

Upper Platte
Annual
Basin-wide
Meeting –
2023
Robust
Review
Summary

August 1, 2024

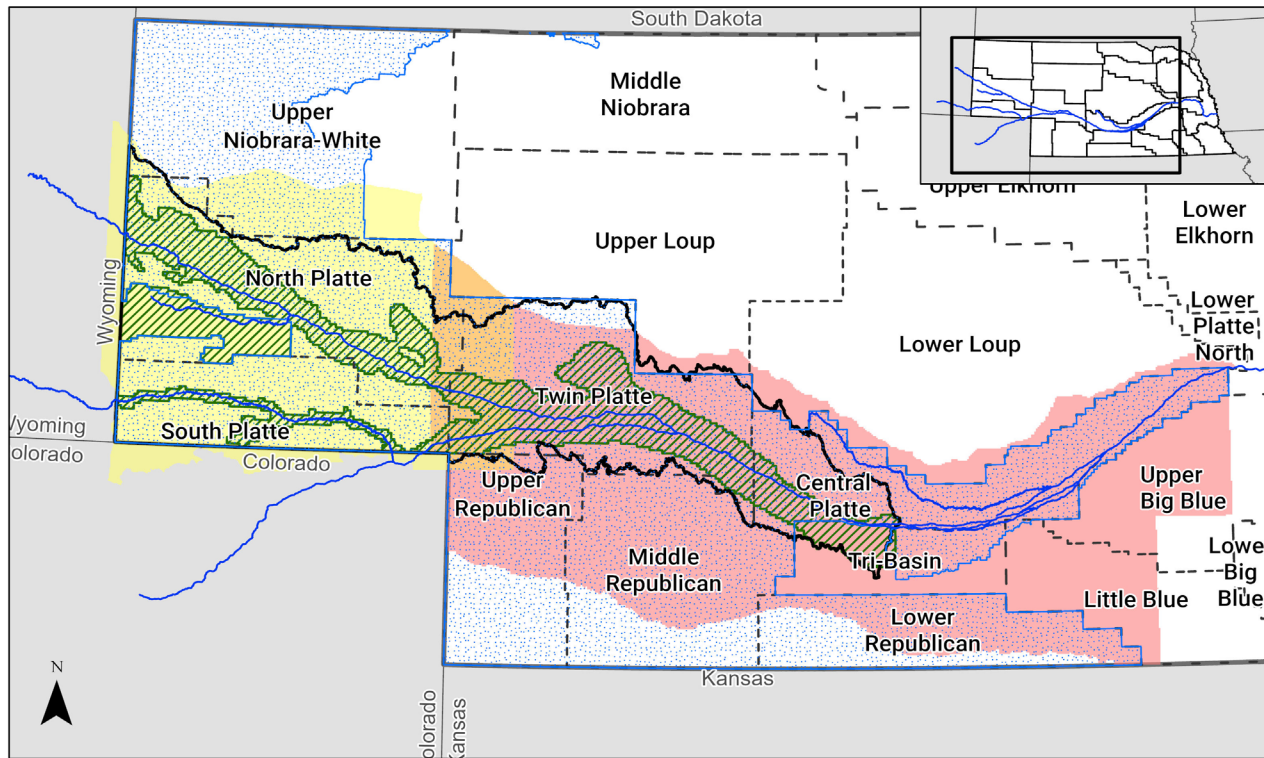
IWM – Overview

Statutes

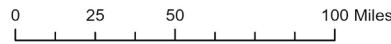
- *Nebraska Revised Statute § 46-715(5):*
 - ✓ IMPs
 - ✓ Basin-wide Plan
 - ✓ Use Consultation & Collaboration Process
 - ✓ Identify overall difference between Over and Fully appropriated
 - ✓ Incremental (10 year) Approach to Fully Appropriated Impacts (stream depletion) of water use initiated after 7/1/1997 to existing users
 - ✓ Technical Analysis to evaluate progress (Robust Review)
 - ✓ Repeat Increments until Fully Appropriated
 - ✓ Afterwards, maintain Fully Appropriated condition

IWM - Overview

Fully and Overappropriated Areas within Model Area



Upper Platte River
Model Areas



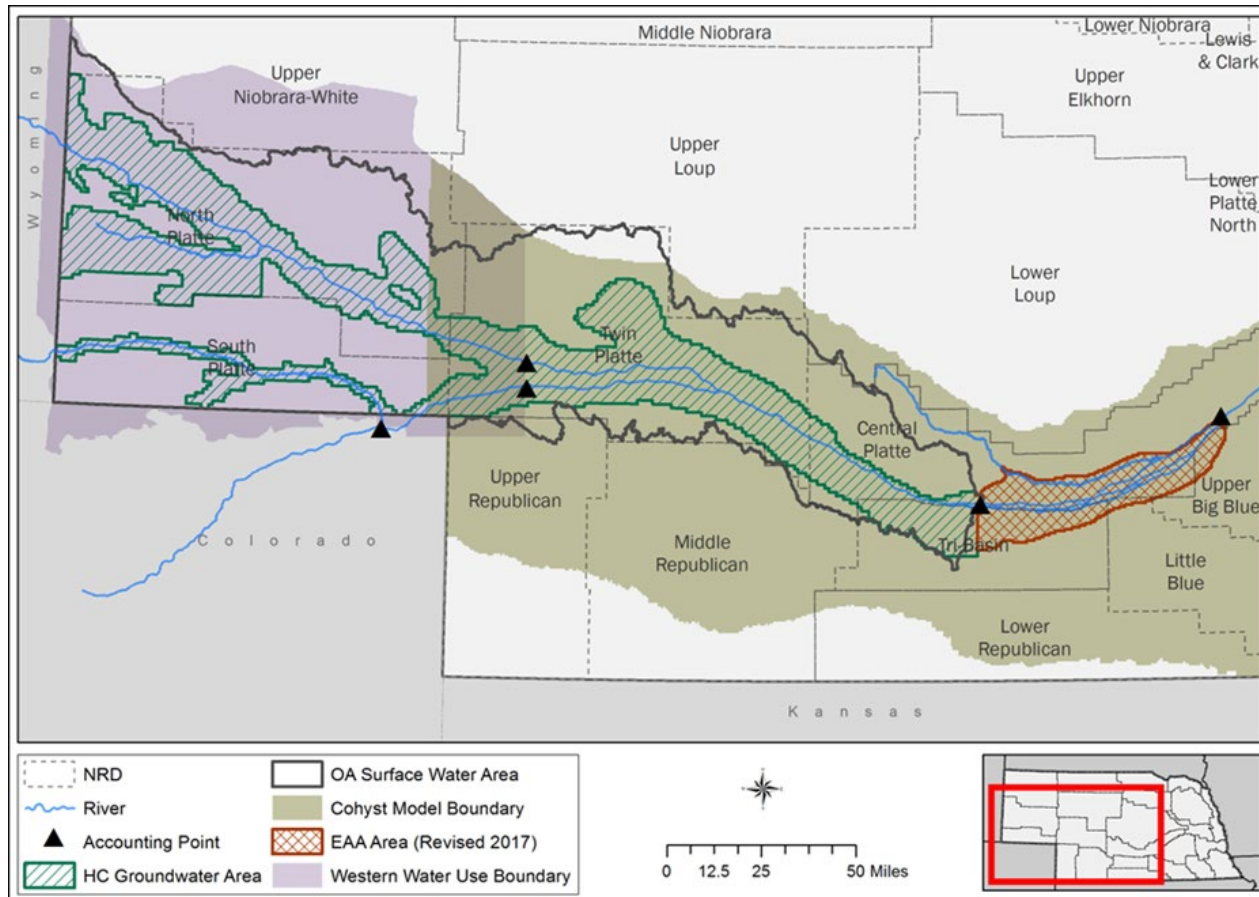
- River
- NRD
- Fully Appropriated Area
- Overappropriated Surface Water Area
- COHYST Model Area
- WWUM Model Area
- Model Area Overlap
- Hydrologically Connected Groundwater Area

Goals of the Robust Review

Required within Nebraska Revised Statute § 46-715(5)

- Evaluate the impact of pre- and post-July 1, 1997 development
- Assess progress towards second increment goals and objectives (**2023 indicators**)
- Assess compliance with PRRIP and Nebraska New Depletion Plan (NNDP)
- 50-year projections into the future by reach based on repeating data, conditions, and assumptions
- Provide information for decision-makers

Model Areas



Major Differences from 2019 Robust Review – COHYST Area

- Update input data 2014 through 2020
 - Climate data
 - Land Use (2012-2020)
 - Excess Flow
 - Crop types
 - Municipal and Industrial Pumping
- Update Watershed Model
 - Incorporated Conservation Study results
 - Modified crop growth specifications
 - Updated crop mixture (increased prevalence corn/soybean rotation)
- Update Groundwater Model to Modflow 6
 - New solver & pumping function
- Recalibrate Groundwater Model
- Incorporate Runoff into Groundwater Model

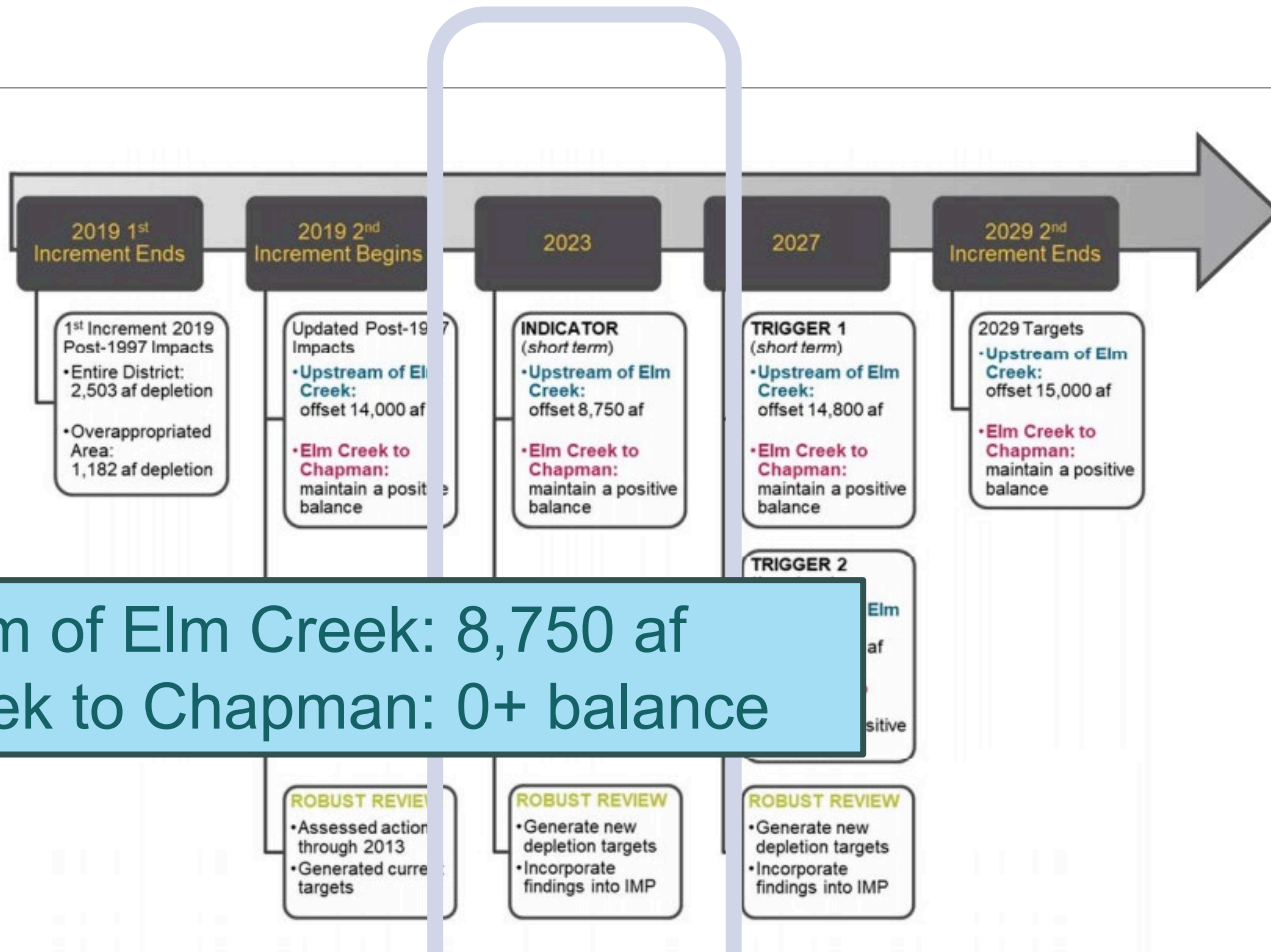
Major Differences from 2019 Robust Review – WWUM Area

