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DEPT. OF NATURAL RESOURCES

Nebraska Department of Natural Resources Preliminary Republican River Basin Forecast for 2024

November 15, 2023

Nebraska Department of Natural Resources (NeDNR)

Agenda:

- Preliminary Forecast and Accounting
- Augmentation Impacts
- TBNRD Hydrologically Balanced Assessment

Preliminary Forecast and Accounting

Topic Outline

- Final 2022 Accounting
- Preliminary 2023 Accounting
- Early Dry-year Forecast (2024)
- Compact Call Year Evaluation Flow Chart
- Forecasted NRD Projections for 2024

Final 2018-2022 Accounting

Hardy Balances, Table 3C	LRNRD	MRNRD	URNRD
2018	500	-1,900	2,900
2019	40,300	47,000	65,800
2020	14,800	28,500	26,300
2021	2,200	12,200	12,600
2022	-6,900	2,100	-7,100
2018-2022	50,900	87,900	100,500
Remaining Compact Compliance Volume (RCCV)	-1,640	-1,840	-240

*Units are acre-feet unless otherwise noted.

**Values throughout accounting and forecast presentation rounded to nearest 100. Sum of subtotals may not equal totals due to rounding.

Final 2021-2022 Accounting

Guide Rock Balances, Table 5C	LRNRD	MRNRD	URNRD
2021	2,100	11,400	11,600
2022	-7,700	100	-9,700
2021-2022	-5,600	11,500	1,900
Remaining Compact Compliance Volume (RCCV)	-1,640	-1,840	-240

Preliminary 2023 Accounting

Year	Item	Information Source
Provisional Data for T=0 (Current Year or Immediate Past Irrigation Season)	Pumping	Prior year pumping
	Surface Water Use	Estimated from preliminary data and previous years values
	Streamflow	Available provisional records – end-of-year estimated
	Evaporation	Prior year records and provisional data

Preliminary 2023 Accounting

- October 2023 – Kansas requested Remaining Compact Compliance Volume (RCCV) delivery of 1,860 acre-feet
- MRNRD completed management actions in 2023 yielding in excess of the RCCV request
 - Riverside retirement
 - Besler retirement
 - Culbertson bypass
- RCCV is reduced to 0 and NRD balances will be adjusted according to NRD agreement
- The following projections for 2023 uses an adjustment that is subject to change upon NRD discussion

Preliminary 2023 Accounting Guide Rock with Management Actions and RCCV Adjustment

	LRNRD	MRNRD	URNRD
Remaining Compact Compliance Volume (RCCV)	-820	-920	-120

Guide Rock Balances, Table 5C	LRNRD	MRNRD	URNRD
2022 (final)	-7,700	100	-9,700
2023 (projected)	-9,600	-5,000	-5,200
2023 (projected) with RCCV	-10,420	-5,920	-5,320
RCCV Yield Credit	0	1,860	0
2023 with RCCV Credit	-10,420	-4,060	-5,320
2022-2023 Balance	-18,120	-3,960	-15,020

Preliminary 2023 Accounting: Hardy with Management Actions and RCCV Adjustment

	LRNRD	MRNRD	URNRD
Remaining Compact Compliance Volume (RCCV)	-820	-920	-120

Hardy Balances, Table 3C	LRNRD	MRNRD	URNRD
2019-2022 (final)	50,400	89,800	97,600
2023 (projected)	-10,000	-4,600	-4,700
2023 (projected) with RCCV	-10,820	-5,520	-4,820
RCCV Yield	0	1,860	0
2023 with RCCV Yield Credit	-10,820	-3,660	-4,820
2019-2023 Balance	39,580	86,140	92,780

Early Dry-Year Forecast (2024)

Dry-Year Forecast

Year	Item	Information Source
Forecast Year T+1 (Coming Irrigation Season)	Groundwater Consumptive Use and Imported Water Supply Credit	Average Values for T=0 and T-1
	Surface Water Consumptive Use	Colorado: Average of T-1 and T-2 use Kansas: $+(0.1858 \times \text{HCLcontent}) + 9,575$ Nebraska: $-(4 \times 10^{-7}) \times (\text{NE lake volume})^2 + 0.52 \times \text{NElakeVolume} - 42,000$
	Streamflow	$(5\text{-year average of state line flows}) \times 0.41 + 0.23 \times \text{HCLcontent} - 27,450$

Compliance Balances

Year	Guide Rock Balance (AF)
T=0 (2023, projected)	-19,800
T=+1 (2024, early forecast)	-21,100
2-Year Forecast Balance	-40,900

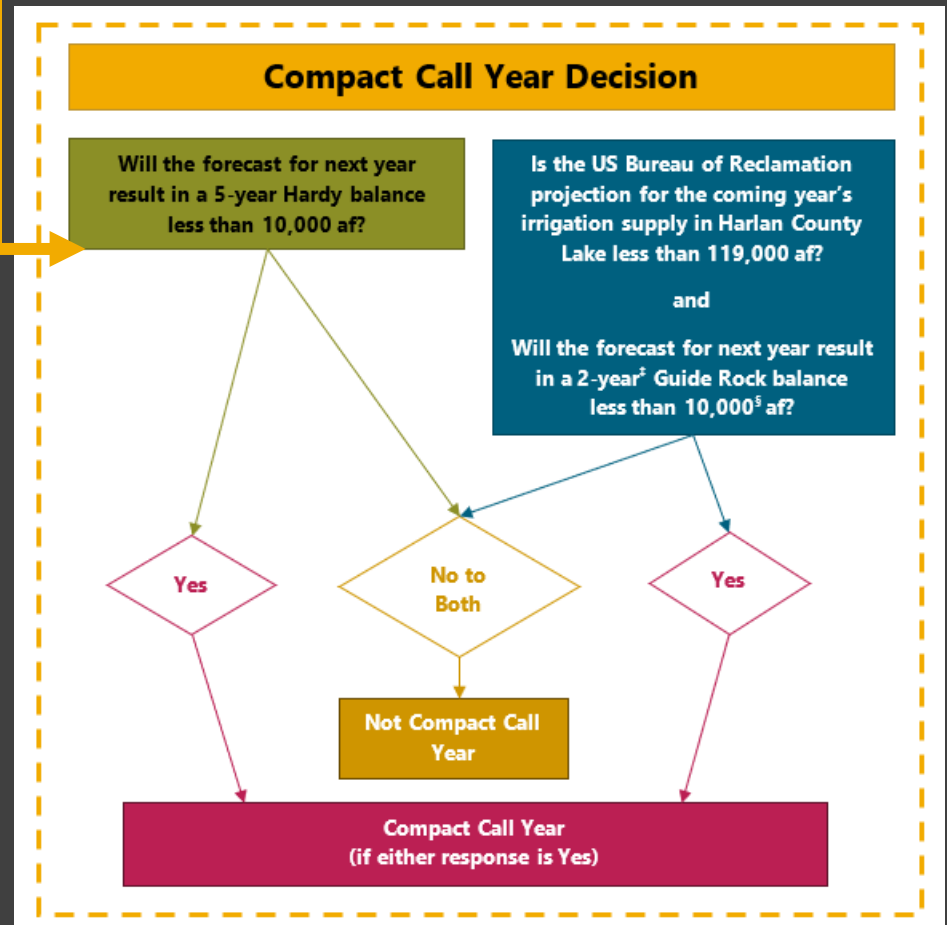
Year	Hardy Balance (AF)
T=-3 to 0 (2020-2023, projected)	65,400
T=+1 (2024, early forecast)	-13,500
5-Year Forecast Balance	51,900

Compact Call Year Evaluation:

Will the forecast for next year result in a 5-year Hardy balance less than 10,000 AF?

Year	Hardy Balance (AF)
5-Year Forecast Balance	51,900

No.



