

Forecast of Allowable Depletions in the Republican Basin During 2015 and 2025

*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 (2015), 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 2015 and 2025.

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 averaging¹) designation is warranted. The current projection by Reclamation is that 2015 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 (2014).

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,
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- 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 evaporation from lakes in Kansas and 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 2013 Compact balance as well as forecast the available water supply and allowable depletions for 2015 is summarized in Table 1.

Table 1. Information Used for 2014 Provisional Accounting and 2015 Forecast of Allowable Depletions.

Year	Item	Information Source
2014 Provisional	Pumping	Power records estimates and NRD data
	Surface Water Use	Estimated from preliminary data and previous years values
	Stream Flow	Provisional records, end of year estimated
	Evaporation	T-1 and 2014 records
2015 Forecast	Groundwater Consumptive Use and Imported Water Supply Credit	Average of 2013 and 2014
	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. 2015 Forecast Values.

Forecast Component	Forecast Value
Colorado GWCBCU ¹	20,050
Kansas GWCBCU	6,310
Nebraska GWCBCU	193,610*
Nebraska Imported Water Supply Credit	12,920
Colorado SWCBCU ²	200
Kansas SWCBCU	38,230
Nebraska SWCBCU	57,930*
Stateline Streamflows	98,450

¹GWCBCU – groundwater computed beneficial consumptive use

²SWCBCU – surface water computed beneficial consumptive use

* Denotes values for basin upstream of Guide Rock

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 2014 and 2015 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 2014 and 2015 (the projected compliance period for next year).

Year	Allocation	Computed Beneficial Consumptive Use	Imported Water Supply Credit	Allocation - (CBCU - IWS Credit)
2014 Provisional	170,400	226,900	76,900 ²	20,400
2015 Forecast	200,600	251,500	12,900	-38,000
Two-Year Average				-8,800
Two-Year Total				-17,600

Note: 2014 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2014 values are not finalized by the RRCA.

² Value includes accounting adjustment pursuant to resolution of the Republican River Compact Administration (RRCA) on October 22, 2014

The resulting two-year average is approximately -8,800 acre-feet (two-year sum is -17,600 acre-feet). Thus, given that the projected balance is negative a Compact Call Year will be in effect in 2015.

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, 2015, describing the actions they will take to ensure that its groundwater consumption is less than the Districts allowable groundwater depletions. If NDNR determines that a District’s plan is insufficient, then that District will be required to curtail all groundwater uses in the Rapid Response Area. A summary of the District’s provisional 2014 balance, forecast 2015 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
2014 Provisional	14,000	5,100	1,300
2015 Forecast	-12,800	-9,300	-15,900
Two-Year Total	1,200	-4,200	-14,600

Note: 2014 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2014 values are not finalized by the RRCA. The provisional 2014 balances for each District reflect the management actions taken in 2014.

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. So, the allowable depletion during 2025, assuming several 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 (2014-2015) 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.

The required management actions total 4,200 acre-feet for the MRNRD and 14,600 acre-feet for the URNRD, for a total of 18,800 acre-feet.