- Update input data 2014 through 2020
 - Climate data
 - Land use
 - Crops
 - Meter data
- Update Cropsim/Watershed Model to ESC
 - Parcel based calculations
 - Modified crop growth specifications
- Update Groundwater Model to Modflow 6
 - New solver & pumping function / fixed dry cells
 - Brule Fractures
 - Base of Aquifer

IMP Goals and Objectives

- Objective 1.1: *Within this increment of this IMP, implement measures to address impacts of streamflow depletions to surface water appropriations and water wells constructed in aquifers dependent upon recharge from streamflow to the extent those depletions are due to water use initiated after July 1, 1997*
- Objective 1.2: *Maintain previous increment mitigation progress.*

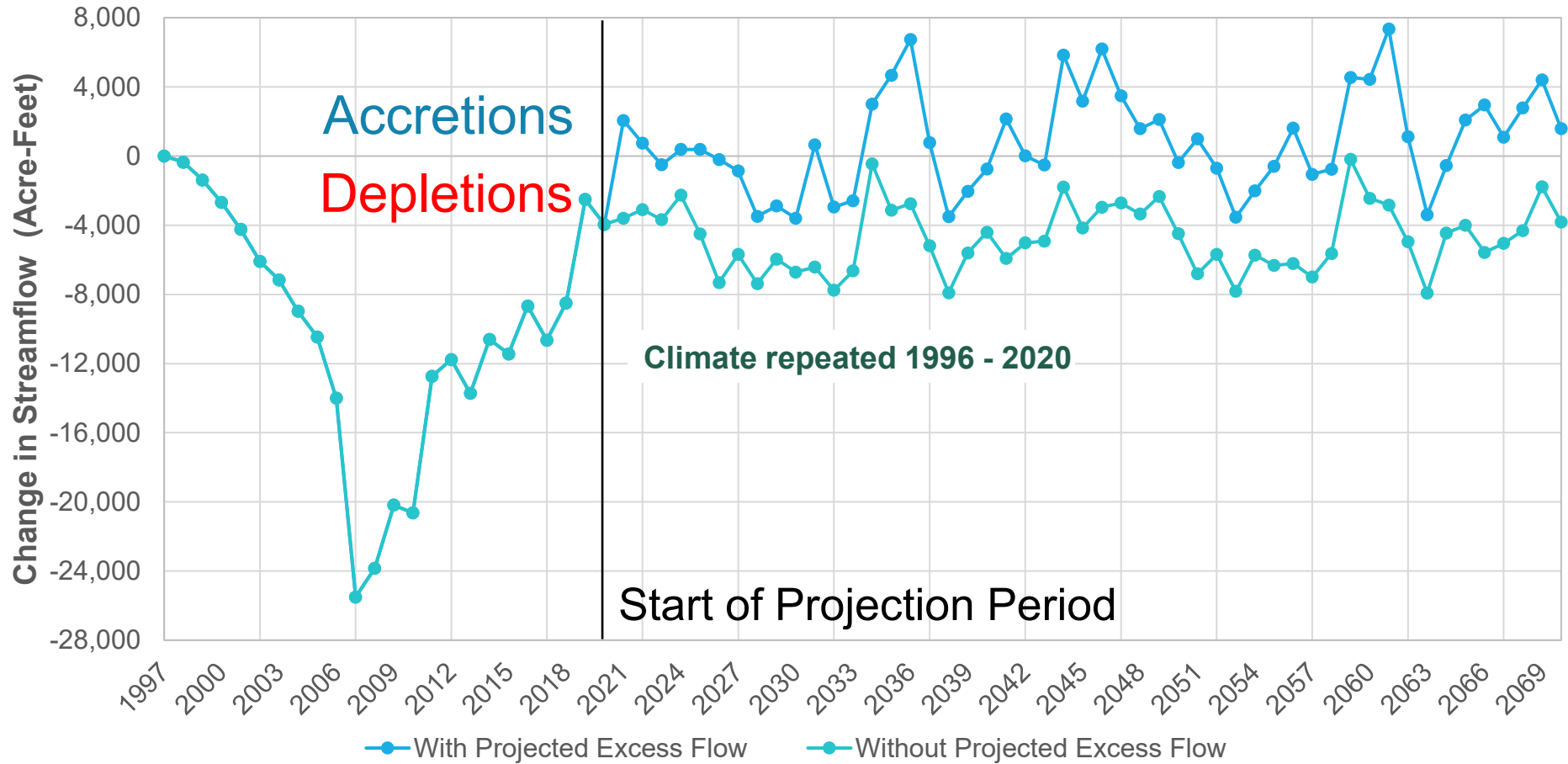
Example IMP Requirements - CPNRD Indicators



Upstream of Elm Creek: 8,750 af
Elm Creek to Chapman: 0+ balance

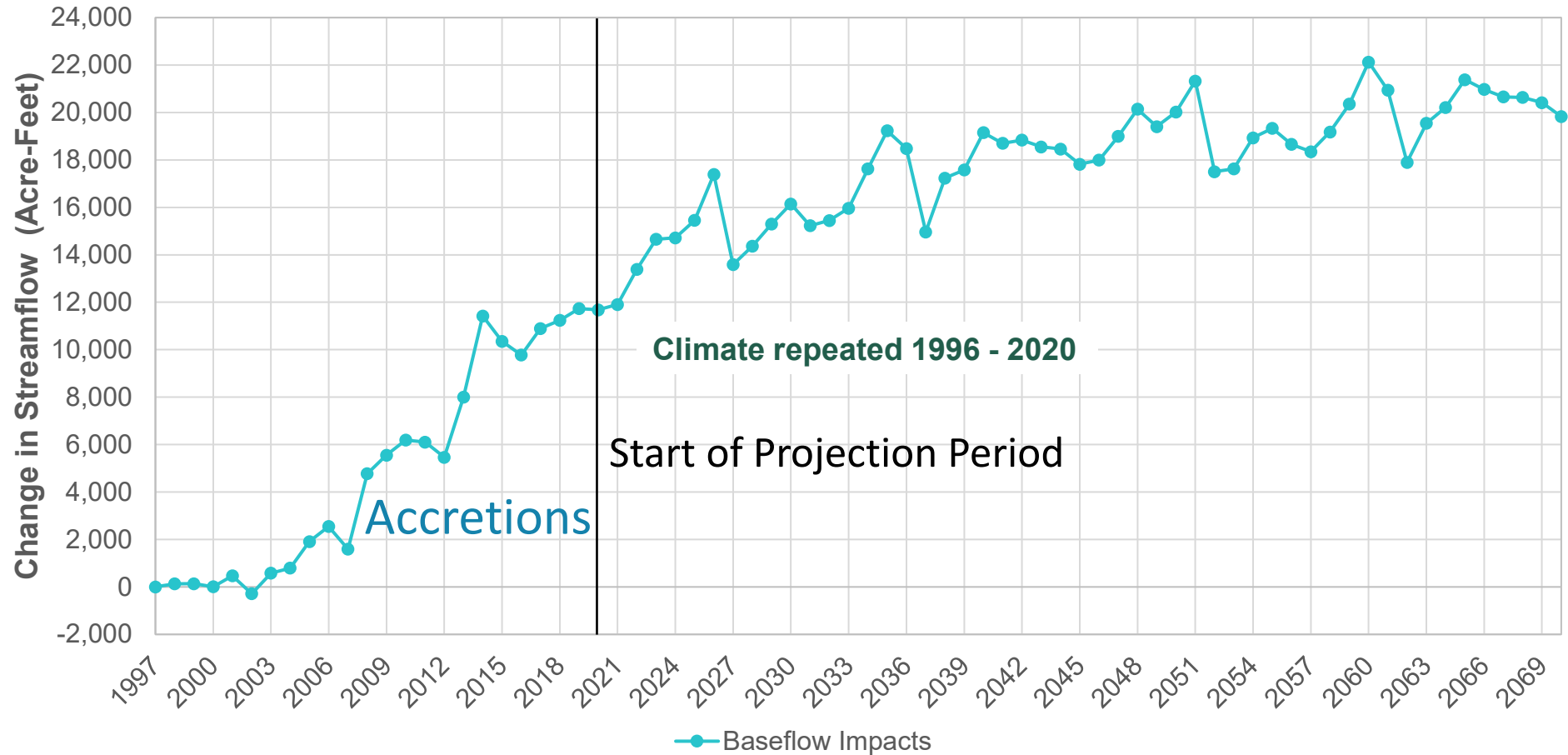
Results – Central Platte NRD

Upstream of Elm Creek



Results – Central Platte NRD

Elm Creek to Chapman



CPNRD Indicator* Review

Upstream of Elm Creek

Year	Current IMP Targets (Indicator)	2023 Robust Review Results (Without Projected Excess Flow)	2023 Robust Review Results (With Projected Excess Flow)
2019	-14,000	-5,000	200
2020	-14,100	-5,000	200
2021	-14,200	-5,000	300
2022	-14,300	-5,000	300
<u>2023*</u>	<u>-14,400 (8,750)</u>	<u>-5,000</u>	<u>+400</u>
2024	-14,500	-5,000	400
2025	-14,600	-5,000	400
2026	-14,700	-5,000	500
2027	-14,800	-4,900	500
2028	-14,900	-4,900	500
2029	-15,000	-4,900	600

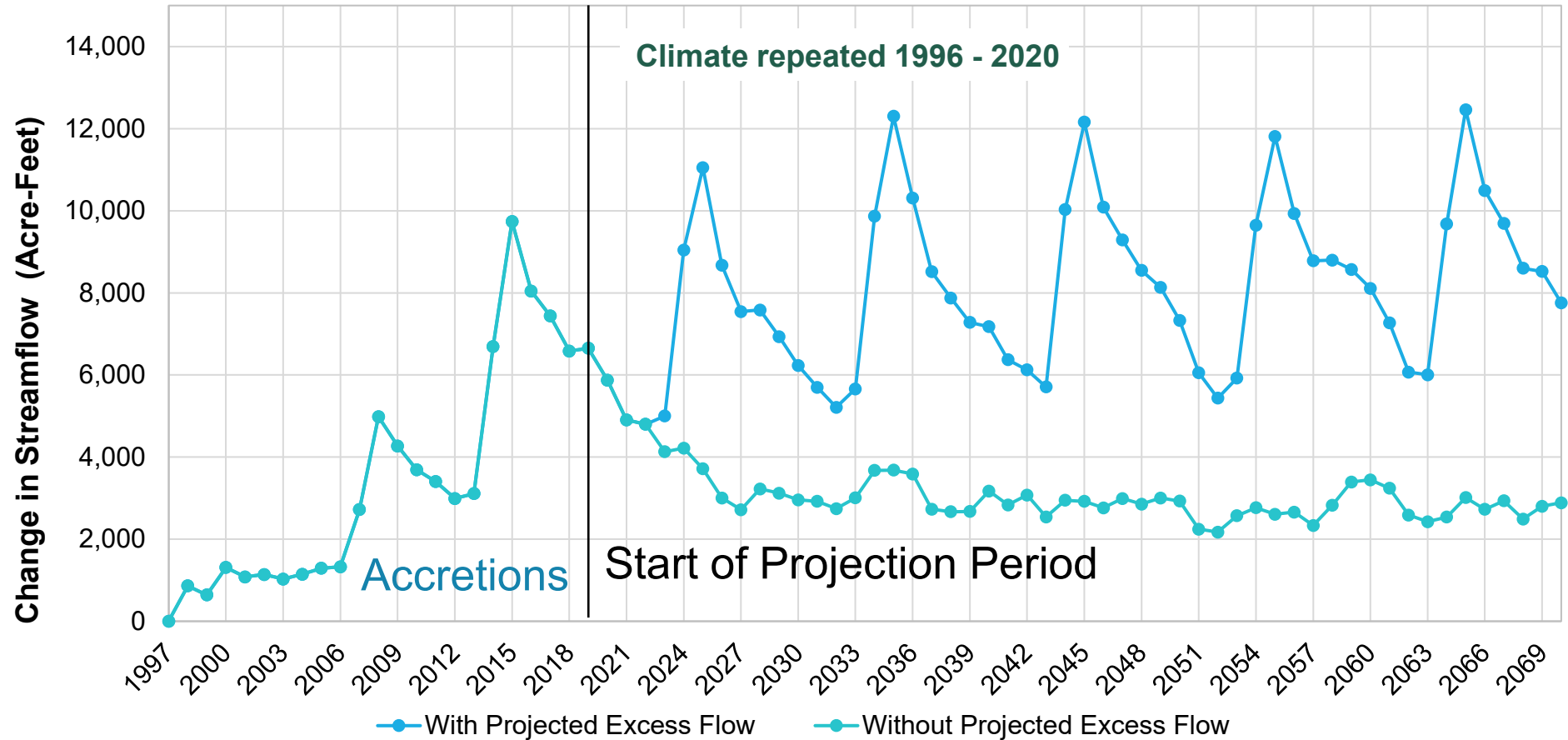
CPNRD Indicator* Review

Elm Creek to Chapman

Year	Current IMP Targets (Indicator)	2023 Robust Review Results
2019	2,100	7,700
2020	2,100	7,800
2021	2,100	7,900
2022	2,100	8,000
<u>2023*</u>	<u>2,200</u>	<u>8,200</u>
2024	2,200	8,300
2025	2,200	8,400
2026	2,300	8,500
2027	2,300	8,600
2028	2,300	8,800
2029	2,400	8,900