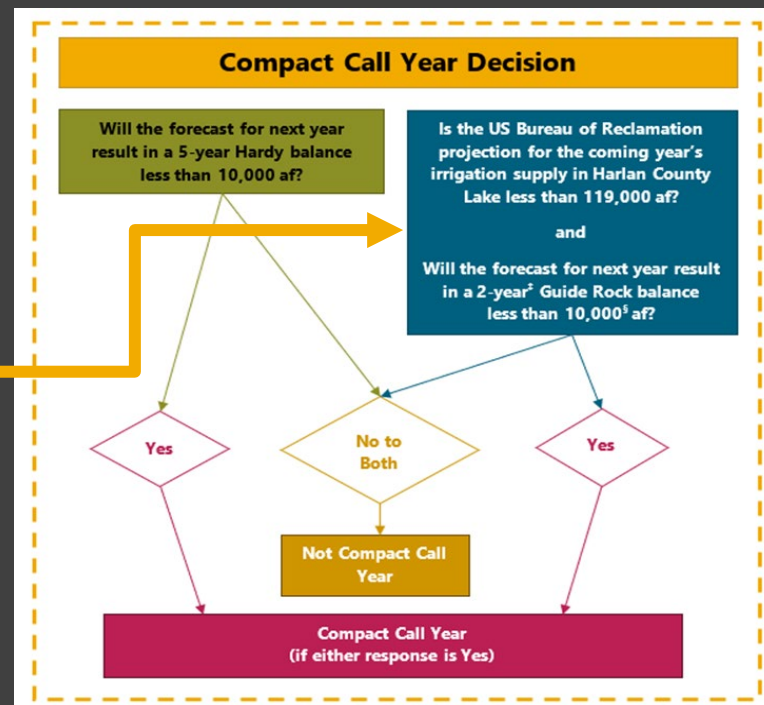
Compact Call Year Evaluation:

Is the US Bureau of Reclamation projection for the coming year's irrigation supply in Harlan County Lake less than 119,000 AF?

AND

Will the forecast for next year result in a 2-year[†] Guide Rock balance less than 5,000 AF?

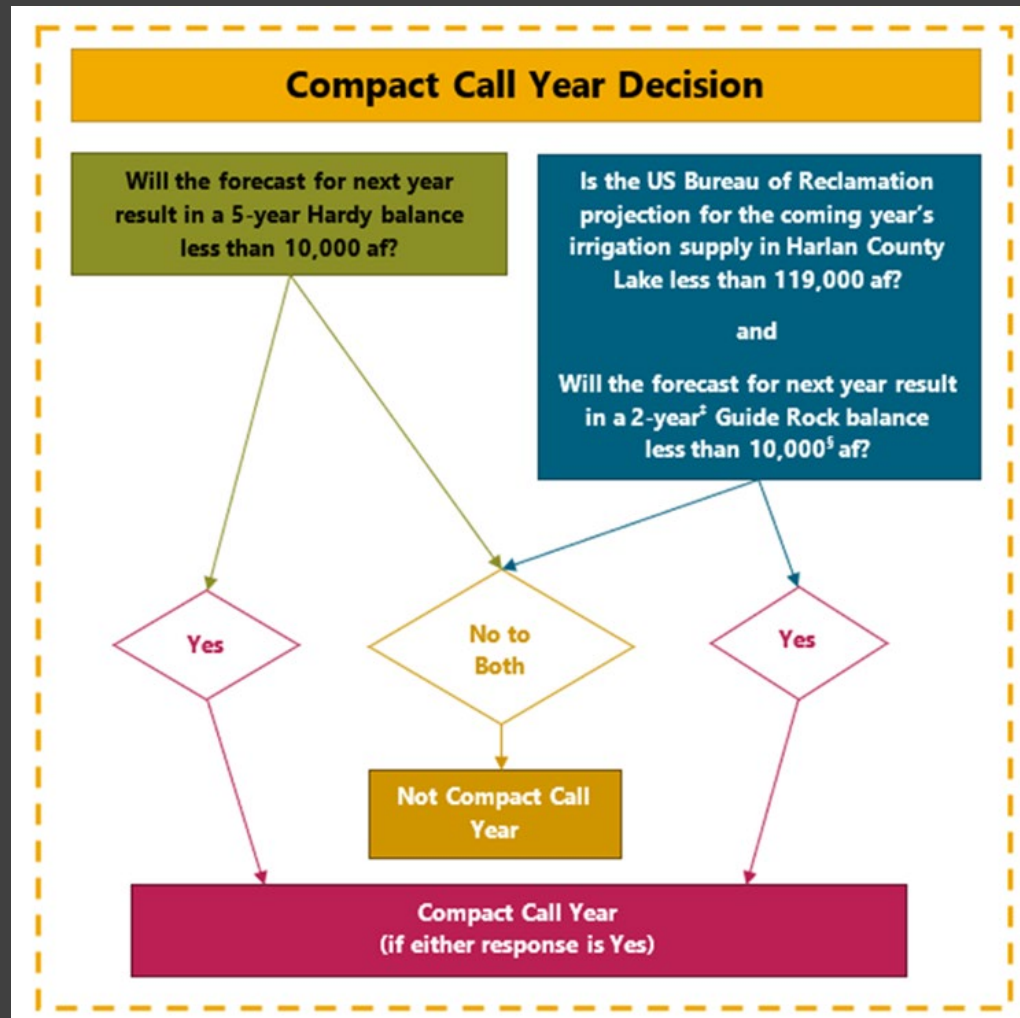
Yes, to Harlan County Lake Irrigation Supply.
Yes, to Guide Rock balance.



Year	Guide Rock Balance (AF)
HCL Irrigation Supply	106,800
2-Year Forecast Balance	-40,900

§ In the second consecutive Compact Call Year, the 10,000 af threshold for the Guide Rock test will be reduced to 5,000 af. For the third and subsequent consecutive Compact Call Years, this value will be reduced to zero.

Compact Call Year Evaluation: 2024 projected to be a Compact Call Year.



NRD-Specific Forecast Balances

NRD Annual Guide Rock Balance Forecast for Upcoming Year (2024)

	LRNRD	MRNRD	URNRD	Total
Allowable Depletion Distribution Percentage from IMPs	24.5%	31.1%	44.4%	100.0%
Allowable Groundwater Depletions	36,700	46,600	66,600	149,900
Projected Groundwater Depletions	45,600	50,900	74,500	171,000
2024 Forecast Balance (no action)	-8,900	-4,300	-7,900	-21,100
2023, projected	-10,420	-4,060	-5,320	-19,800
2-Year Forecast Balance	-19,320	-8,360	-13,220	-40,900
2-Year Forecast Balance + 5K AF	-24,320	-13,360	-18,220	
RCCV	0	0	0	0

NRD Annual Hardy Balance Forecast for Upcoming Year (2024)

	LRNRD	MRNRD	URNRD	Total
Allowable Depletion Distribution Percentage from IMPs	25.3%	30.8%	43.9%	100.0%
Allowable Groundwater Depletions	40,400	49,200	70,200	159,900
Projected Groundwater Depletions	48,000	50,900	74,500	173,400
2024 Forecast Balance (no action)	-7,600	-1,700	-4,300	-13,500
2020-2023, projected	-720	39,140	26,980	65,400
5-Year Forecast Balance	-8,320	37,440	22,680	51,900
5-Year Forecast Balance + 5K AF	-13,320	32,440	17,680	
RCCV	0	0	0	0

Summary

- Based on the preliminary forecast, the IMP checklist indicates that 2024 is projected to be a **Compact Call Year**.
- Preliminary approximate 2023 accounting balances:
 - Guide Rock: **-19,800 ac-ft**
 - Hardy: **-19,300 ac-ft**
- Preliminary dry-year forecast balance for 2024 currently approximated at **-21,100 ac-ft** at Guide Rock and **-13,500 ac-ft** at Hardy
- RCCV on January 1, 2024, will be **0 acre-feet**
- Preliminary dry-year forecast balance for 2024 with the **5K AF cushion** is currently approximated at **-26,100 ac-ft** at Guide Rock and **-18,500 ac-ft** at Hardy
 - Two-year Guide Rock balance can be up to **-45,900 ac-ft with 5K AF cushion**.

Next Steps

- **Preliminary Forecast and Basin-Wide Meeting**

- Participants can discuss the forecasted streamflow and surface water consumptive use.
- From these discussions, surface water project sponsors may present a plan to NeDNR to achieve a consumptive use that is less than forecasted consumptive use. Such a plan could allow surface water project sponsors to avoid a potential Compact Call Year.

- **Final Forecast and Compact Call Year Determination**

- NeDNR will publish the final forecast before January 1 of each year as required by Neb. Rev. Stat. § 46-715(6), including both short and long-term forecasts and whether a Compact Call Year will be designated.
- If any potential deficit between allowable and forecast depletions is projected, that information will also be included with the final forecast.

