

Forecast of Allowable Depletions in the Republican Basin During 2016 and 2026

*Nebraska Department of Natural Resources
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Background

Pursuant to Neb. Rev. Stat. § 46-715(6), the Nebraska Department of Natural Resources (NDNR) 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 NDNR has determined that the short-term forecast should apply to the upcoming year (2016), and that the long-term forecast should be for a decade later. Therefore, this document includes the dry-year forecast of allowable depletions to streamflow in 2016 and 2026.

Short-Term Forecast

The outcome of NDNR's short-term forecast is largely dependent on three key elements. The first key element is the identification of the averaging period that will be utilized for assessing compliance for the upcoming year. The averaging period is determined based on irrigation water supplies contained in Harlan County Lake (HCL). The Bureau of Reclamation (Reclamation) is responsible for projecting these water supplies and determining if a Water-Short-Year (two-year averaging) designation is warranted. The current projection by Reclamation is that 2016 will be a Water-Short Year and thus, the two-year averaging compliance standard above Guide Rock will be in effect.

The second key element in the short-term forecast is an evaluation of the recent Compact balances for the State of Nebraska as determined using the current Republican River Compact Administration (RRCA) accounting procedures. These procedures allow for the determination of Nebraska's Compact balance for years through the current year (2015).

The third key element is the forecast of available water supplies and consumption within Nebraska for the upcoming year. To carry out this forecast NDNR has determined 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 has reduced to a low near-constant number in recent years, and may be 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 show little variation from year to year and may be estimated in all three states using a two-year average, and
- Streamflow, assuming that the upcoming year is a dry year, may be estimated from 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 2015 Compact balance as well as forecast the available water supply and allowable depletions for 2016 is summarized in Table 1.

Table 1. Information Used for 2015 Provisional Accounting and 2016 Forecast of Allowable Depletions.

| Year | Item | Information Source |
|---------------------|---|--|
| 2015 Provisional | Pumping | 2014 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 2015 records |
| 2016 Forecast | Groundwater Consumptive Use and Imported Water Supply Credit | Average of 2014 and 2015 |
| | 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 1 the required components of the forecast can be calculated (Table 2).

Table 2. 2016 Forecast Values.

| Forecast Component | Forecast Value |
|---------------------------------------|----------------|
| Colorado GWCBCU | 32,420 |
| Kansas GWCBCU | 12,350 |
| Nebraska GWCBCU | 185,380 |
| Nebraska Imported Water Supply Credit | 14,960 |
| Colorado SWCBCU | 430 |
| Kansas SWCBCU | 38,370 |
| Nebraska SWCBCU | 64,350 |
| Stateline Streamflows | 80,130* |

GWCBCU – defined as groundwater computed beneficial consumptive use

SWCBCU – defined as surface water computed beneficial consumptive use

* Denotes values for basin upstream of Hardy

Combining the results from the current RRCA accounting procedures and forecast procedures contained in the Monitoring and Studies Section of the Districts Integrated Management Plans, an early estimate of Nebraska’s 2015 and 2016 Compact balances can be obtained (Table 3).

Table 3. Estimated Allocations (available water supply), Computed Beneficial Consumptive Use (groundwater and surface water consumption), and Imported Water Supply Credit for 2015 and 2016 (the projected compliance period for next year).

| Year | Allocation | Computed Beneficial Consumptive Use | Imported Water Supply Credit | Allocation - (CBCU - IWS Credit) |
|------------------|------------|-------------------------------------|------------------------------|----------------------------------|
| 2015 Provisional | 188,900 | 234,500 | 34,600 ¹ | -11,100 |
| 2016 Forecast | 200,000 | 250,300 | 15,000 | -35,300 |
| Two-Year Average | | | | -23,200 |
| Two-Year Total | | | | -46,400 |

Note: Values rounded to the nearest 100. 2015 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2015 values are not finalized by the RRCA.

¹ Value includes accounting adjustment pursuant to resolution of the Republican River Compact Administration (RRCA) on March 6, 2015

The resulting two-year average is approximately -23,200 acre-feet (two-year sum is -46,400 acre-feet). Thus, given that the projected balance is negative a Compact Call Year will be in effect in 2016.

A Compact Call Year designation requires that each District within the basin that has a projected negative two-year balance submit a plan to NDNR by January 31, 2016, describing the actions they will take to ensure that its groundwater consumption is less than the Districts allowable groundwater depletions.

If augmentation pumping is the management action submitted by the Districts then sufficient augmentation capacity will be demonstrated by the Districts to ensure Compact compliance based on the forecast. Additionally, the Districts will coordinate to make good faith efforts to pump the augmentation water associated with their NRD management actions prior to June 1, 2016, with the exception that augmentation pumping may be suspended once the Kansas Bostwick Irrigation District's (KBID) total storage water supply (water not carried over under Warren Act Contract) in Harlan County Lake has reached 40,000 acre-feet, as long as the total sum of the Districts remaining management actions is projected to be less than 20,000 acre-feet by June 1, 2016. The Department will coordinate with the Districts to provide updated water supply projections throughout 2016.

If NDNR determines that a District's plan is insufficient, then that District will be required to curtail all groundwater uses in the Ten Percent in Five Year Area. A summary of the District's provisional 2015 balance, forecast 2016 balance, and summed balances for the compliance period is provided in Table 4 below.

Table 4. Summary of Balances for each District within the Basin

| Year | LRNRD | MRNRD | URNRD |
|---------------------|--------------|--------------|--------------|
| 2015 Provisional | -8,700 | -3,300 | 900 |
| 2016 Forecast | -8,200 | -8,500 | -18,600 |
| Two-Year Total | -16,900 | -11,800 | -17,700 |

Note: 2015 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2015 values are not finalized by the RRCA. The provisional 2015 balances for each District reflect the management actions taken in 2015. The 2016 Forecast values incorporate the permanent retirement of the Riverside Canal by the MRNRD and accounting adjustments associated with an agreement implemented between the LRNRD and MRNRD in 2015 to exchange 1,200 acre-feet of management actions.

In addition to the actions that will be taken by the Districts, NDNR will issue an order designating next year as a Compact Call Year and carry out the necessary administration of natural flow and storage surface water appropriations within the basin.

Long-Term Forecast

Due to the absence of a long-term trend in water supply, the lowest water supply in the future is likely to be similar to the lowest available supply in the past. Thus, the maximum amount of water that may be available from streamflow for beneficial use during 2026, assuming several consecutive dry years, is estimated to be approximately 200,000 acre-feet.

Summary

Utilizing the best available information, the current RRCA accounting procedures, and the forecast procedures developed by NDNR, it is currently predicted that if next year is dry and the two-year averaging period (2015-2016) is in effect that additional management actions will be necessary to ensure compliance. The implementation of these management actions will be carried out in a manner consistent with the procedures set forth in the Monitoring and Studies Section of the Districts Integrated Management Plans.