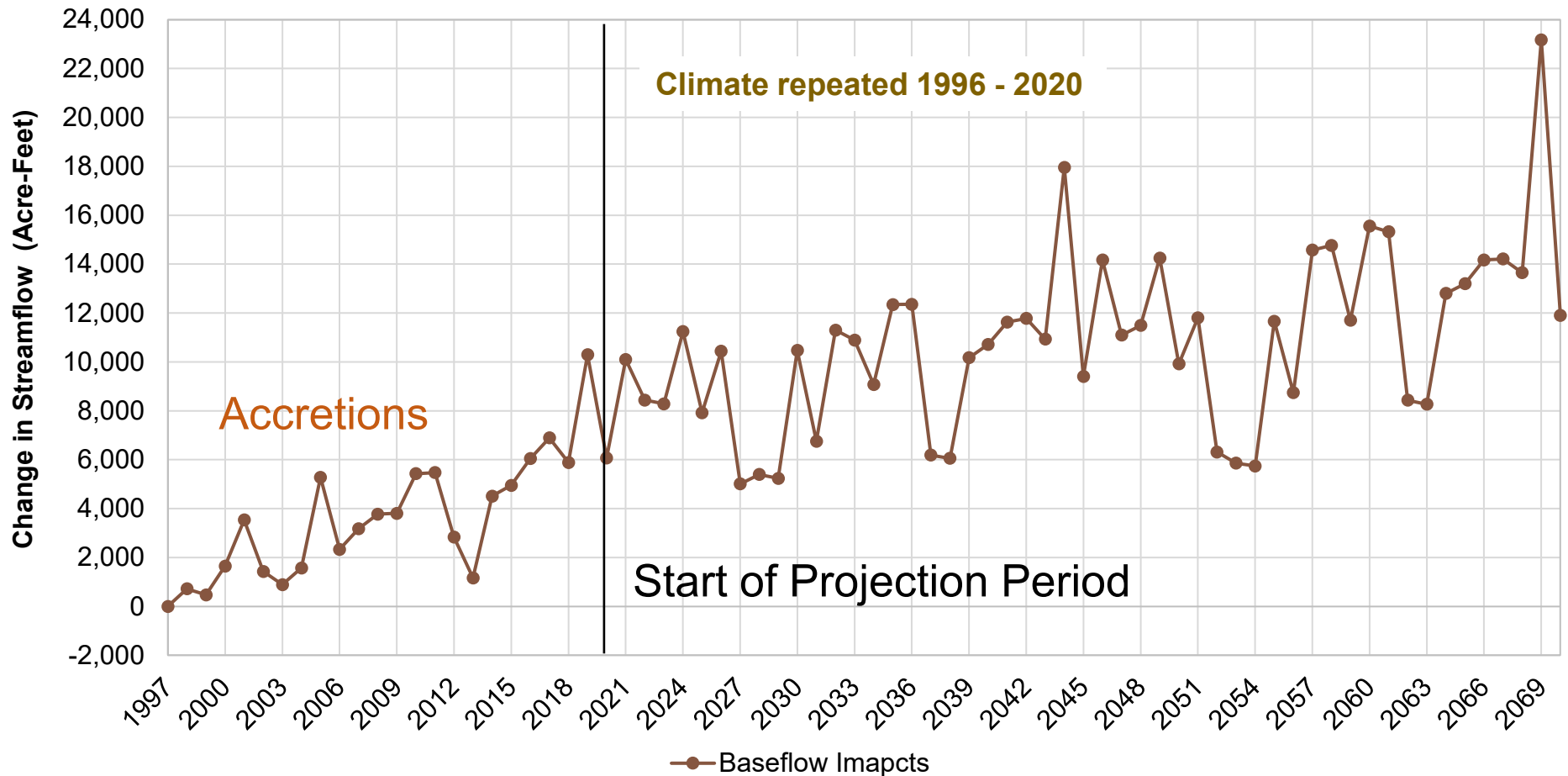
Results – Tri-Basin NRD

Upstream of Elm Creek



Results – Tri-Basin NRD

Elm Creek to Chapman



TBNRD Indicator* Review

Elm Creek to Chapman

Year	Current IMP Targets (Indicator)	2023 Robust Review Results
2019	2,100	7,700
2020	2,100	7,800
2021	2,100	7,900
2022	2,100	8,000
<u>2023*</u>	<u>2,200</u>	<u>8,200</u>
2024	2,200	8,300
2025	2,200	8,400
2026	2,300	8,500
2027	2,300	8,600
2028	2,300	8,800
2029	2,400	8,900

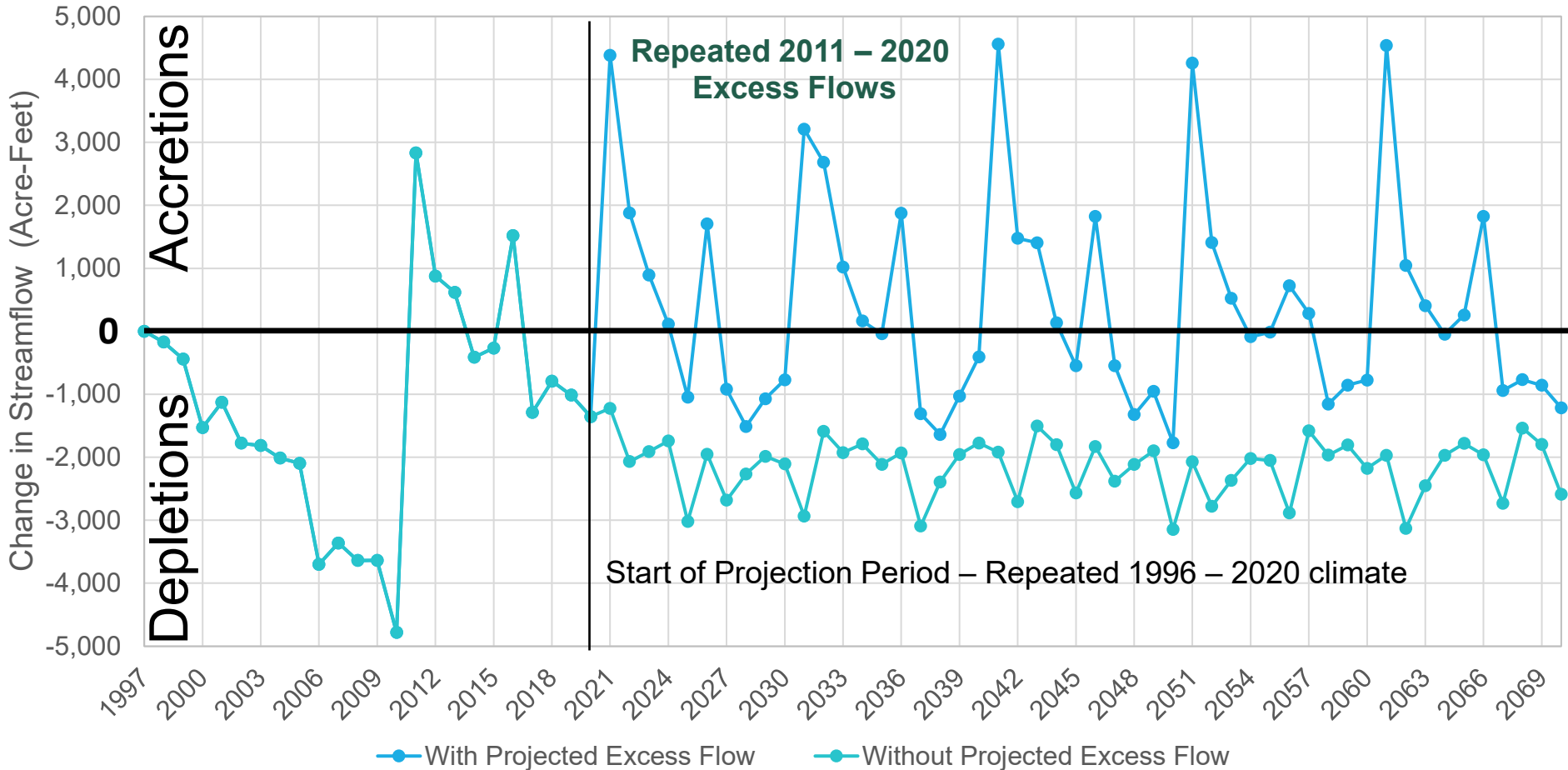
TBNRD Indicator* Review

Upstream of Elm Creek

Year	Current IMP Targets (Indicator)	2023 Robust Review Results (Without Projected Excess Flow)	2023 Robust Review Results (With Projected Excess Flow)
2019	2,100	3,600	7,000
2020	2,100	3,600	7,100
2021	2,000	3,600	7,100
2022	2,000	3,500	7,200
<u>2023*</u>	<u>2,000</u>	<u>3,500</u>	<u>7,200</u>
2024	1,900	3,500	7,200
2025	1,800	3,500	7,300
2026	1,800	3,500	7,300
2027	1,800	3,400	7,400
2028	1,800	3,400	7,400
2029	1,700	3,400	7,400