- <https://dnr.nebraska.gov/water-planning/lower-republican-nrd>

Timeline

- **December 2023:** NeDNR notifies the NRDs in writing that the following year will be a Compact Call Year and notifies the NRDs how much yield from potential management actions may be needed within the CCY.
- **January 2024:** The NRDs notify NeDNR in writing about planned management actions to ensure Compact compliance.
 - NeDNR then issues orders to implement surface water controls.
- **Late February or early March 2024:** NeDNR provides a written assessment of the NRDs' planned management actions. If NeDNR determines that proposed management actions are insufficient to ensure compliance with the Compact, the IMPs, or the Republican River Basin-Wide Plan, the NRDs will implement additional controls to make up the remaining deficit.
- **April 2024:** NeDNR notifies Colorado, Kansas, and relevant federal agencies in writing about preliminary management actions and the anticipated water yield.

Timeline

- **May-December 2024:** NeDNR provides monthly preliminary accounting estimates to the NRDs, Kansas, Colorado, and the Bureau.
 - 10th of every month
- **June 2024:** NeDNR notifies Colorado, Kansas, and relevant federal agencies in writing about management actions taken and to be taken, and the anticipated water yield.
- **June 30th 2024:** Bureau finalizes Water-Short Year designation.
- **October 1st 2024:** Nebraska and Kansas review accounting;
 - Kansas can request remaining Compact compliance volume (RCCV).
- **September–October 2024:** NeDNR notifies the NRDs in writing about the assessment of NRD management actions and identifies specific additional management actions that are required by each NRD.

Augmentation Impacts

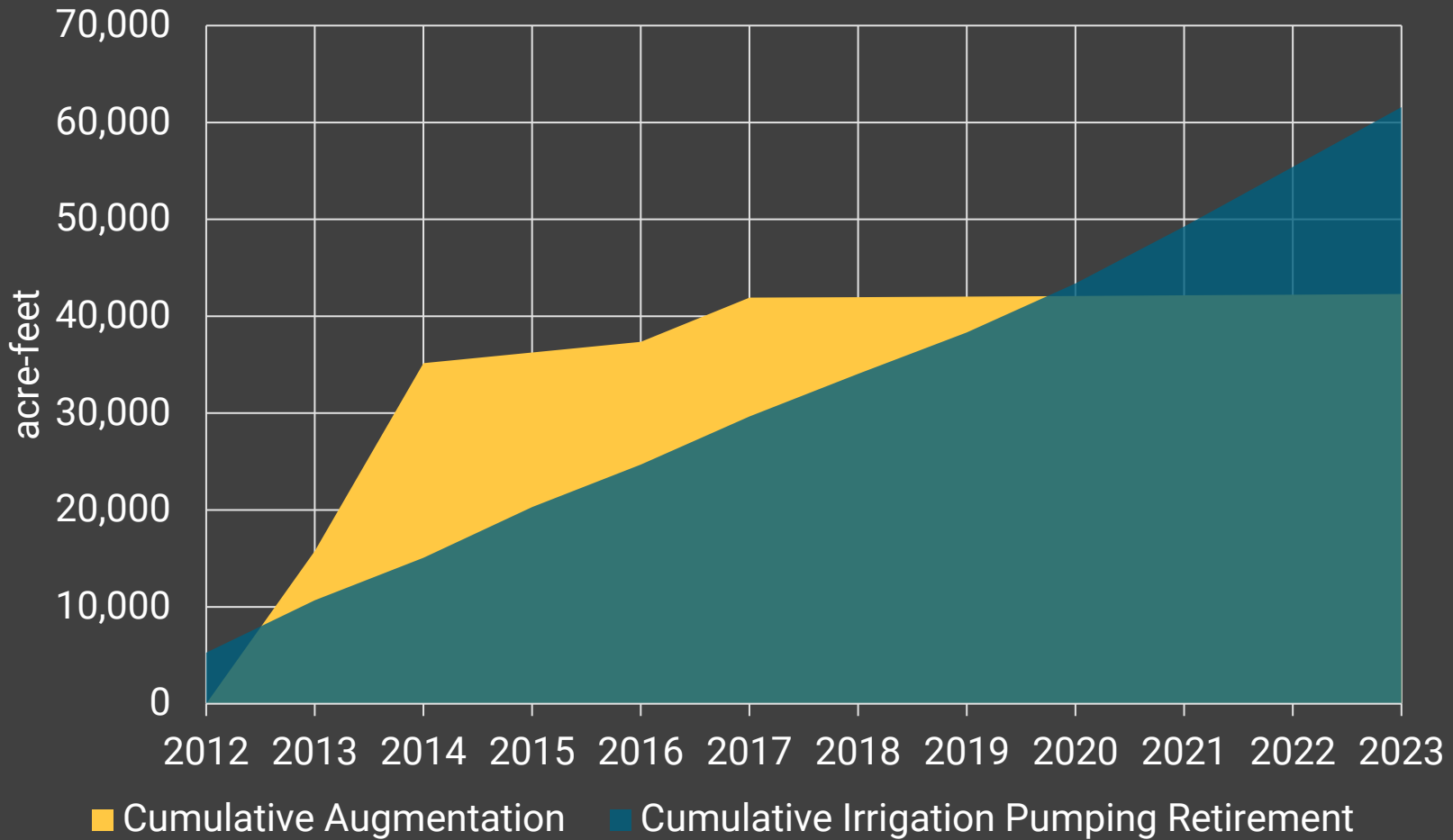
Augmentation Impacts – IMP

Our IMPs state:

“...NeDNR will annually evaluate whether offsets are necessary to mitigate new net depletions resulting from augmentation pumping or other management actions.”

