

2022 Annual Report of 2021 Data

By the Nebraska Department of Natural Resources

To Meet the Requirements of the Integrated Management Plan
for those Portions of the Tri-Basin Natural Resources District
within the Republican River Basin

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I. INTRODUCTION

This report is intended to satisfy the Nebraska Department of Natural Resources' (NeDNR's) tracking and reporting requirements as described in the "Monitoring and Studies" section of the integrated management plan (IMP) for those portions of the Tri-Basin Natural Resources District (NRD) located within the Republican River Basin. This report has been filed annually following the adoption of the IMP in June 2012. The IMP requires that NeDNR track and report on the following items on an annual basis:

- a) Any surface water permits issued;
- b) Any dam safety permits issued;
- c) Any groundwater transfer permits issued;
- d) Reports of water diverted and, when available, water stored by surface water users; and
- e) The associated offsets for any new permits issued.

This report covers activities that occurred from January 1, 2021, to December 31, 2021. Data from streamgages within Tri-Basin NRD are also provided with this report along with calculations of streamflow depletions using the Republican River Compact Administration (RRCA) model.

The information contained in this report will assist in measuring the success of the IMP in meeting its goals and objectives.

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II. ACTIVITIES TO BE REPORTED ANNUALLY

A. Summary

Items reported annually include any surface water or groundwater permitting activity occurring during the reporting period, including surface water use data. The NeDNR field offices use pump-site inspections of surface water appropriations to monitor surface water use when time and conditions allow.

B. NeDNR Permitting

In 2021, NeDNR did not issue any new surface water permits, dam safety permits, nor any new groundwater transfer permits in the Republican River Basin portion of the Tri-Basin NRD.

C. Water Diverted by Surface Water Users

In 2021, no water was reported as having been diverted from natural flow for irrigation purposes. Insufficient streamflow at irrigation time, not needing to irrigate due to sufficient rainfall, or using groundwater instead of surface water were reasons cited for not irrigating with surface water rights in 2021.

There are no Federal reservoirs or non-Federal reservoirs with capacities greater than 200 AF within the Republican River Basin region of Tri-Basin NRD. Evaporation from small reservoirs (capacity to store 15 to 200 AF) is estimated on an annual basis to comply with the RRCA. The total estimated net evaporation for small reservoirs in the Republican River Basin portion of the Tri-Basin NRD for 2021 was 193.2 AF. Net evaporation is calculated by multiplying the presumptive average annual surface area of each small reservoir by the net evaporation measured at the nearest United States Bureau of Reclamation reservoir climate and evaporation station. The presumptive average annual surface area of each small reservoir is 25% of the area at the principal spillway elevation, as measured in 2012. The presumptive average surface area may change from year to year based on evaluations by the Dam Safety section of NeDNR.

D. Associated Depletion Offsets

No offsets were necessary in 2021.

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E. Estimated Depletions

There is no information to include on estimated depletions from permitted new or expanded water use or accretions from associated offsets for 2021.

III. STREAMGAGE DATA

Data for streamgages located on Muddy Creek at the Furnas-Gosper County line, Muddy Creek at Arapahoe, Turkey Creek at the Furnas-Gosper County line, and Turkey Creek at Edison, can be found in