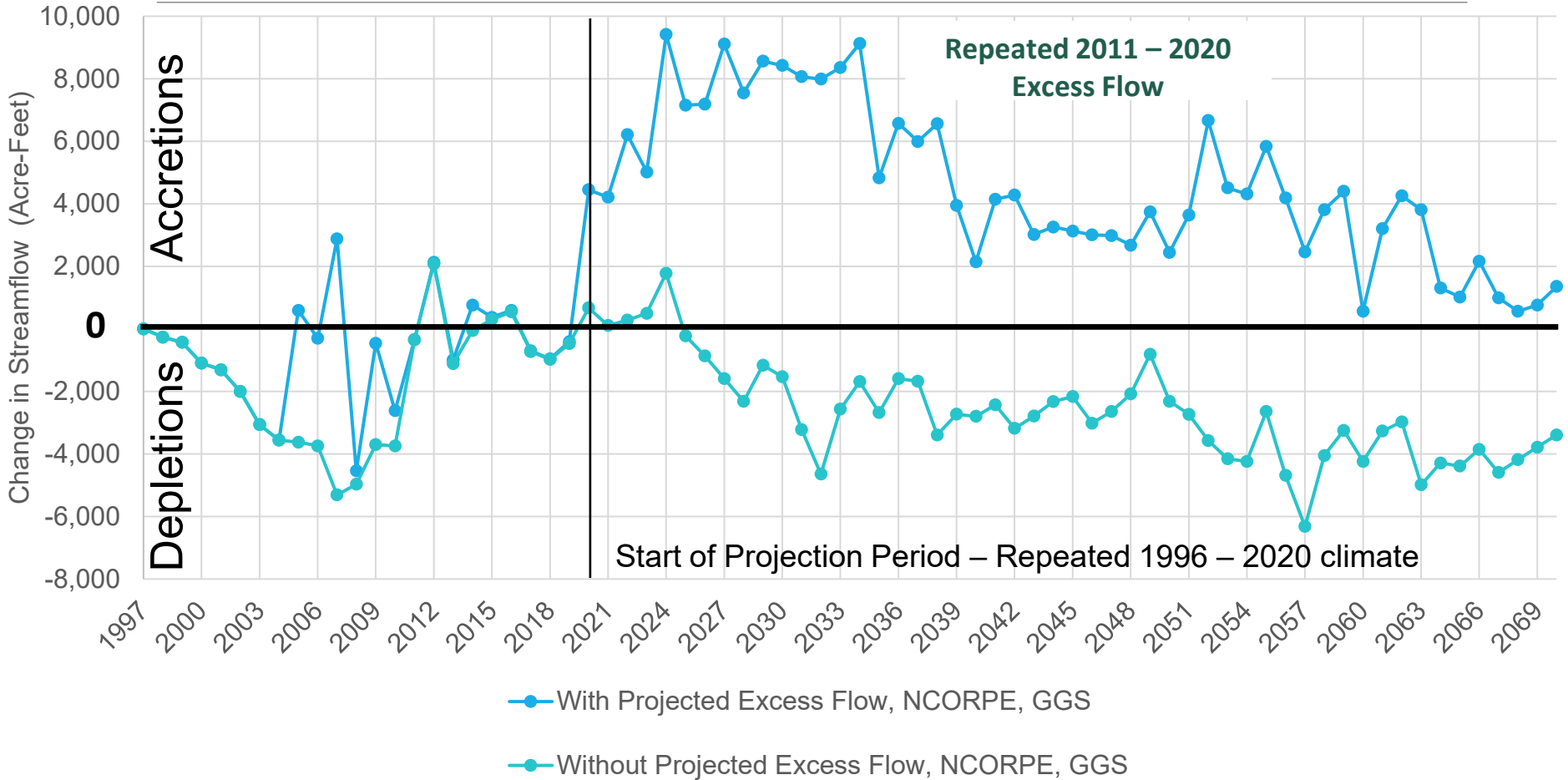
Results – Twin Platte NRD

North Platte River



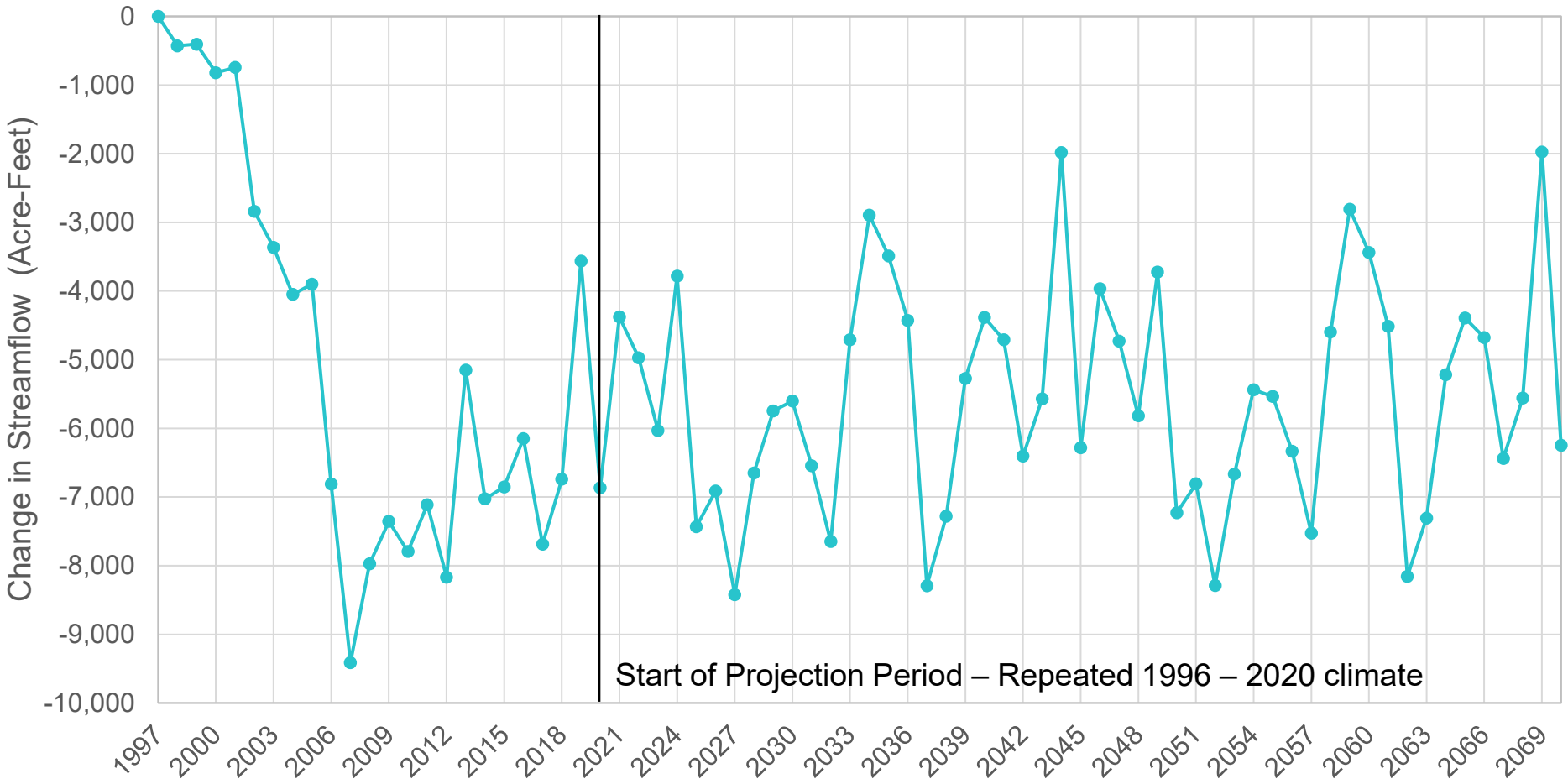
Results – Twin Platte NRD

South Platte River



Results – Twin Platte NRD

Confluence to Elm Creek

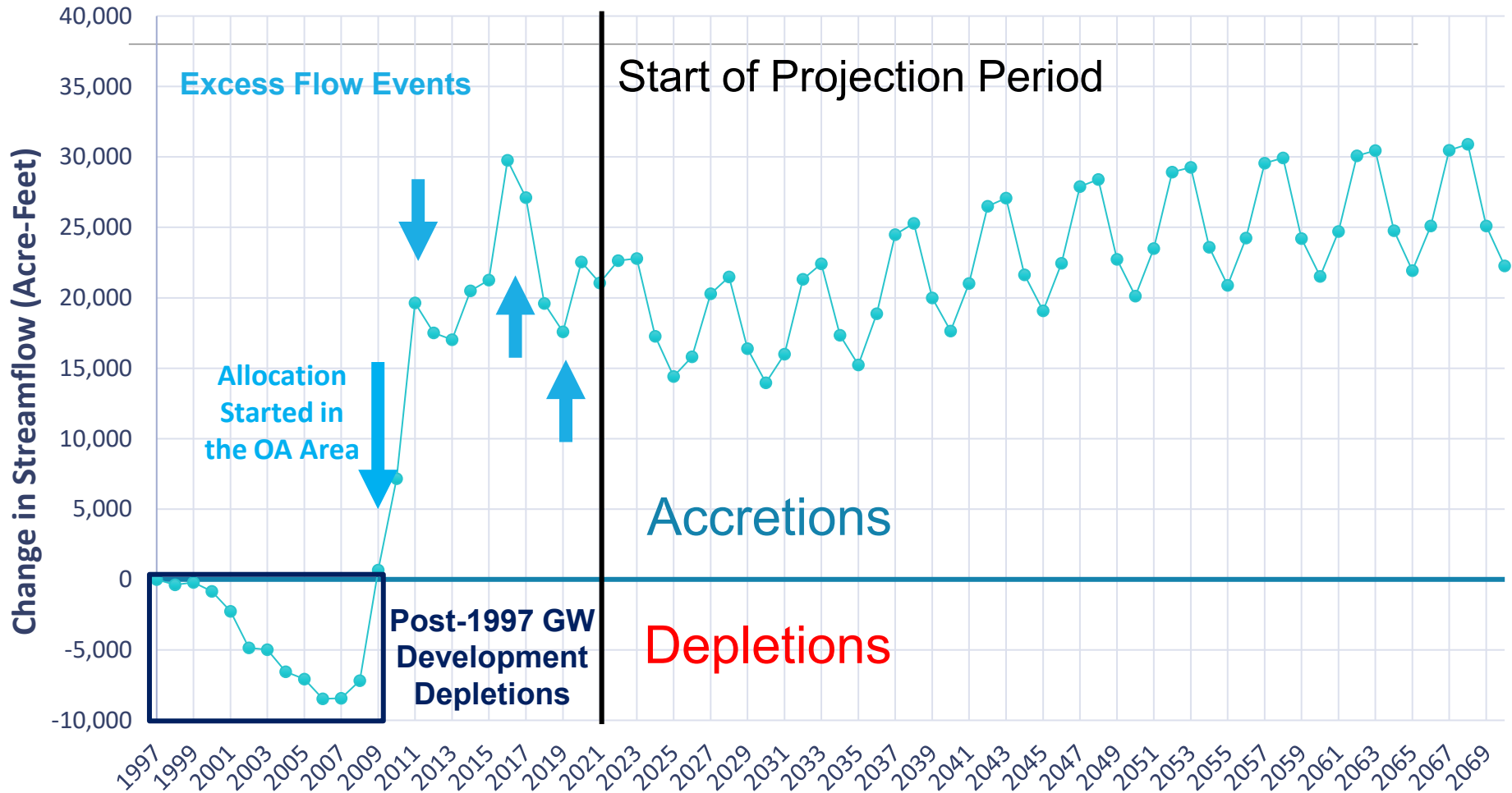


TPNRD Indicator* Review

Year	Confluence to Elm Creek Current IMP Targets	South Platte River Current IMP Targets	North Platte River Current IMP Targets	Total NRD IMP Targets	Total NRD Results with Projections	Total NRD Results without Projections
2019	-10,100	-5,900	-6,900	-22,900	3,200	-8,500
2020	-10,100	-6,000	-7,000	-23,100	3,100	-8,500
2021	-10,200	-6,200	-7,000	-23,400	2,800	-8,600
2022	-10,200	-6,300	-7,100	-23,600	2,700	-8,700
<u>2023*</u>	<u>-10,300</u>	<u>-6,500</u>	<u>-7,100</u>	<u>-23,900</u>	<u>2,600</u>	<u>-8,800</u>
2024	-10,300	-6,600	7,100	-24,000	2,400	-8,900
2025	-10,400	-6,800	-7,200	-24,400	2,300	-9,000
2026	-10,400	-6,900	-7,200	-24,500	2,200	-9,000
2027	-10,400	-7,100	-7,300	-24,800	1,900	-9,100
2028	-10,500	-7,200	-7,300	-25,000	1,900	-9,100
2029	-10,500	-7,400	-7,300	-25,200	1,800	-9,200