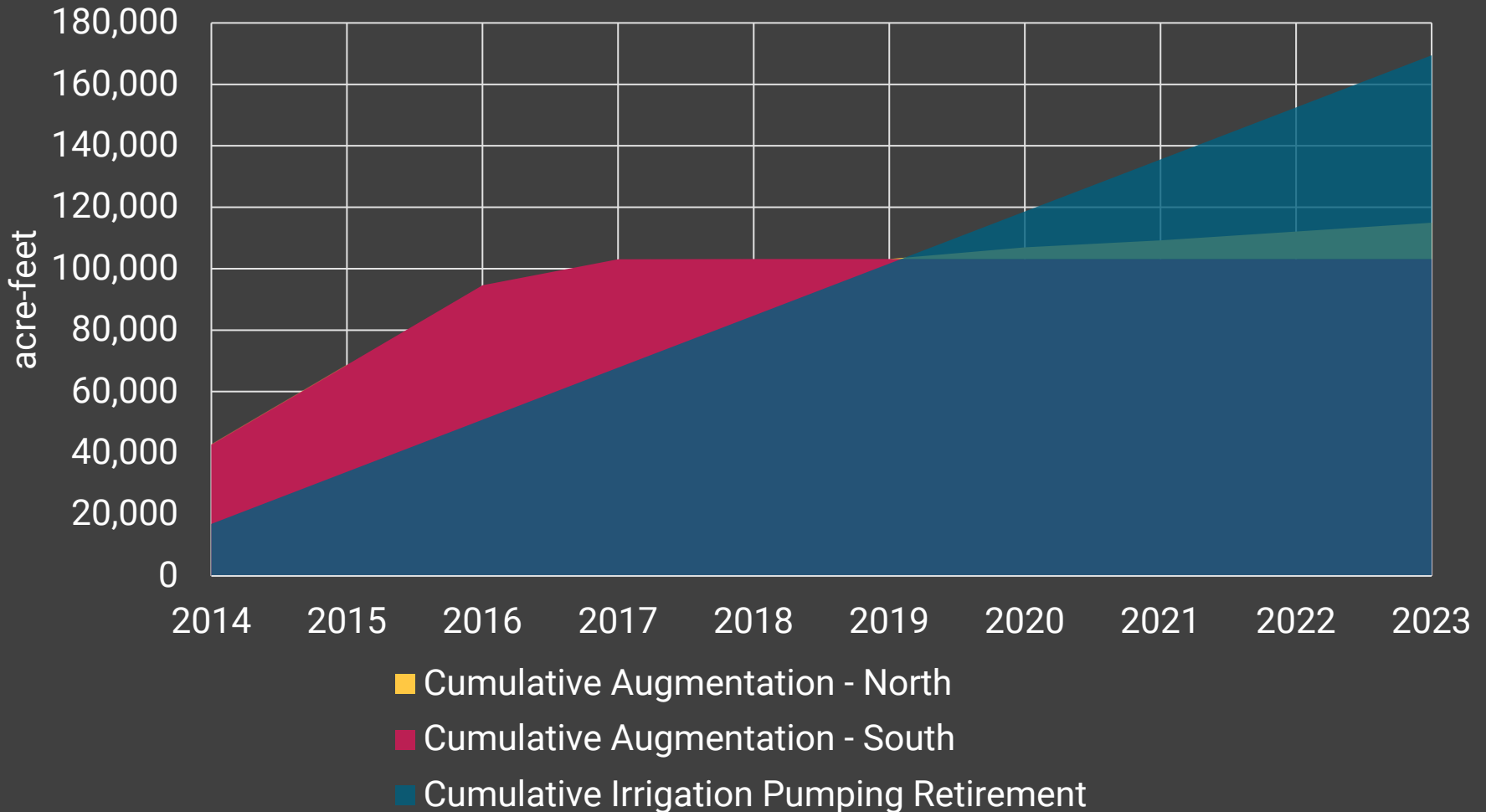
Augmentation Impacts – Model Inputs

Rock Creek



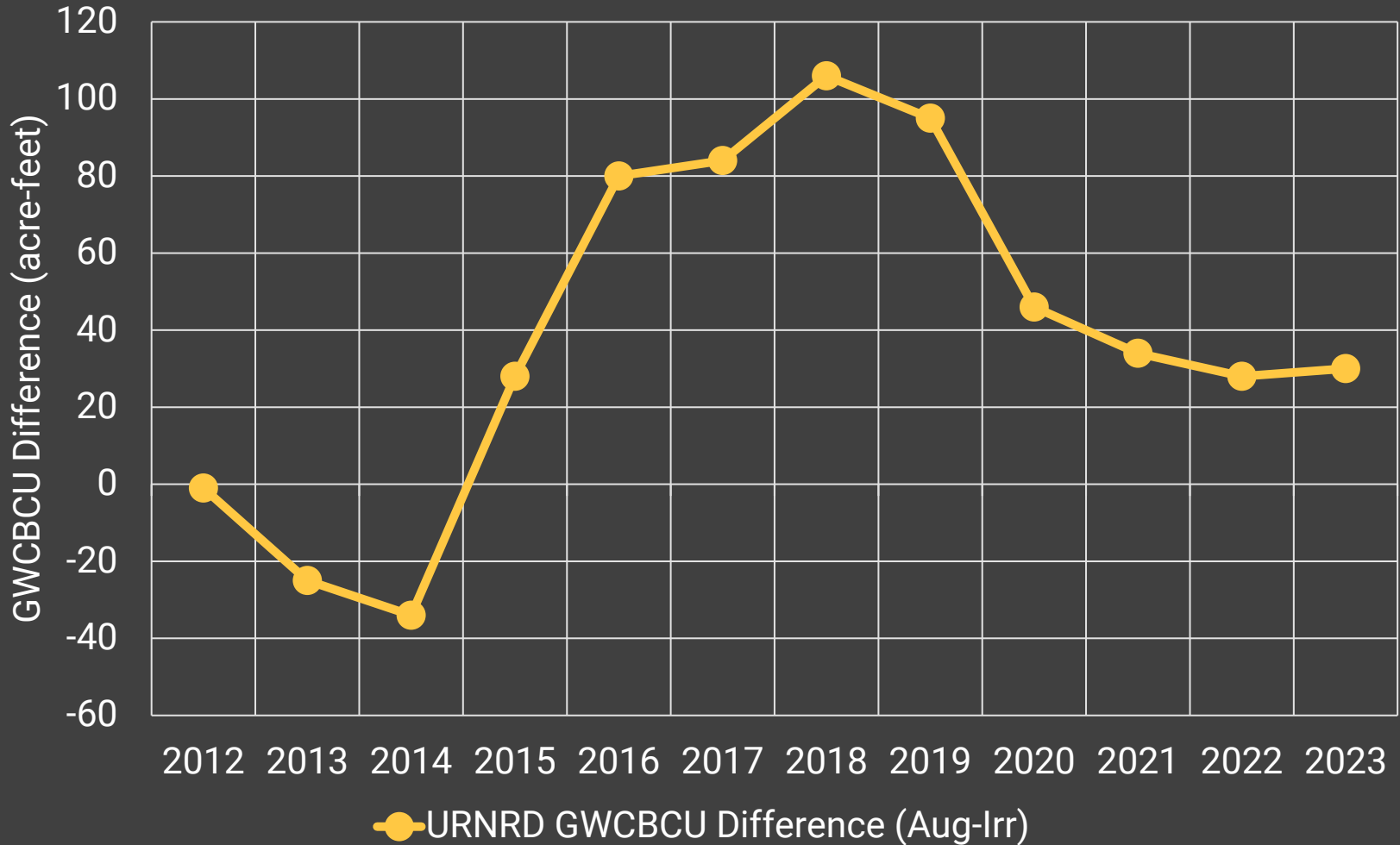
Augmentation Impacts – Model Inputs

N-CORPE



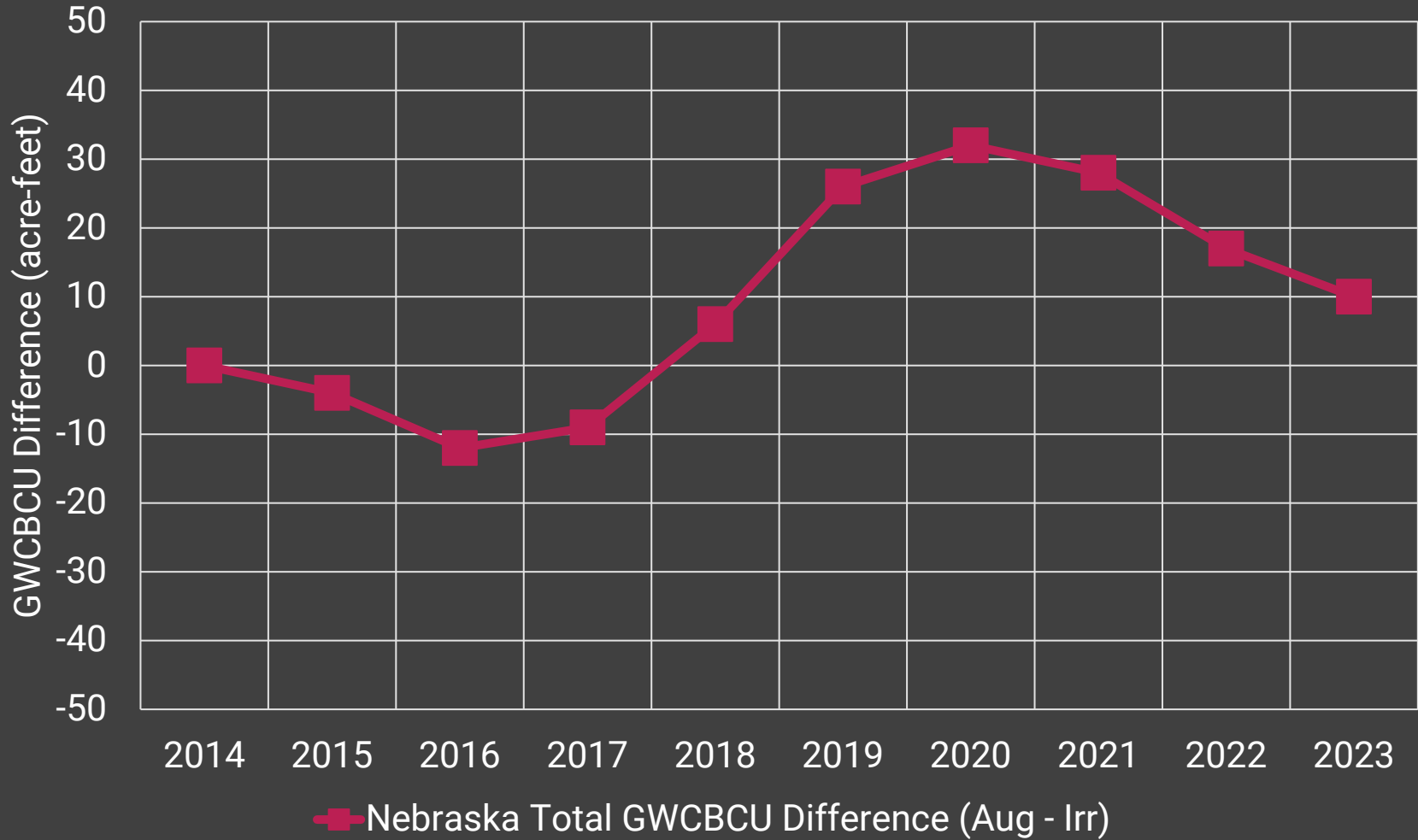
Augmentation Impacts – Oct. 2023 run

Rock Creek Impacts



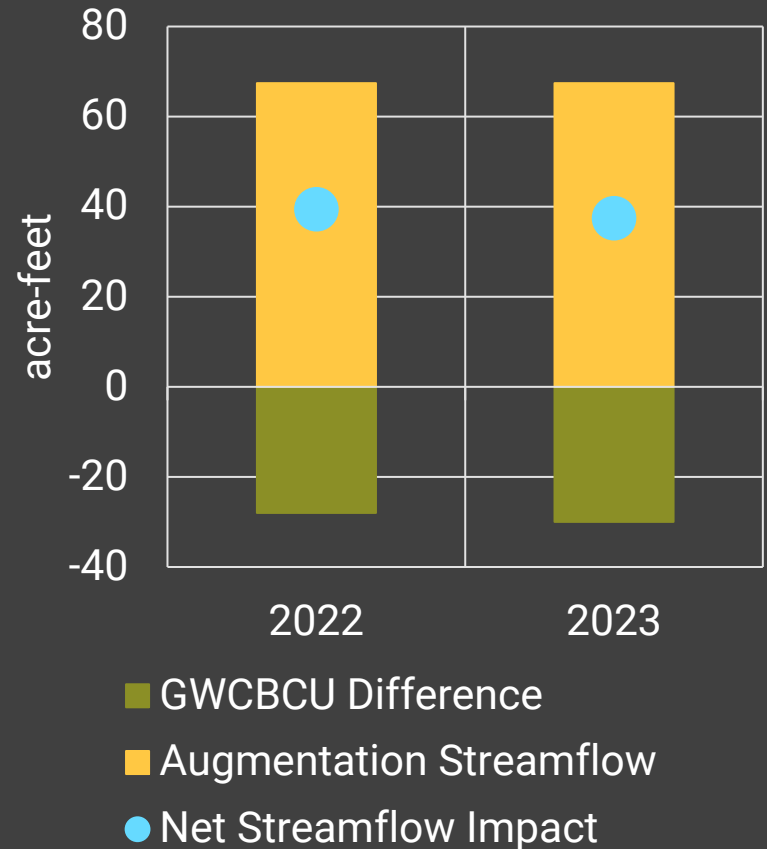