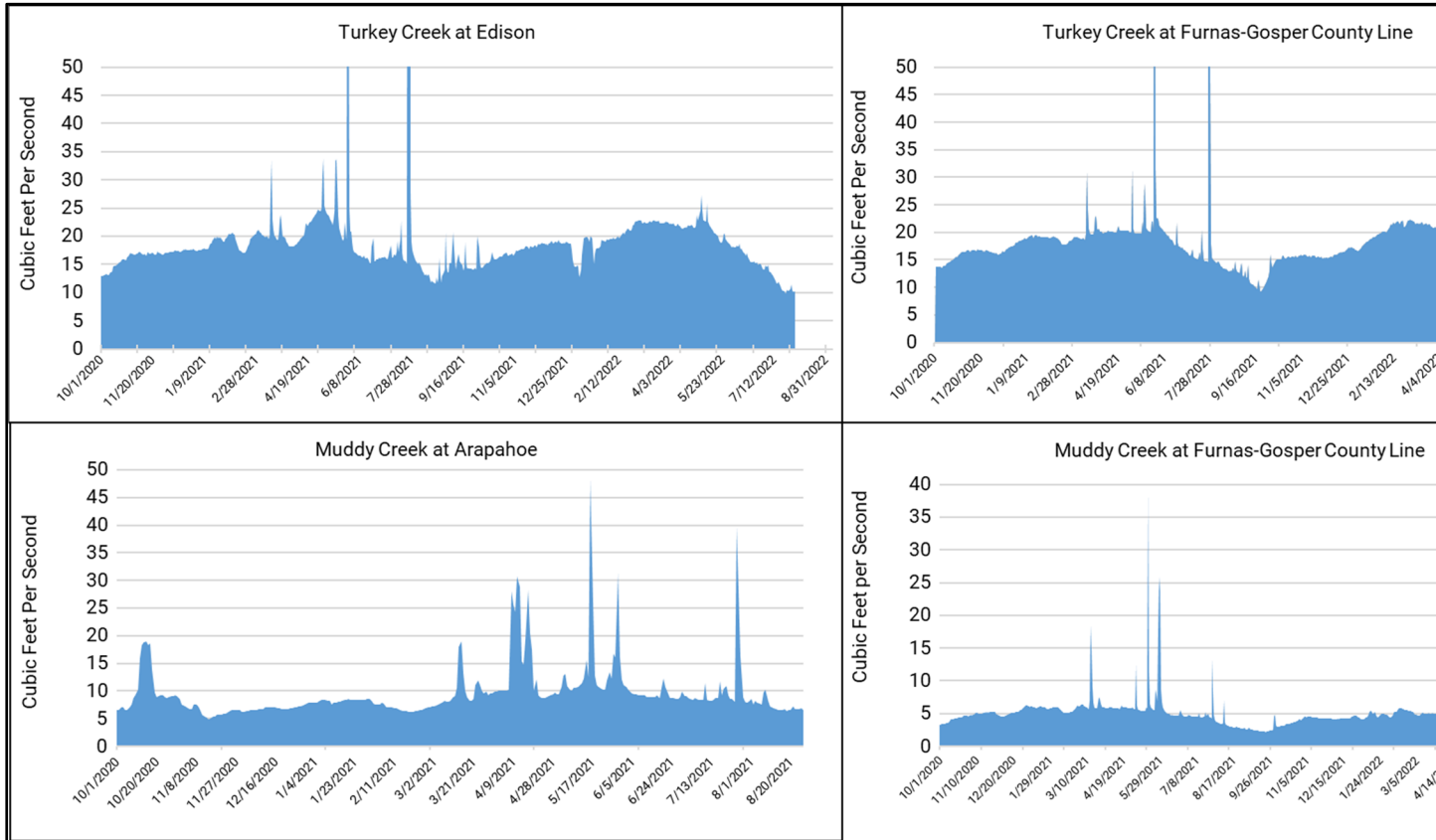


Figure 1. Please note that data from Muddy Creek at Arapahoe ends in August 2021 because the gage was removed for a bridge construction project.