Results – North Platte NRD

North Platte River



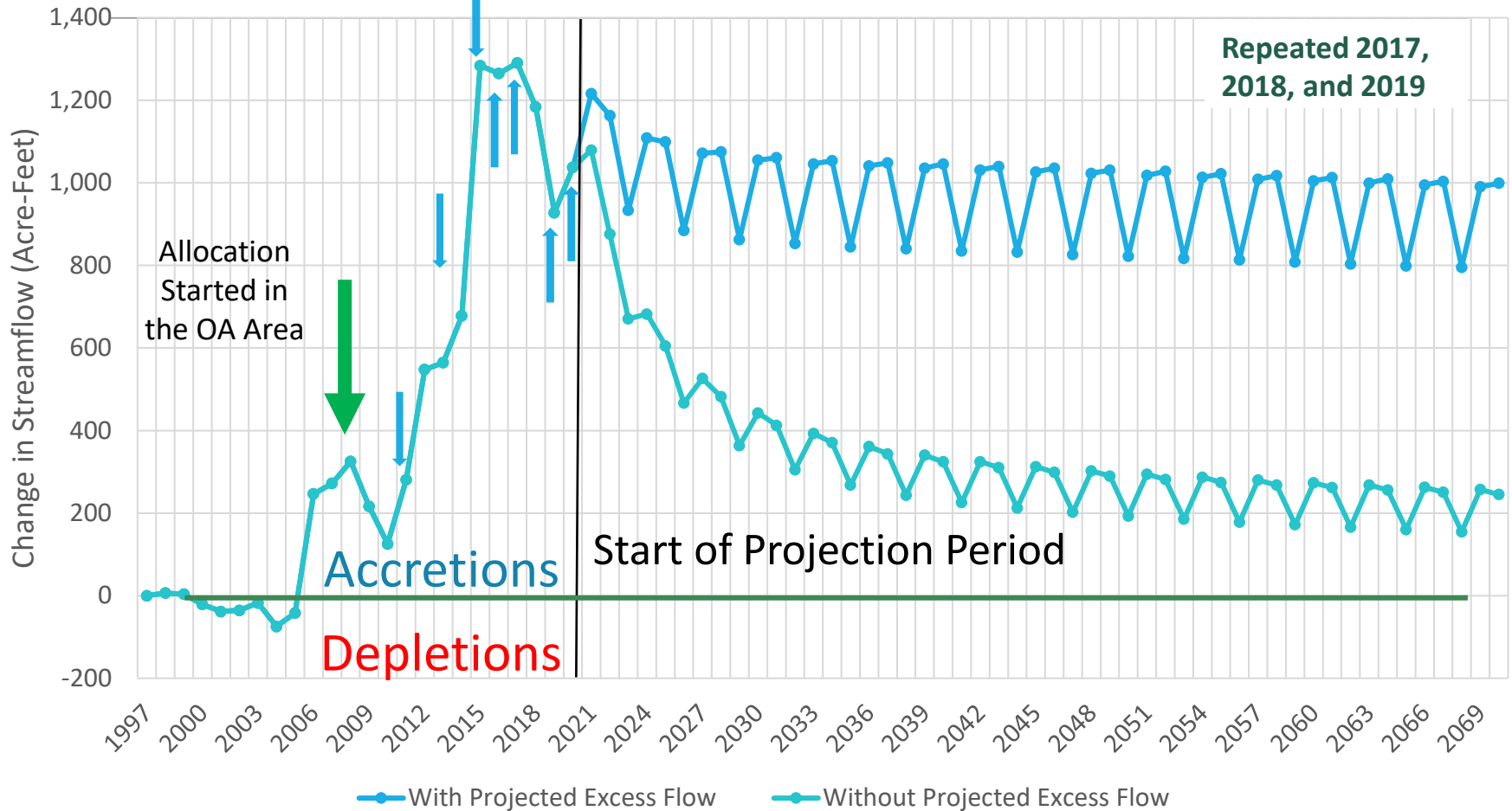
NPNRD Indicator* Review:

North Platte River

Year	Current IMP Targets	2023 Robust Review Targets
2019	23,300	17,600
2020	23,400	17,800
2021	23,500	18,000
2022	23,500	18,200
<u>2023*</u>	<u>23,600</u>	<u>18,400</u>
2024	23,700	18,600
2025	23,700	18,800
2026	23,900	19,000
2027	23,900	19,200
2028	24,000	19,400

Results – South Platte NRD

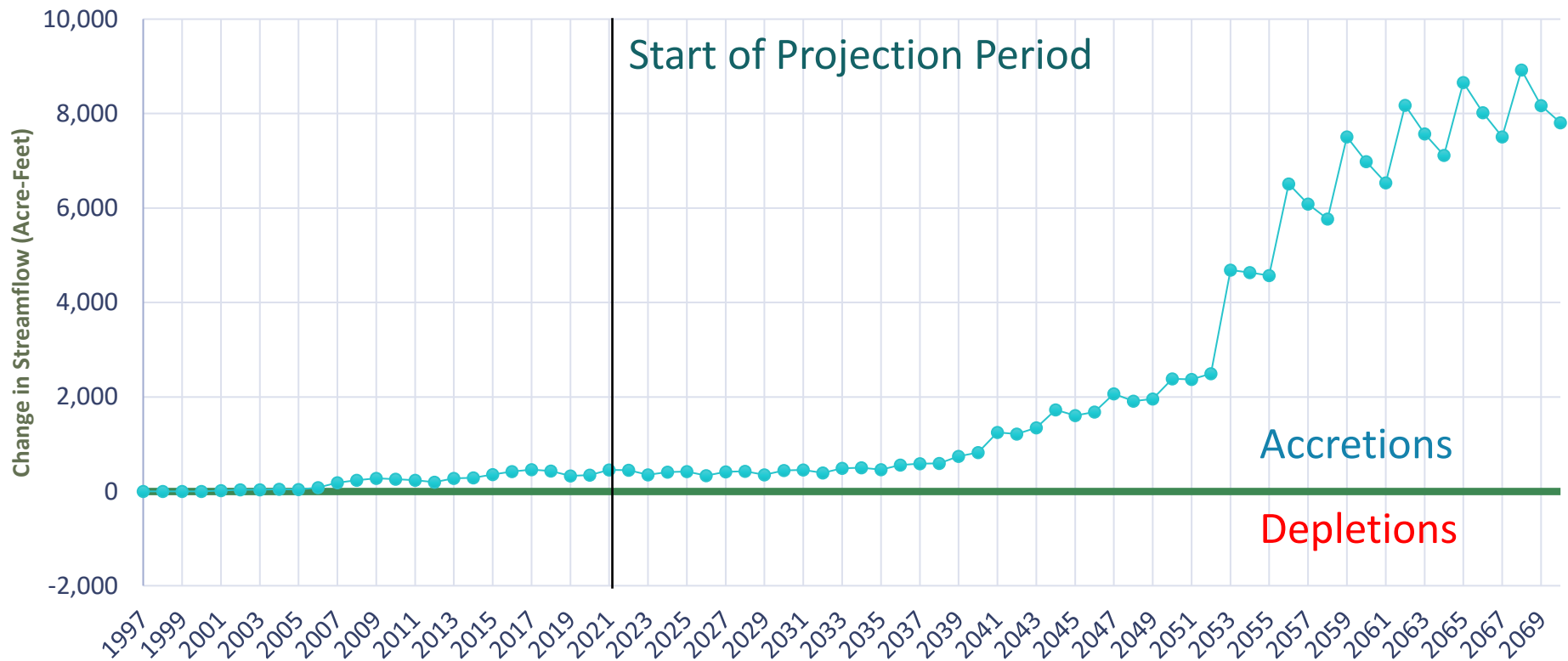
South Platte River



Results – South Platte NRD

Lodgepole Creek

SPNRD: Lodgepole Creek

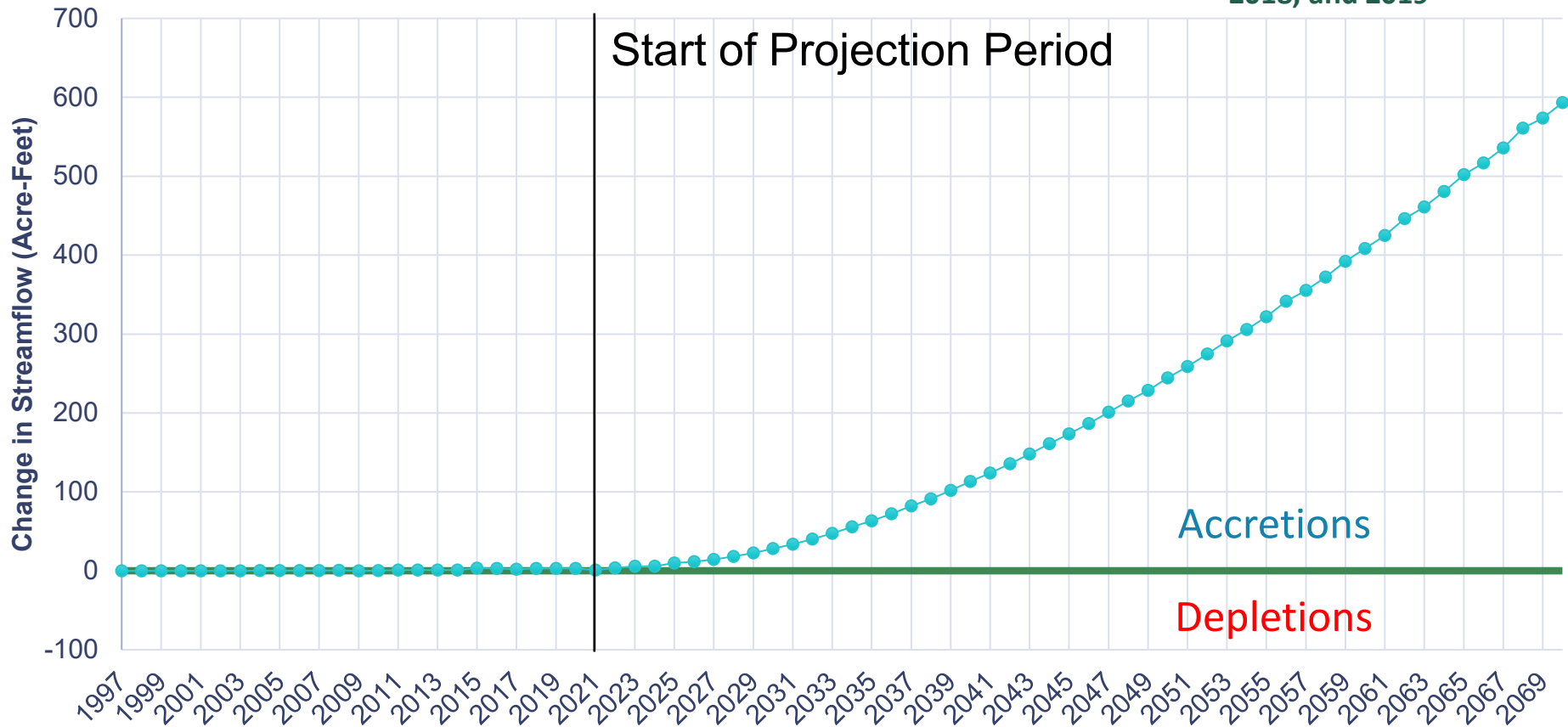


Results – South Platte NRD

North Platte River

SPNRD: North Platte River

Repeated 2017,
2018, and 2019



SPNRD Indicator* Review:

South Platte River

Year	Current IMP Targets	2023 Robust Review Results
2019	200	1000
2020	200	1000
2021	200	900
2022	200	900
<u>2023*</u>	<u>200</u>	<u>800</u>
2024	200	700
2025	200	700
2026	200	600
2027	200	500
2028	200	500
2029	200	400

SPNRD Indicator* Review:

Lodgepole Creek

Year	Current IMP Targets	2023 Robust Review Results
2019	4,300	400
2020	4,300	400
2021	4,300	400
2022	4,300	400
<u>2023*</u>	<u>4,300</u>	<u>400</u>
2024	4,400	400
2025	4,400	400
2026	4,400	400
2027	4,400	400
2028	4,400	400
2029	4,500	400

SPNRD Indicator* Review:

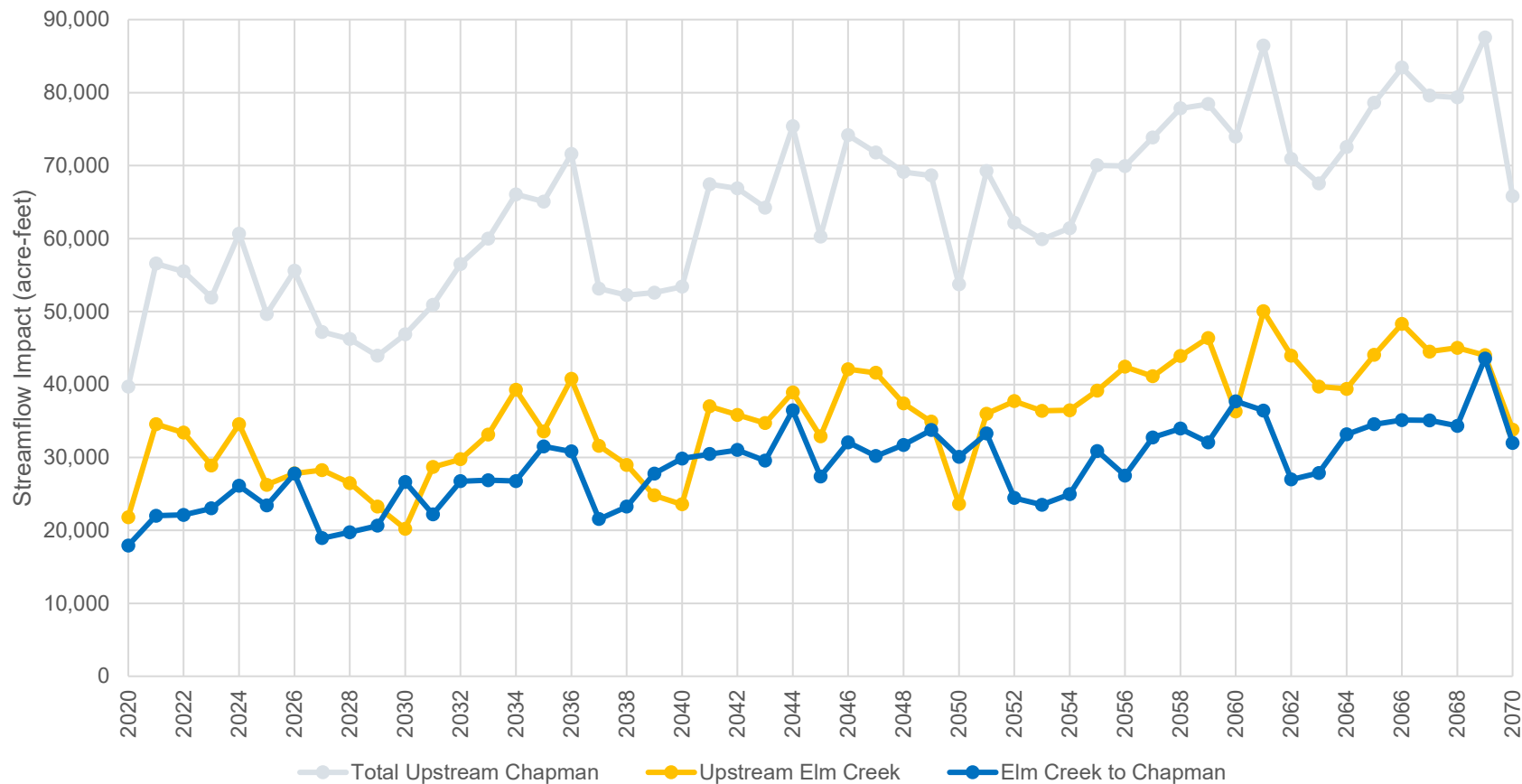
North Platte River

Year	Current IMP Targets	2023 Robust Review Results
2019	0	0
2020	0	0
2021	0	0
2022	0	0
<u>2023*</u>	<u>0</u>	<u>0</u>
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0

2023 Robust Review Results: Basin-wide Projected Streamflow Impacts by Reach

Year	Impacts Upstream of Elm Creek (AF)	Impacts Elm Creek to Chapman (AF)	Combined Impacts Upstream of Chapman (AF)
2022	33,400	22,100	55,500
2023	28,900	23,000	51,900
2024	34,600	26,100	60,700
2025	26,300	23,400	49,700
2026	27,800	27,800	55,600
2027	28,300	18,900	47,200
2028	26,500	19,800	46,300
2029	23,300	20,600	43,900
2030	20,200	26,600	46,800
2031	28,700	22,200	50,900
2032	29,800	26,700	56,500
2033	33,100	26,900	60,000

2023 Robust Review Results: Basin-wide Projected Streamflow Impacts by Reach



Path Forward

- No Regulatory action needed at this time in all NRD reaches
- Finish documentation of models and analyses
- Complete 2023 Robust Review Report in 2024
- Prepare for 2027 Robust Review
- Update IMPs as needed
 - CPNRD and TPNRD IMP updates in 2024

Resources

Upper Platte River Presentations: <https://dnr.nebraska.gov/water-planning/upper-platte-river-presentations>

- Conservation Study Presentations

Upper Platte Basin-Wide Plan: <https://dnr.nebraska.gov/water-planning/upper-platte-basin-wide-plan>

Integrated Management Plans: <https://dnr.nebraska.gov/water-planning/approved-water-management-plans>

- Approved IMPs + 2023 Robust Review Board Presentations

Questions?

Thank You!

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Outcomes of the Robust Review

1. A 50-year estimate of the **streamflow depletions** associated with pre- and post-1997 levels of water use development within the hydrologically connected area of the overappropriated basin within each NRD and within the entirety of each NRD.
2. A 50-year estimate of **streamflow accretions** associated with management actions implemented by each NRD and NeDNR within the hydrologically connected area of the overappropriated basin within each NRD and within the entirety of the NRD.
3. A summary of the net streamflow depletions within the overappropriated basin resulting from groundwater pumping within each NRD.

Model Updates Since 2019 – WWUMM

Updated input data 2014-2020

Updated CropSim/Watershed Model to ESC

- Parcel-based calculations
- Modified crop growth specifications

Updated Groundwater to MODFLOW 6

- New solver & pumping function / fixed dry cells
- Brule Fractures
- Base of Aquifer

Robust Review Analyses

Individual analyses performed in areas where they are applicable

Post-1997 Analysis

- Post-1997 groundwater-only irrigated acres development
- Post-1997 municipal and industrial pumping development
- Historical Run
- Excess flows
- Total flow analyses
- Groundwater-only irrigation retirements
- Augmentation projects Allocation effects

Additional Input Data Information

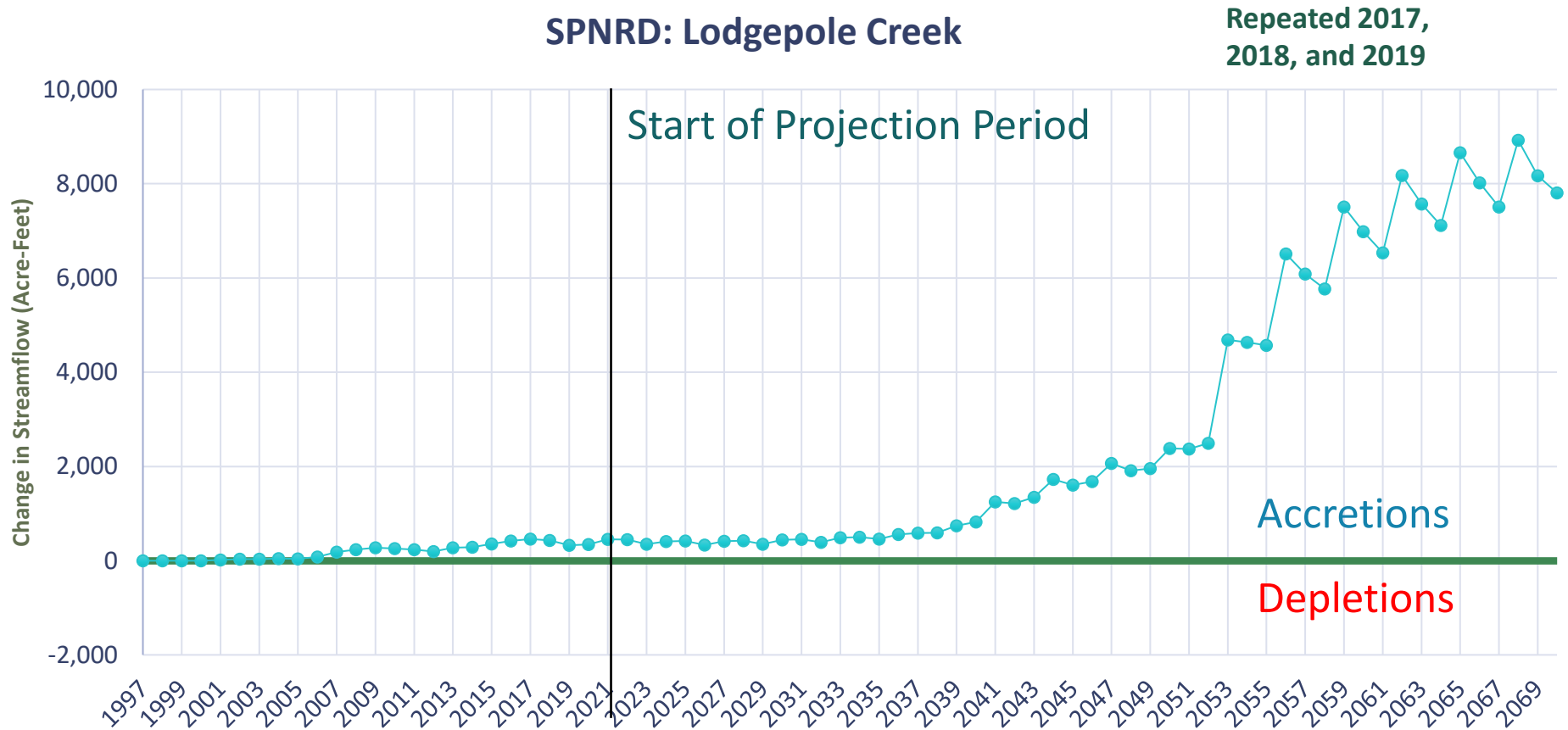
Input datasets reviewed/updated through 2020 include:

- Land use data and irrigable acres spatial datasets for all UP NRDs
 - Irrigation status, irrigation source, crop type
- Historical excess flows & projected excess flows at IMP-defined reach scale
- Municipal & industrial pumping
- Available metered groundwater pumping
- Augmentation pumping
- Weather data
- Livestock population analysis

Completed a tillage field survey and incorporated conservation practices (increased prevalence of no-till, change in crop growing degree days, crop phenology)

SPNRD Results

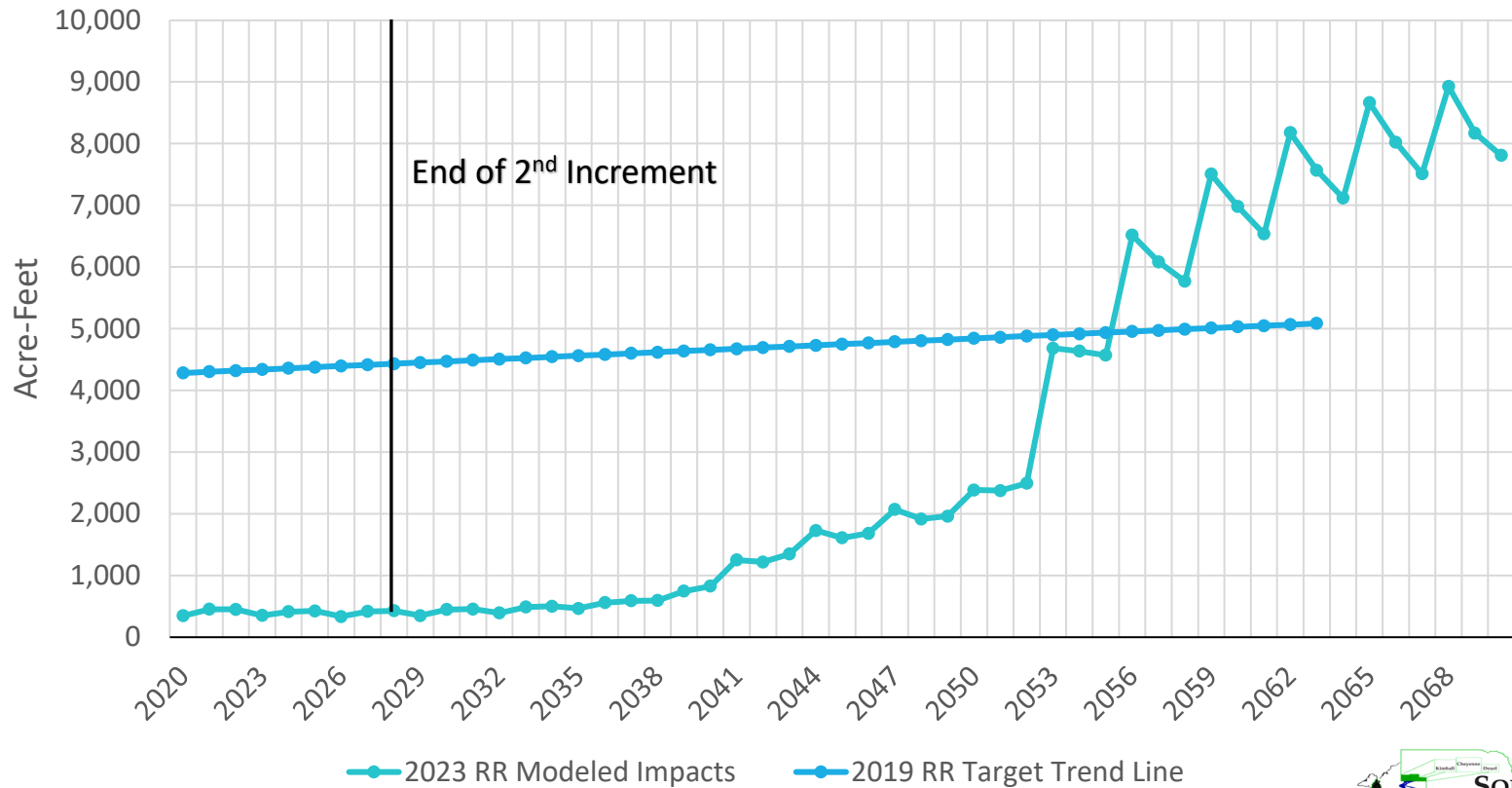
Robust Review Analysis Results: Post-1997 Combined