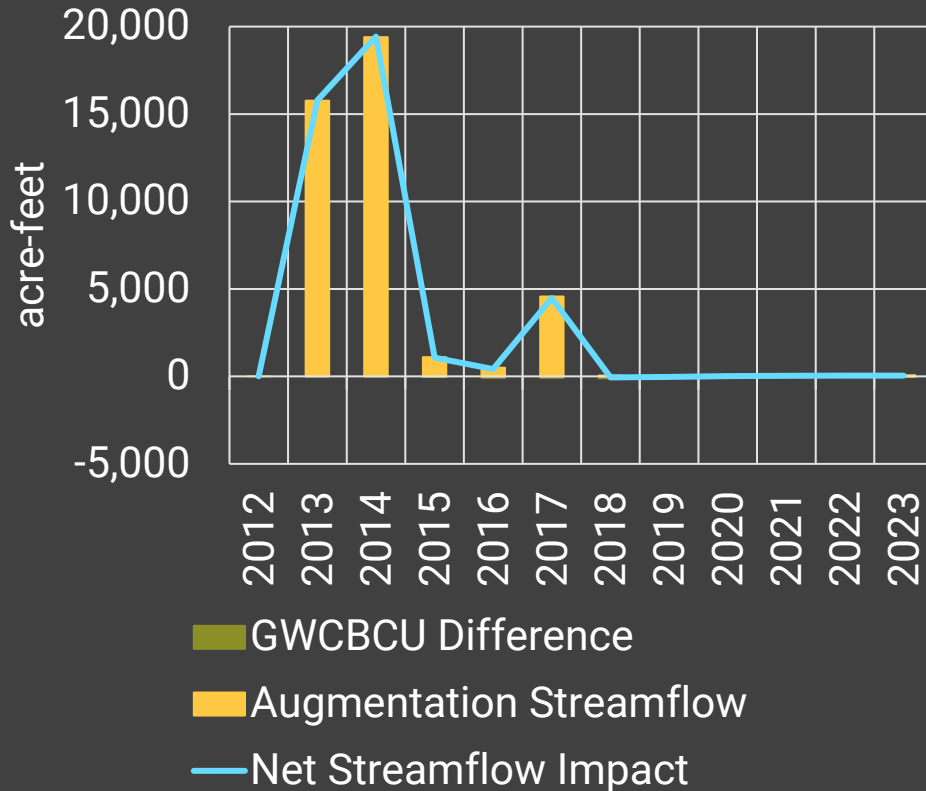
Augmentation Impacts – Oct. 2023 run

N-CORPE Impacts



Augmentation Net Streamflow Impacts – Rock Creek

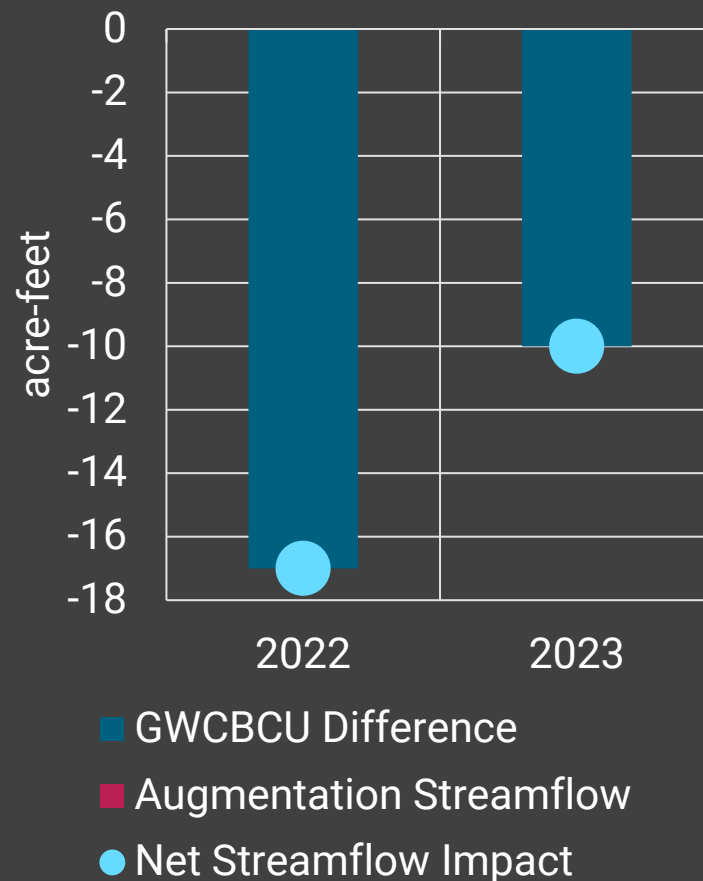
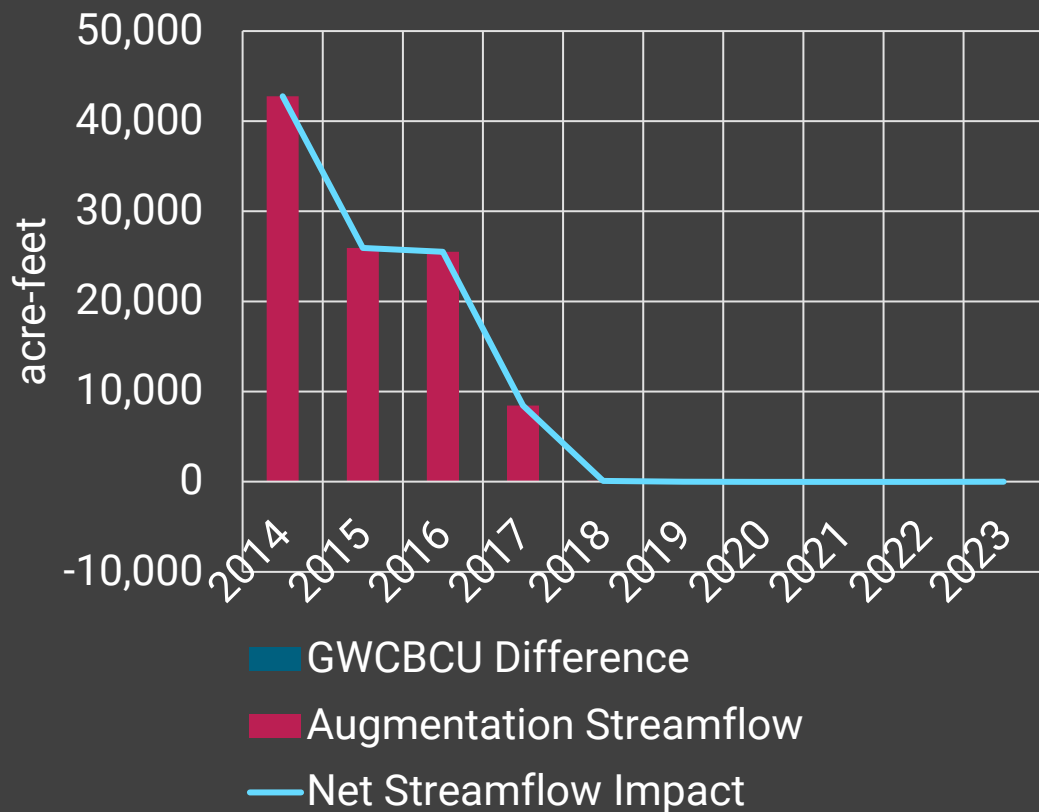
Rock Creek Augmentation Net Impacts to Streamflow



