Kansas: + (.1858 x HCL content) + 9,575
		Nebraska: - (0.0000004) x (NE lake volume) ² + (0.5151) x (NE lake volume) - 41,518
Stream Flow	+ (5-year average of state line flows) x 0.41 + 0.23 x HCL content - 27,450	

Utilizing the data sources outlined in Table 3, the required components of the forecast can be calculated (Table 4).

Table 4. 2020 Forecast values in acre-feet, where GWCBCU is defined as groundwater computed beneficial consumptive use and SWCBCU is defined as surface water computed beneficial consumptive use.

Forecast Component	Forecast Value Upstream of Guide Rock	Forecast Value Upstream of Hardy
Colorado GWCBCU	33,400	33,400
Kansas GWCBCU	24,600	24,600
Nebraska GWCBCU	216,600	219,000
Nebraska Imported Water Supply Credit	25,900	25,900
Colorado SWCBCU	700	700
Kansas SWCBCU	69,000	69,000
Nebraska SWCBCU	109,300	110,200
Streamflows	128,800	150,200

The 2020 Compact balances – of allocations (available water supply), computed beneficial consumptive use (CBCU, groundwater and surface water consumption), and Imported Water Supply Credit – are calculated from the forecast procedures contained in the Monitoring and Studies Section of the IMPs (Table 5).

Table 5. Forecast 2020 Allocations (available water supply), Computed Beneficial Consumptive Use (CBCU, groundwater and surface water consumption), Imported Water Supply Credit, and Compact Balances for Guide Rock and Hardy in acre-feet.

Year	Allocation	Computed Beneficial Consumptive Use	Imported Water Supply Credit	Allocation - CBCU + IWS Credit (Balance)
2020 Forecast upstream of Guide Rock	291,200	325,900	25,900	-8,800
2020 Forecast upstream of Hardy	303,600	329,200	25,900	300

Note: Values are rounded to the nearest one hundred acre-feet.

Combining the results from the three key elements (applicable compliance test for 2020, previous years' balances, and forecast of available water supplies and consumption for 2020), Nebraska's 2016-2020 five-year total balance upstream of Hardy is forecast to be positive, and the additional two-year averaging test upstream of Guide Rock will not be applicable (Table 6).

Table 6. 2016-2018 approved Compact balance total upstream of Hardy, 2019 provisional balances upstream of Guide Rock and Hardy, and 2020 forecast balances upstream of Guide Rock and Hardy in acre-feet.

Year	Upstream of Guide Rock Balance*	Upstream of Hardy Balance
2016-2018 total, approved	-	61,000
2019, provisional	-	143,500
2020, forecast	-	300
Two-year (2019-2020) Total	N/A	-
Five-year (2016-2020) Total	-	204,700

Note: Values are rounded to the nearest one hundred acre-feet. 2019 values are preliminary and have not been approved by the RRCA.

* 2020 forecast for upstream of Guide Rock is not applicable.

Compact Call Year Evaluation

The Monitoring sections of the District IMPs specifies the process that will be completed by NeDNR to determine Compact Call Years. The process is completed in a flowchart/checklist manner until a determination of whether or not the following year will be a Compact Call Year is made. Based on review of the IMP checklist with the information presented in the previous sections of this document, a Compact Call Year designation is not required for 2020.

Review of Resolution Provisions

Nebraska's 2019 Compact compliance required meeting the five-year averaging test upstream of Hardy. As illustrated in Table 2, the balance for the test is positive, so no additional Remaining Compact Compliance Volume (RCCV) will be accrued from 2019. Additionally, Kansas representatives did not request RCCV water supplies be made available for the Kansas Account prior to June 1, 2020; therefore, RCCV ends 2019 at -9,300 acre-feet. Since 2020 will not be designated as a Compact Call Year, RCCV will be reduced by 20% on January 1, 2020, to -7,440 acre-feet with an equal volumetric reduction applied to RCCV (1,860 acre-feet) for each of the four subsequent years.

Summary of the Short-Term Forecast for 2020

Nebraska's 2020 compliance will be measured by the five-year average upstream of Hardy which is projected to be positive. Therefore, the Districts are not expected to have any Compact Call Year obligations for 2020. Additionally, District obligations related to RCCV from previous year carry-over will be reduced as illustrated in Table 7.

Table 7. Remaining Compact Compliance Volume obligation for each District within the Basin in acre-feet after January 1, 2020.

Year	LRNRD	MRNRD	URNRD
Total Remaining Compact Compliance Volume	-3,280	-3,680	-480

Long-Term Forecast

Due to the absence of a long-term trend in water supply, the periods of low water supplies in the future are likely to be similar to periods of low water supplies from the past. Historically, the minimum water supplies that have been available to Nebraska were approximately 200,000 acre-feet. Therefore, the amount of water that may be available from streamflow for beneficial use ten years in the future (2030), assuming several consecutive dry years, is estimated to be approximately 200,000 acre-feet. In an effort to continue to ensure long-term Compact compliance through future dry years, the Compliance Standards in the IMPs outline objectives to maintain groundwater depletions at a relatively constant level over the long-term. The NeDNR and Districts will continue to evaluate the trends in long-term groundwater depletions over typical wet and dry cycles (approximately 12 years) and jointly assess if additional management actions are necessary to accomplish this objective.