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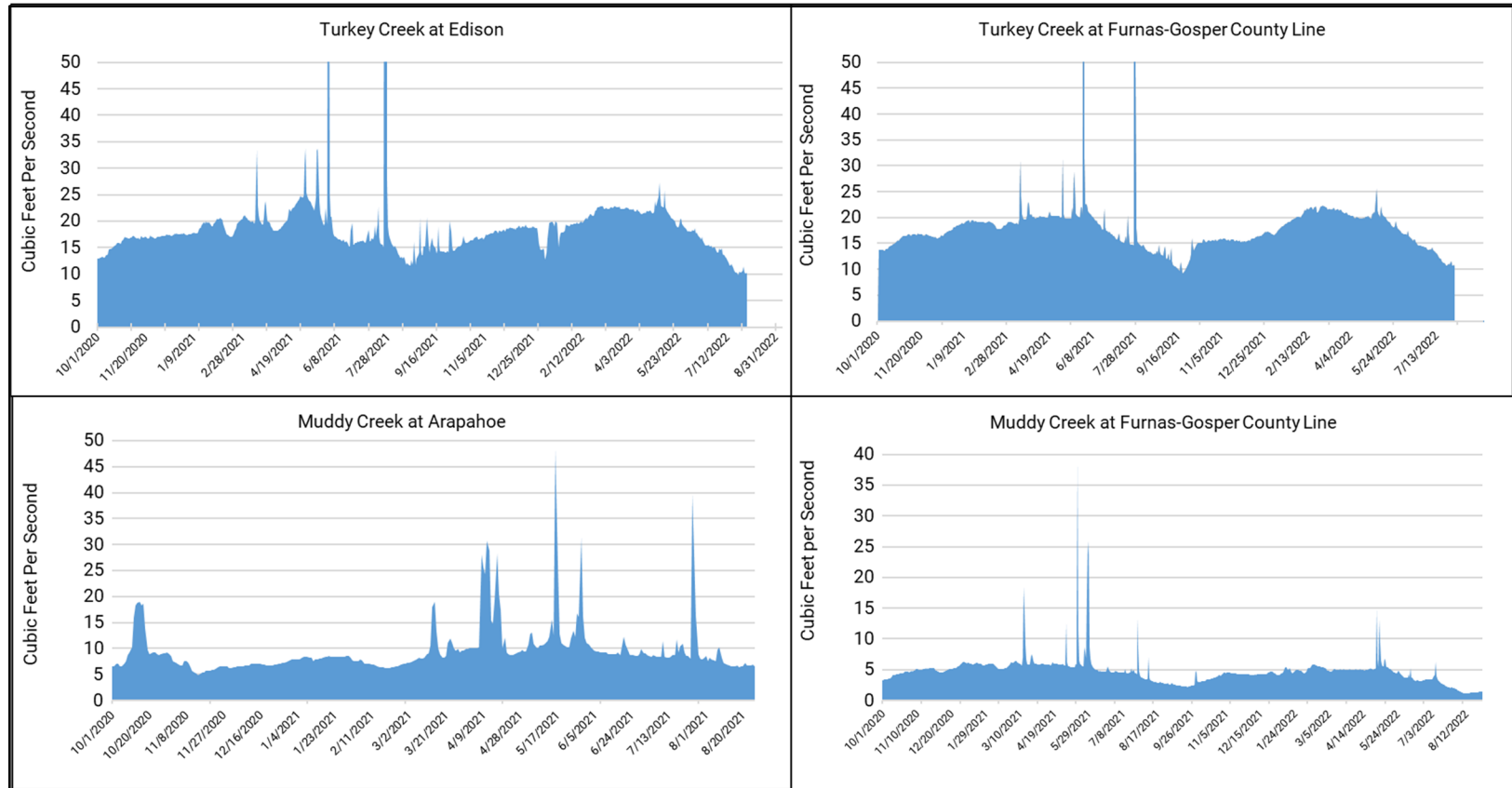


Figure 1. Measured flow at 4 streamgages in the Republican River Basin of Tri-Basin NRD. Data shown in dark blue are those that have been finalized since NeDNR's 2020 report. Due to high variability of flow, flows measured above 50 cfs were truncated at 50 cfs for visualization purposes. Streamgage data can be downloaded from <https://nednr.aquaticinformatics.net/>.

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IV. STREAMFLOW DEPLETION CALCULATIONS

This section of the report includes information on the calculated depletions to streamflow due to groundwater pumping within the Tri-Basin NRD and the imported water credit (Table 1 and Figure 3). The data shown in Table 1, Figure 2, and Figure 3 were calculated using the August 2020 RRCA accounting procedures. These calculations were completed using historical Tri-Basin NRD pumping data, groundwater mound, and recharge data as inputs to the RRCA groundwater model. Net effect to baseflow for each calendar year was calculated by totaling the imported water credit (mound accretions) and the streamflow depletion at the southern boundary of the Tri-Basin NRD. The net effects are summarized into a rolling three-year average to assess the progress towards achieving and sustaining a hydrologically balanced condition in accordance with the IMP. The three-year average net effect is positive for 2021 (Table 1 and Figure 3). In accordance with the IMP, these data will be used to assess the Tri-Basin NRD's progress to meet Goal A, Objective 1, of the IMP. In instances where the balance is negative, Tri-Basin NRD and NeDNR will set an objective for an offset up to 1000 acre-feet, and Tri-Basin NRD could begin augmentation pumping the same year. This report includes the final data approved by the RRCA through calendar year 2021.