*Augmentation streamflow assumed to occur in same year as pumped; 2022 pumping repeated for 2023

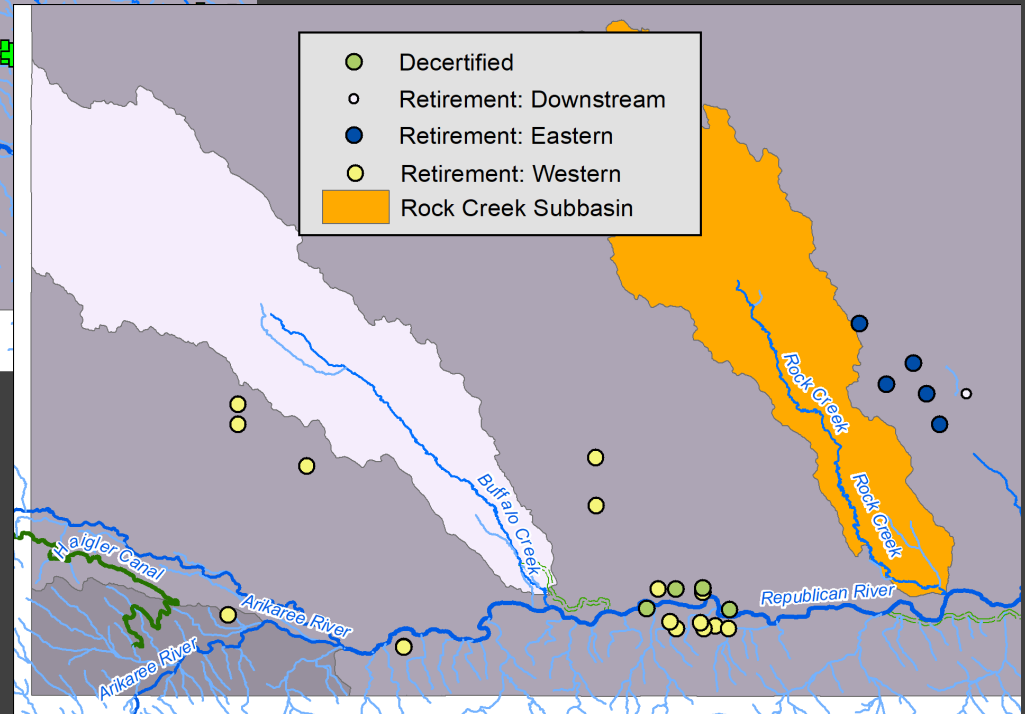
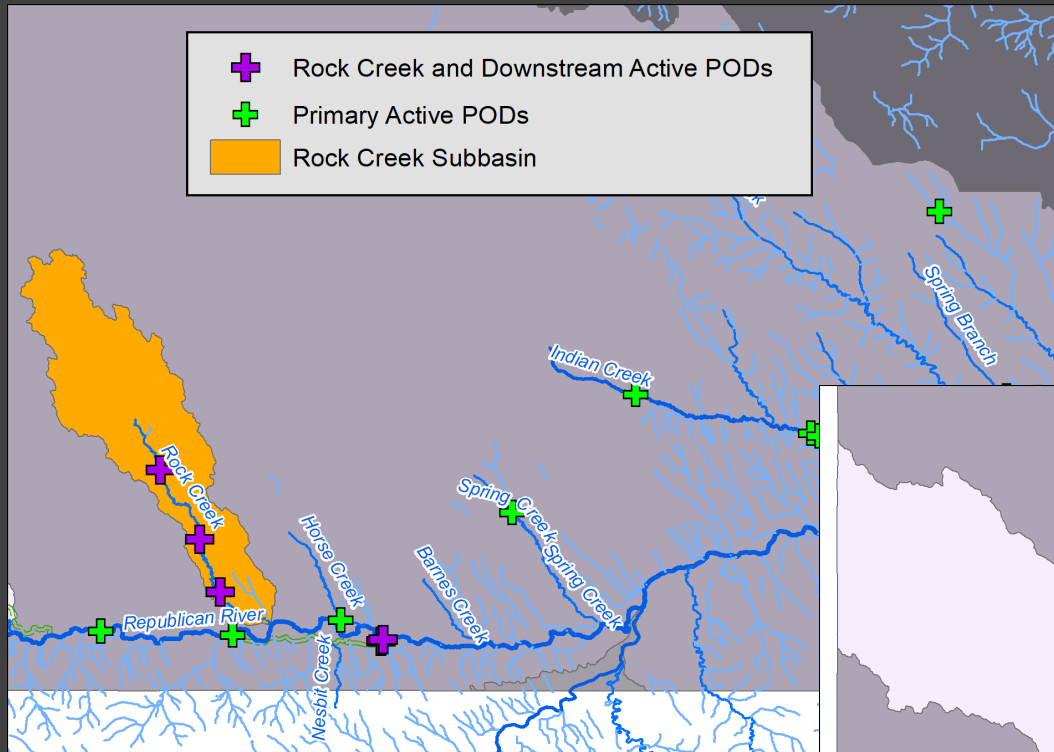
Augmentation Net Streamflow Impacts – N-CORPE