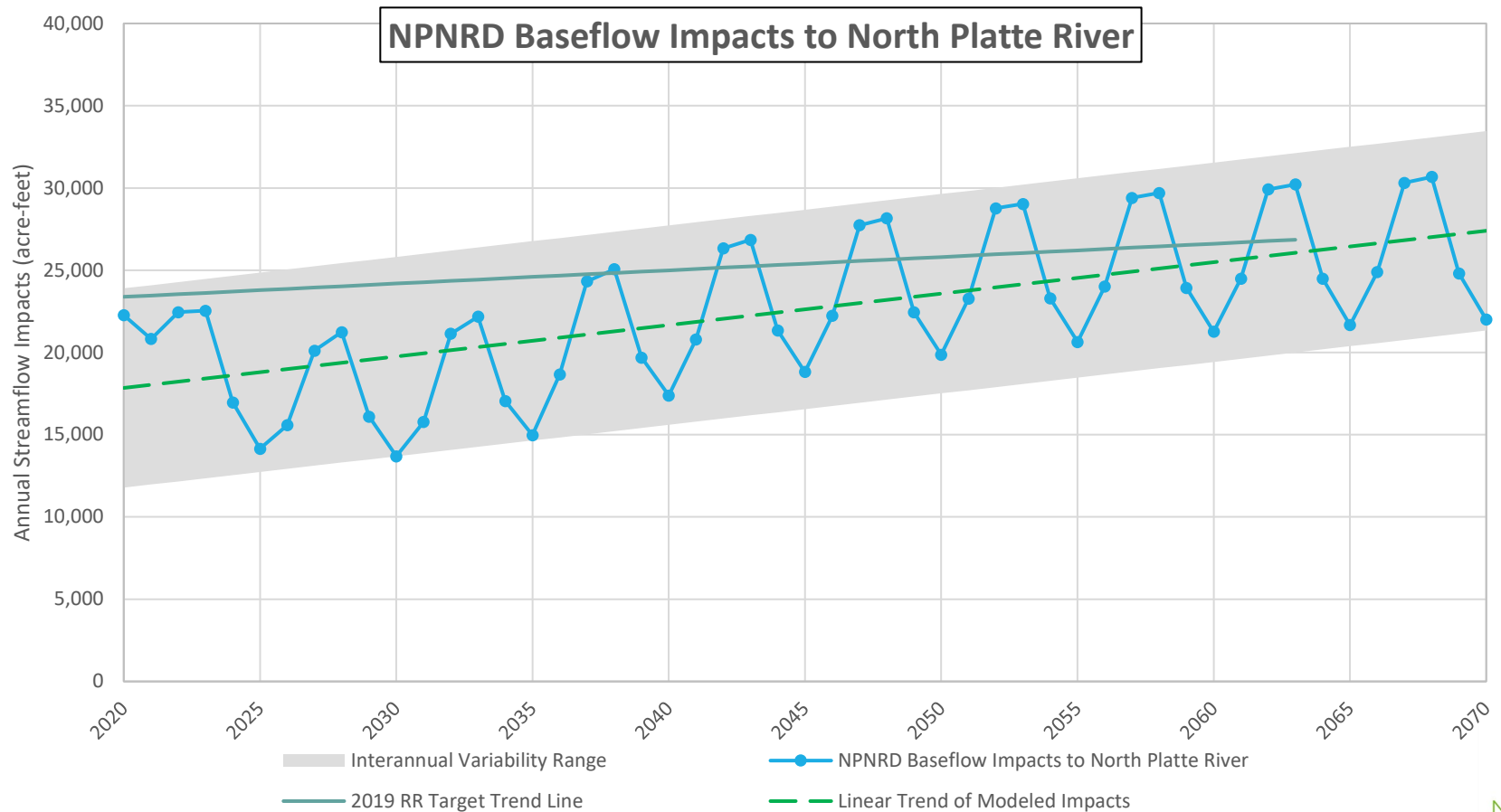
SPNRD Results

Target Comparison Lodgepole Creek

SPNRD Baseflow Impacts to Lodgepole Creek

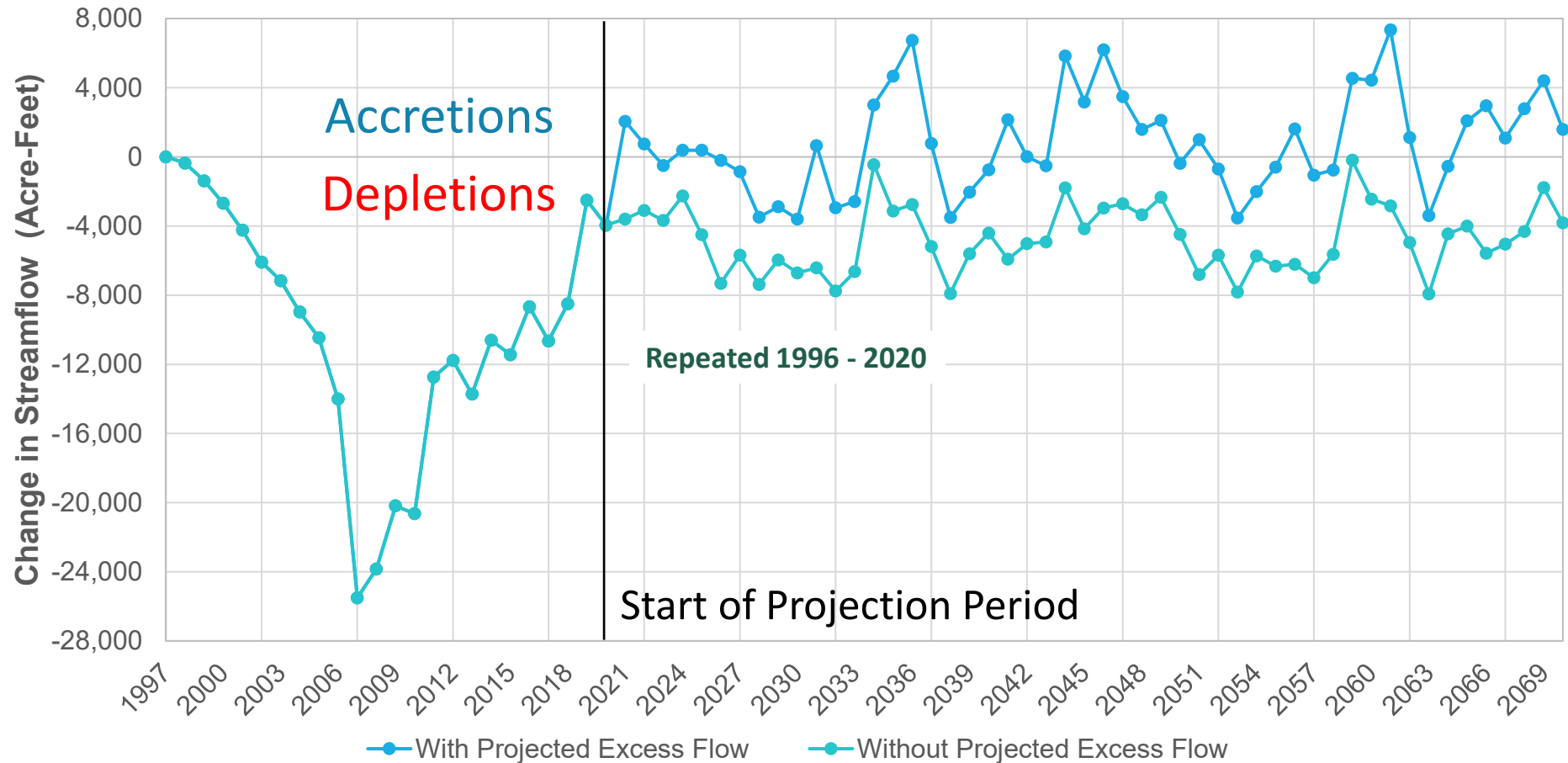


Updated Targets North Platte River



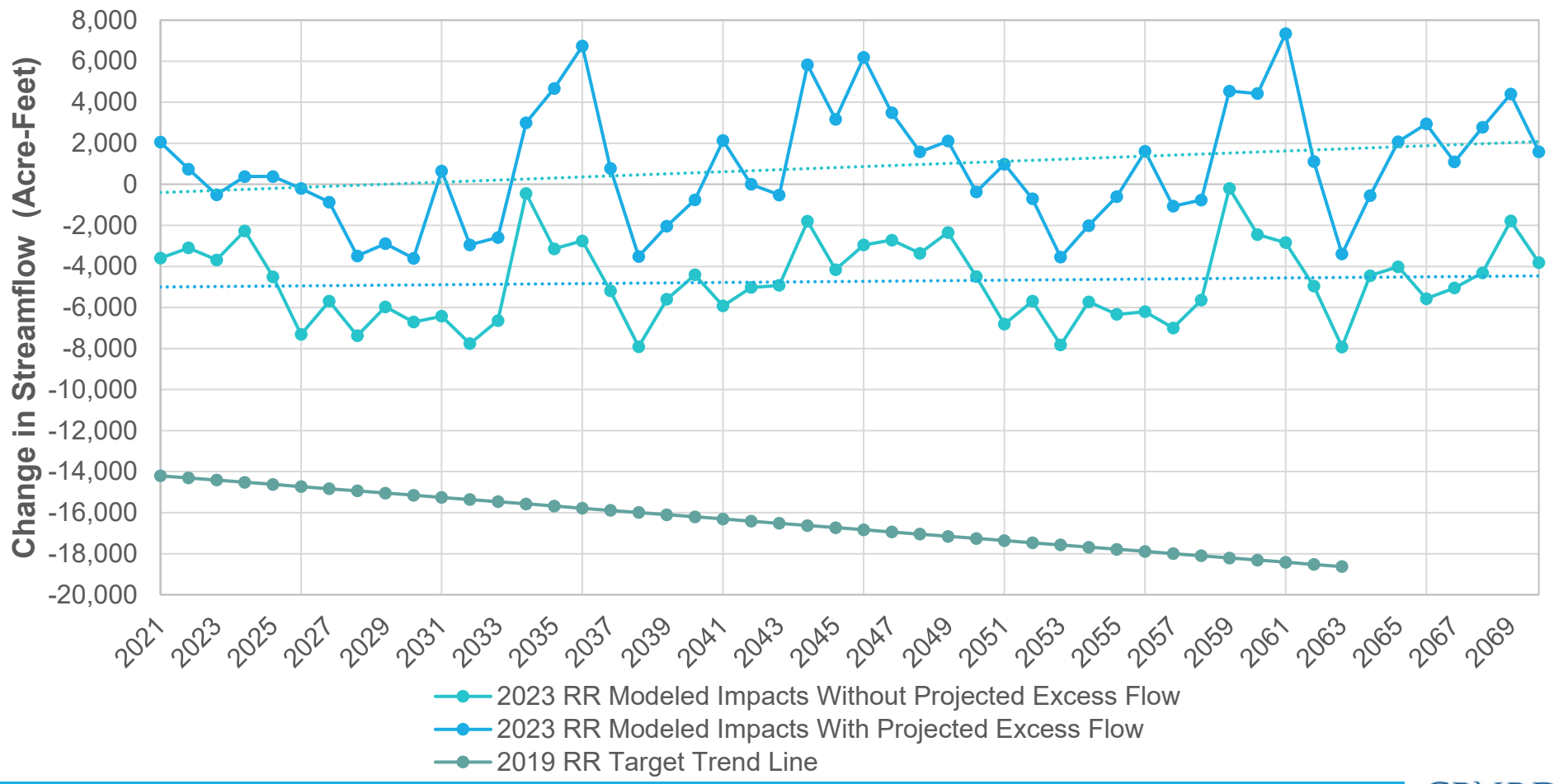
CPNRD Results Upstream of Elm Creek

Robust Review Analysis Results: Post-1997 Analysis, includes M&I, Decertifications, and Recharge Projects (with & w/o Projected Excess Flow)