Table 1. Calendar years 2013 to 2021 modeled streamflow depletion, mound accretion, and net effect to baseflow in acre-feet and previous three-year average net effect to baseflow for 2014 through 2021. A negative value represents depletion, and a positive value represents accretion.

Year	Streamflow Depletion (AF)	Mound Accretion (AF)	Net Effect (AF)	3-year Average Net Effect (AF)
2013	-9,174	9,476	302	--
2014	-9,588	9,456	-132	686
2015	-9,636	9,837	201	124
2016	-9,794	10,077	283	117
2017	-9,751	10,256	505	330
2018	-10,089	11,203	1,114	634
2019	-10,717	12,931	2,214	1,278
2020	-10,464	12,305	1,841	1,723
2021	-10,556	11,914	1,358	1,804

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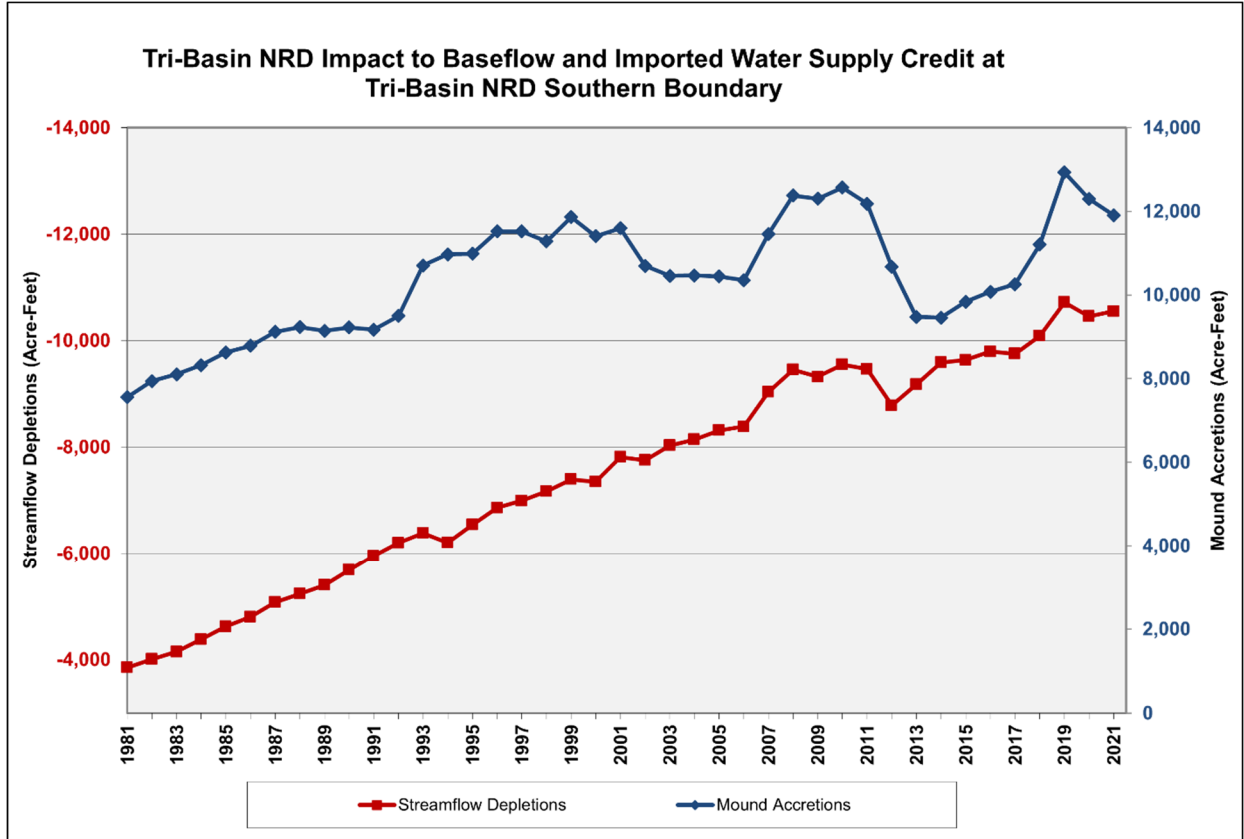


Figure 2. Modeled annual streamflow depletions and mound accretion for calendar years 1981 through 2021. These data were calculated using the August 2020 RRCA accounting procedures and the RRCA groundwater model. In order to show both streamflow depletions and mound accretions for comparison in one chart, the negative values on the left vertical axis pertain to the red line, representing stream depletion values, and positive values on the right vertical axis pertain to the blue line, representing mound accretions.