N-CORPE Augmentation Net Impacts to Streamflow



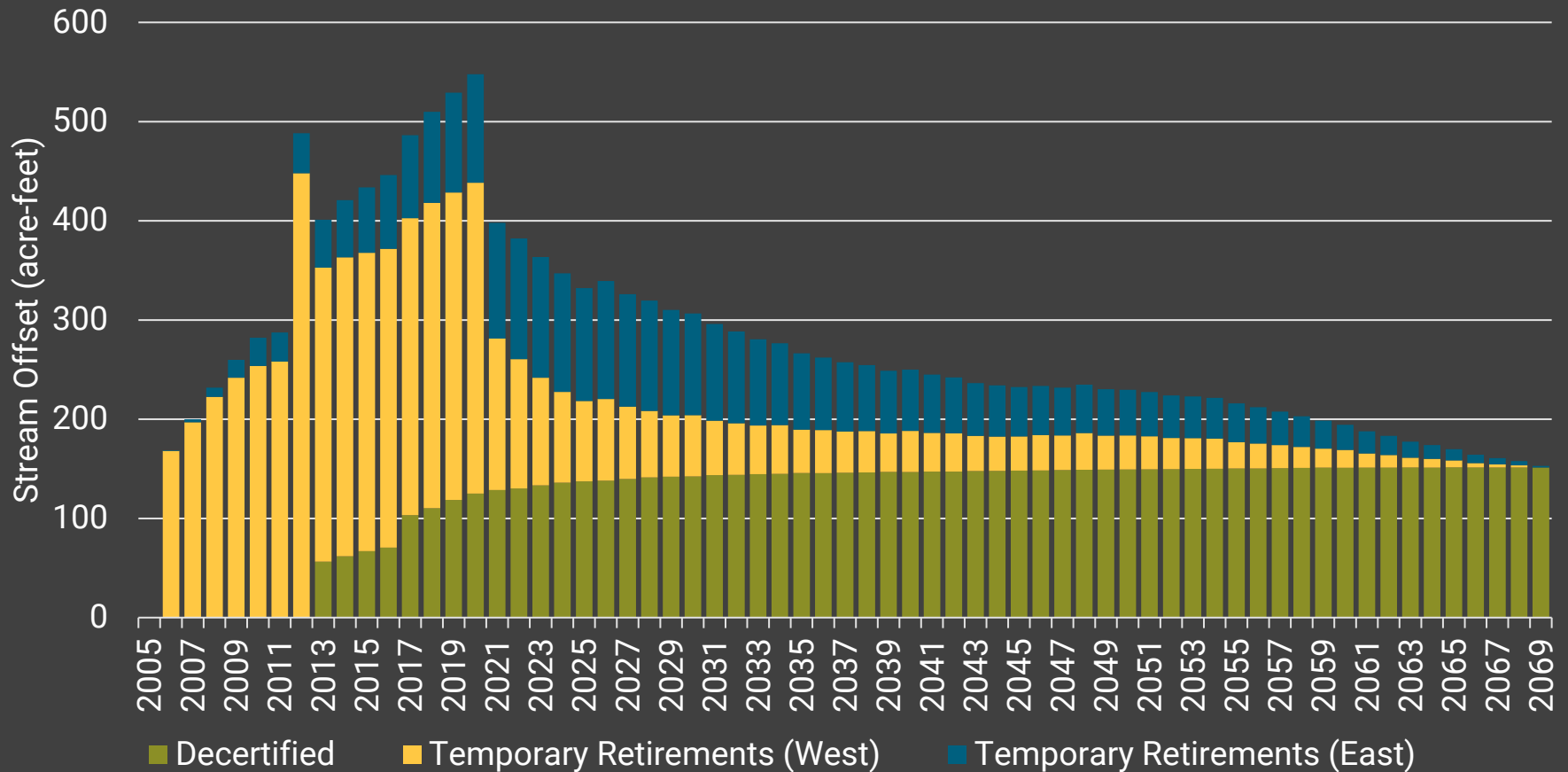
*Augmentation streamflow assumed to occur in same year as pumped; 2022 pumping repeated for 2023

Augmentation Impacts – Rock Creek Offsets



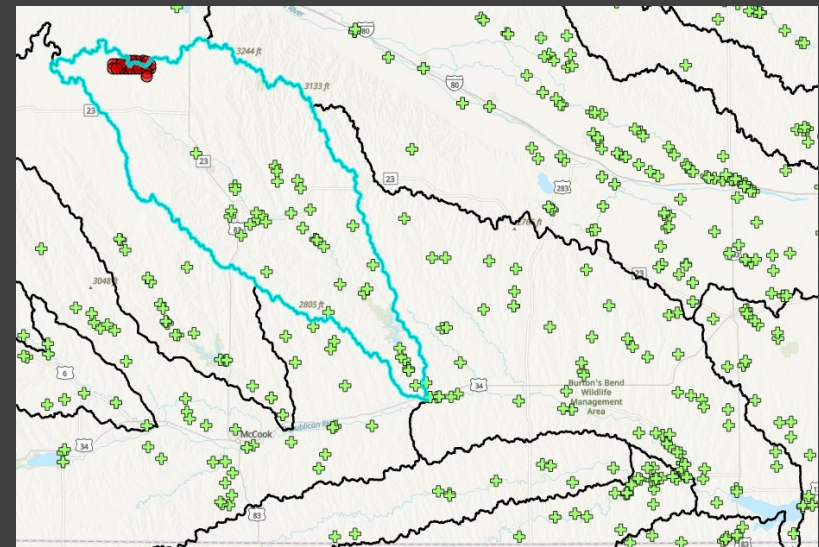
Augmentation Impacts – Rock Creek Offsets

Annual Offset from Decertified and Retired Historical Uses Affecting and Upstream of the Rock Creek and Republican River Confluence



N-CORPE Offsets Discussion

- Net depletions are to Medicine Creek
- Consideration of users impacted by depletions
- NRD management action to consider



Hydrologically Balanced Assessment

For the IMP for the Republican Basin
Portion of Tri-Basin NRD

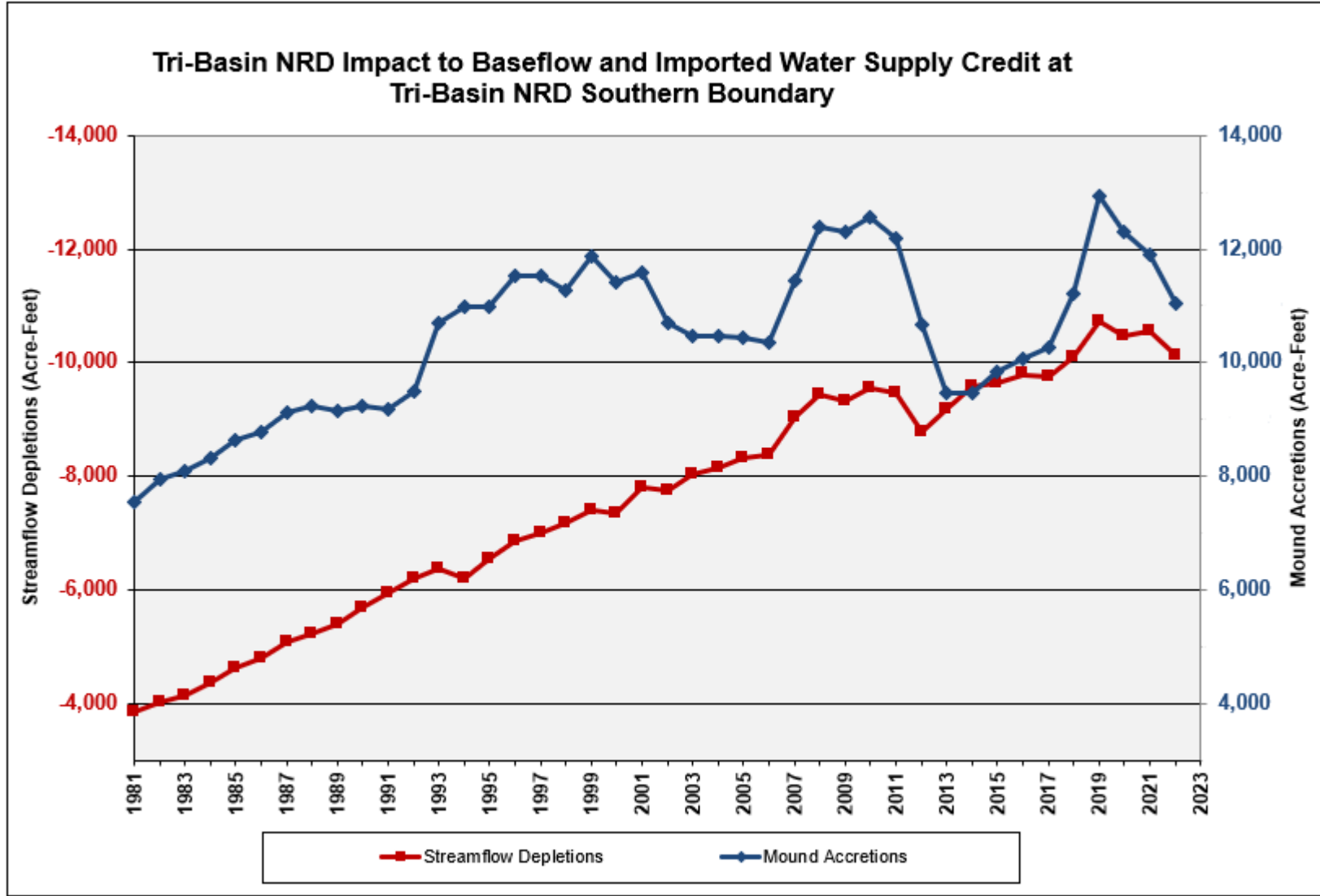
Goal A, Objective 1

“Revise existing NRD integrated water management rules and regulations, to the extent necessary, to insure **that the NRD will incrementally achieve and sustain a hydrologically “balanced” condition** so that, in combination with imported water contributions from the Platte basin, streamflow augmentation and other management actions, Tri-Basin NRD water users will not cause a net depletion to streamflow.....**Under a hydrologically balanced condition in the context of this plan, baseflow impacts and the mound credit will be equal.**”