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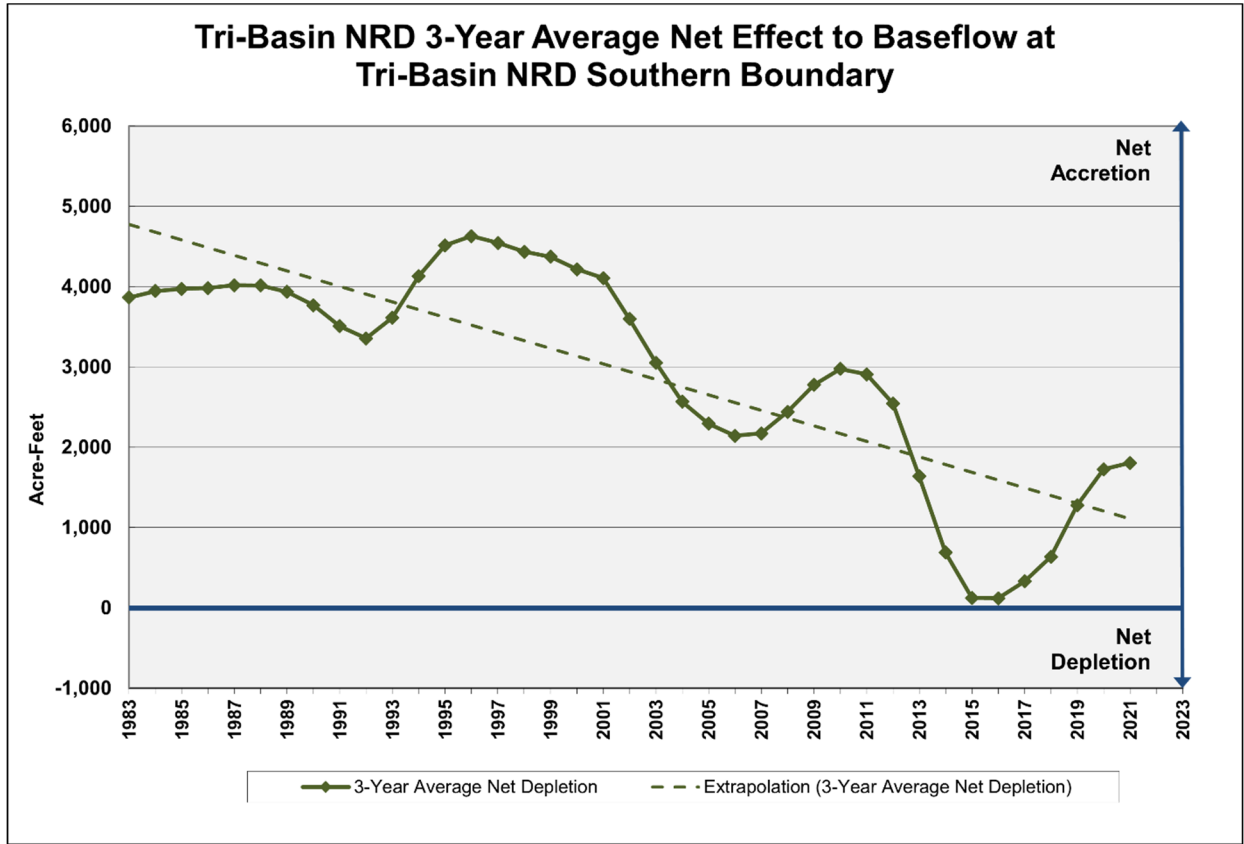


Figure 3. Rolling three-year average net effect to baseflow for calendar years 1981 through 2021, as the total of modeled values of streamflow depletion and mound accretions using the August 2020 RRCA Accounting Procedures and the RRCA groundwater model.