Assessment

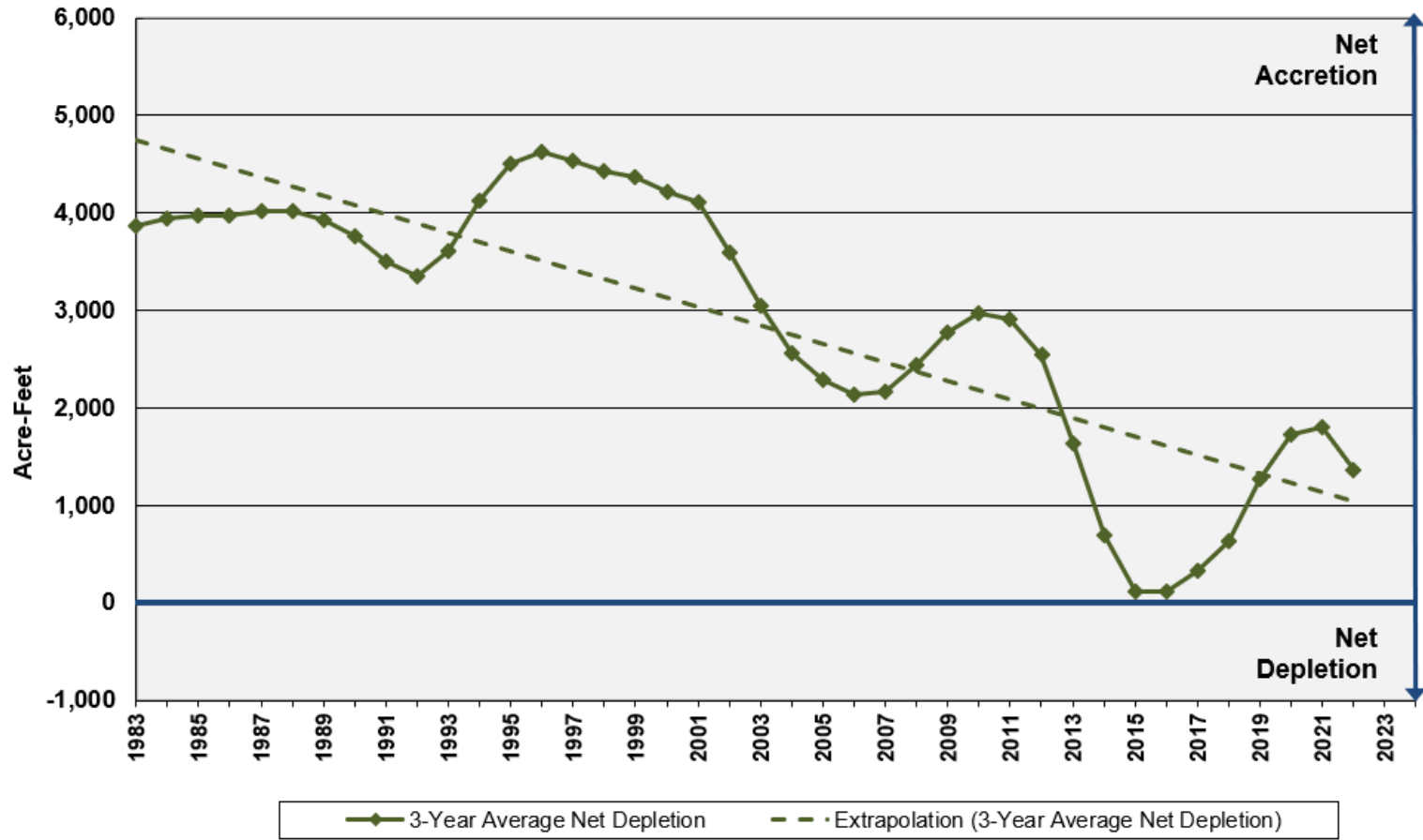
“Goal A Objective 1 of this IMP is to establish a hydrologically ‘balanced’ condition in which Tri-Basin NRD water users will **not cause a net depletion to streamflow of the Republican basin when evaluated on a three-year rolling average basis**.”

Modeled Depletions and Accretions, 1981 – 2022



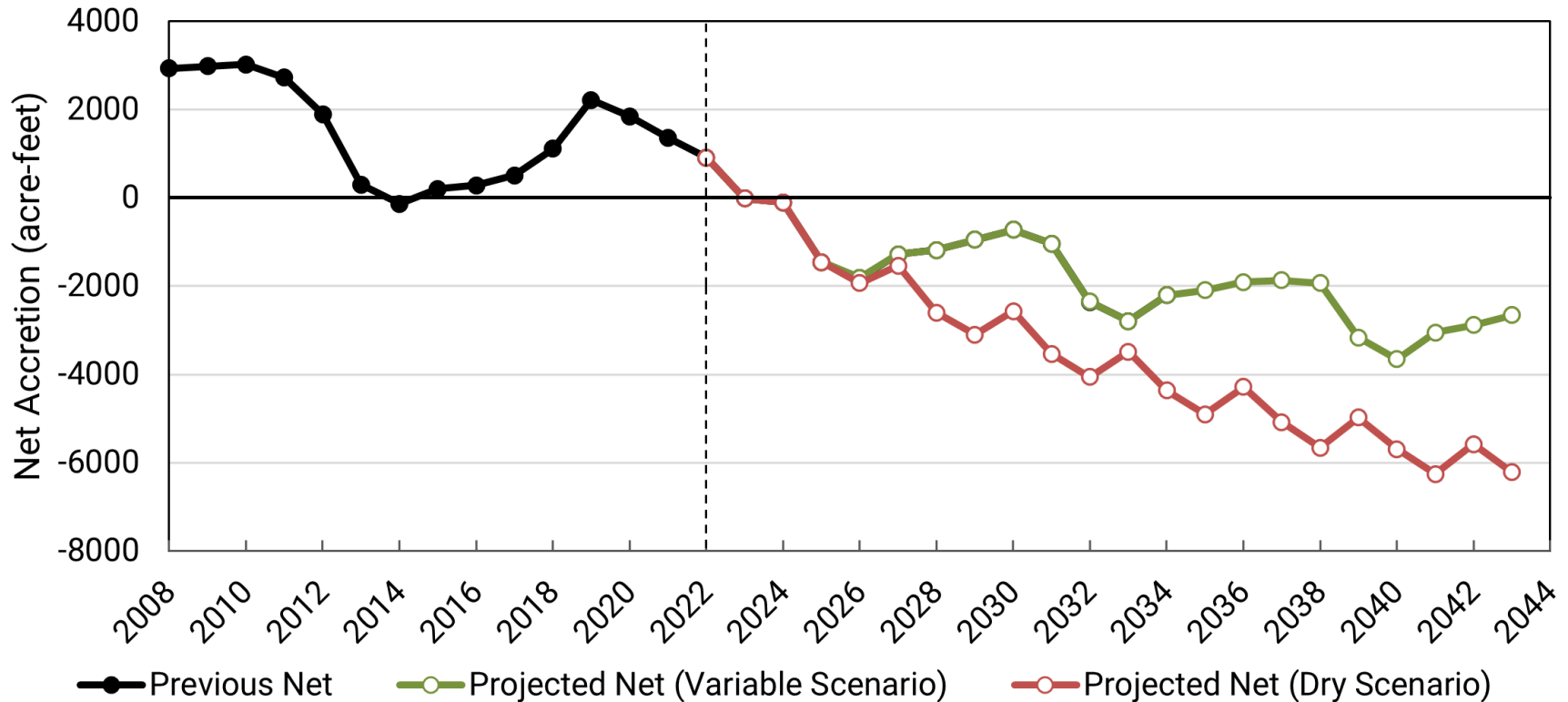
Hydrologically Balanced Assessment

Tri-Basin NRD 3-Year Average Net Effect to Baseflow at Tri-Basin NRD Southern Boundary



Projected Net Accretion

Annual Net Accretion under Variable and Dry Scenarios



In 2025 the 3-year average net accretion projected to be negative (-524 ac-ft).

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