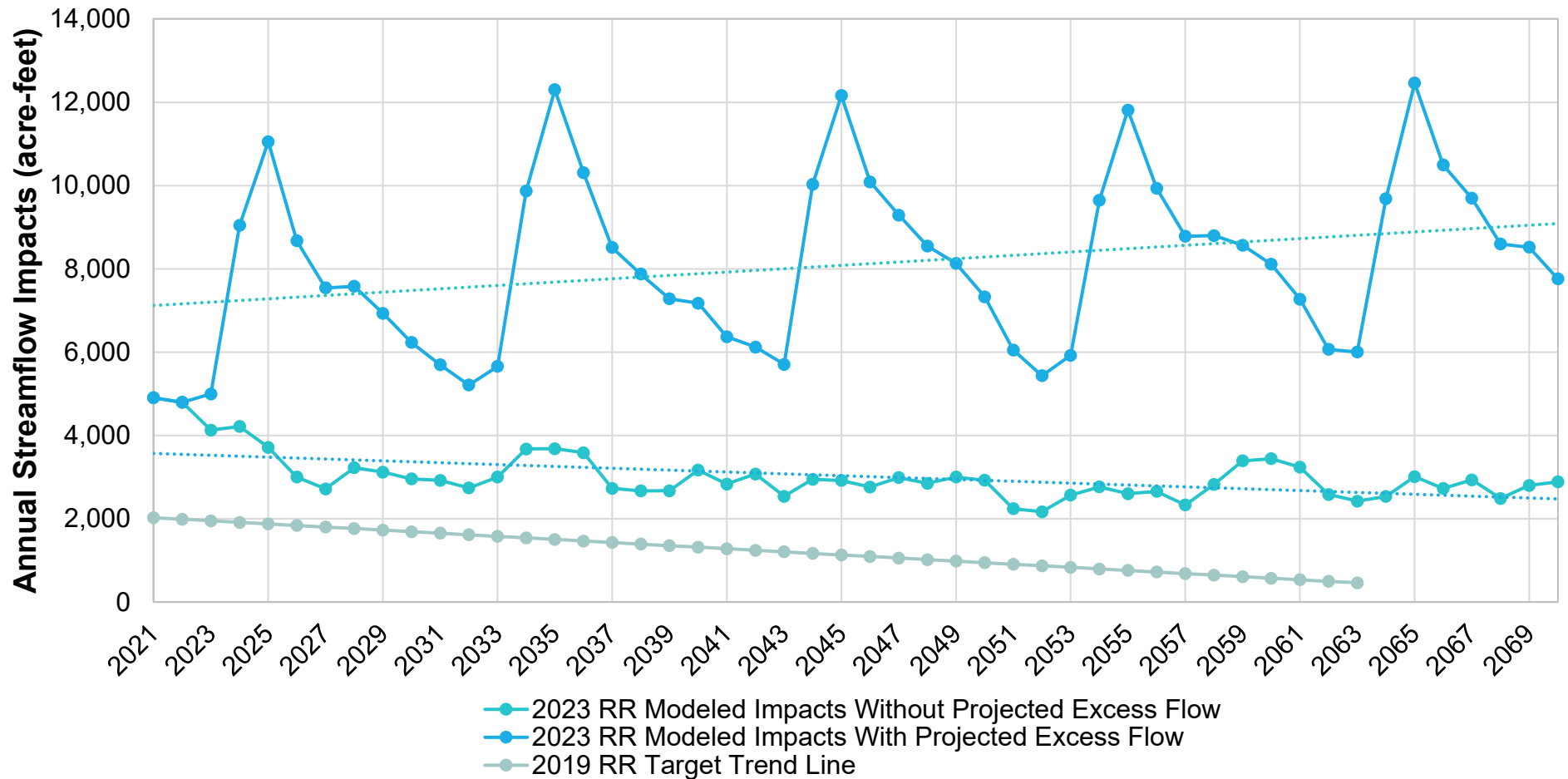
CPNRD Results

Target Comparison: Upstream of Elm Creek



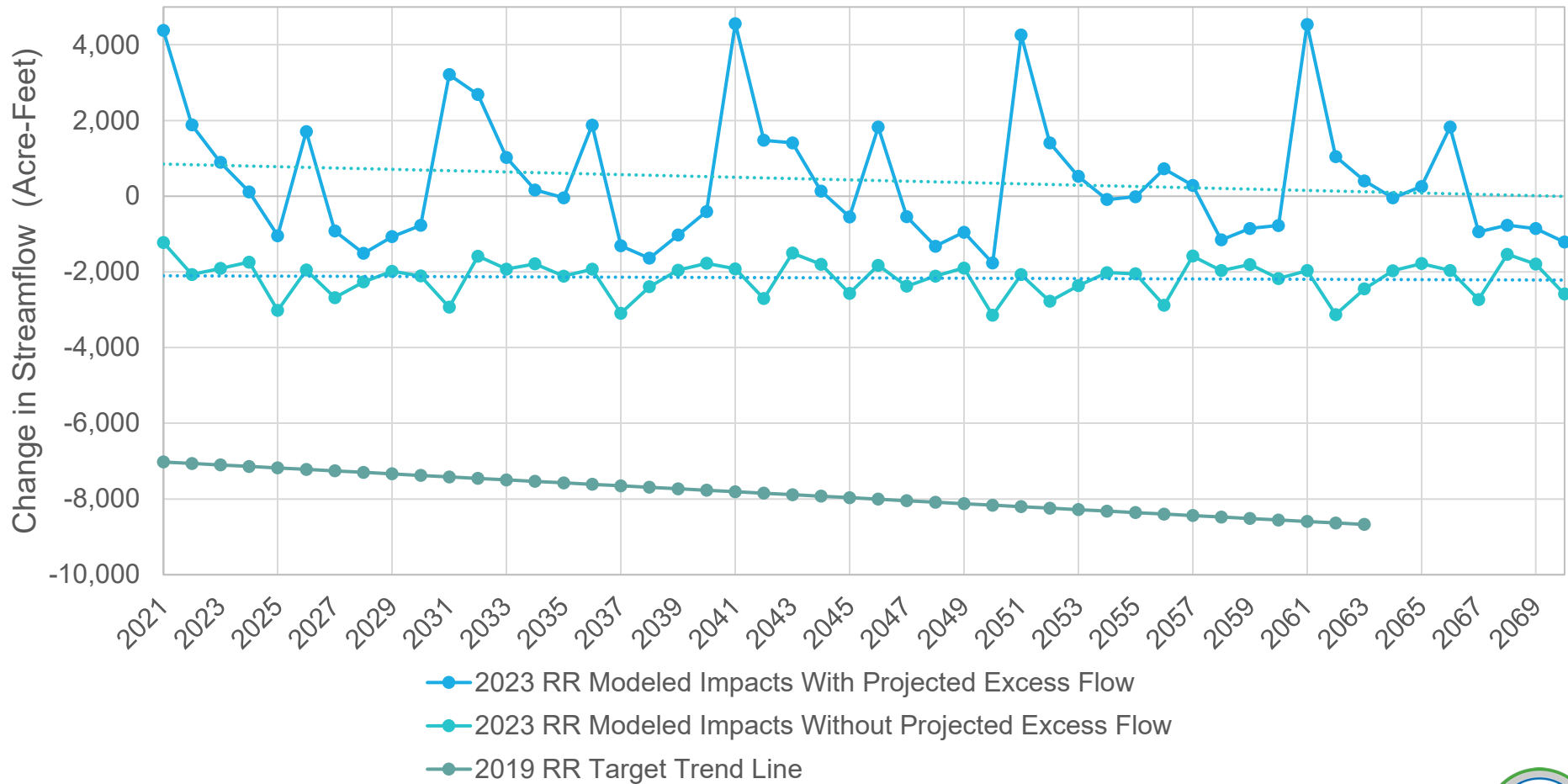
TBNRD Results

Target Comparison: Upstream of Elm Creek



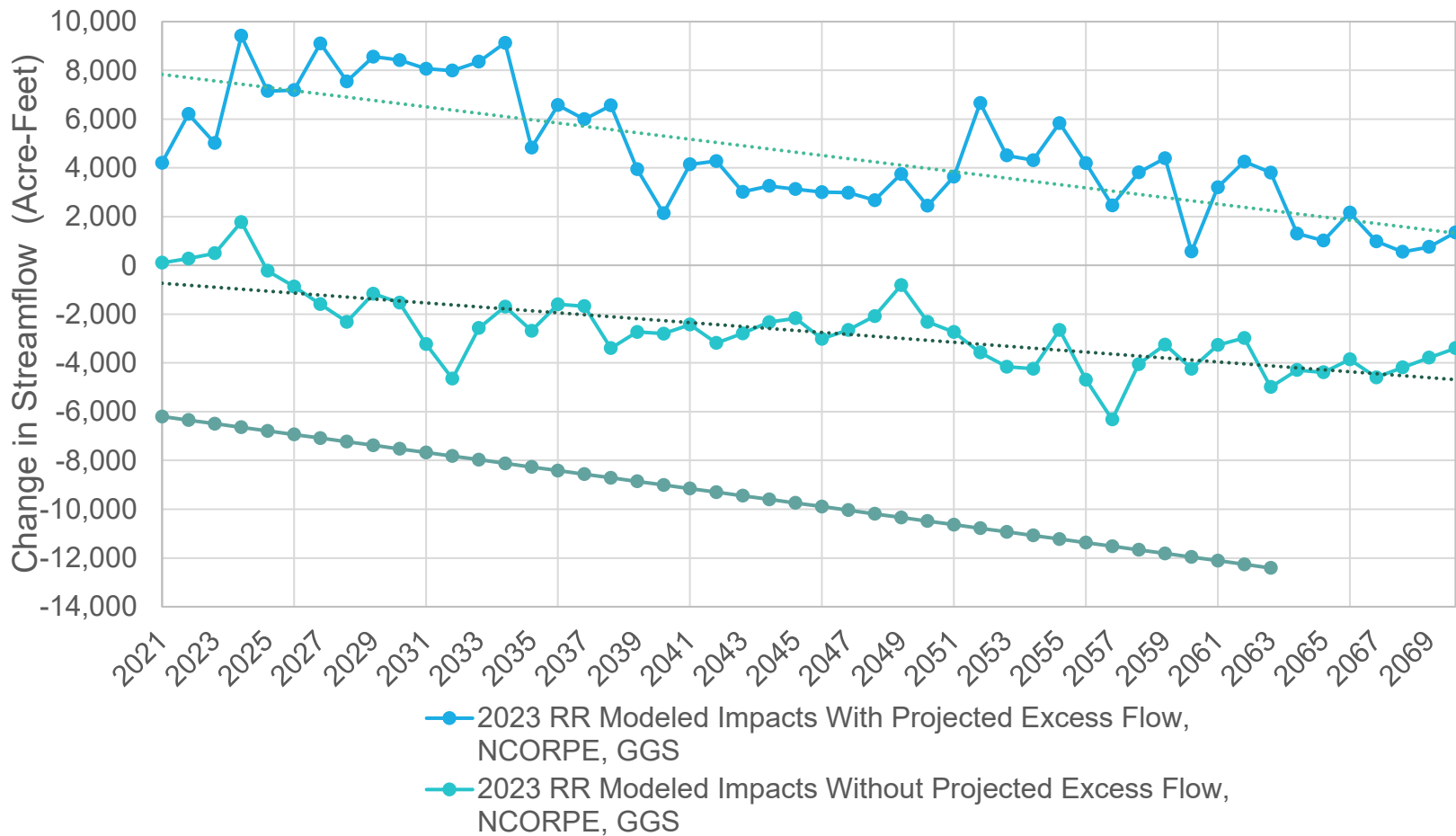
TPNRD Results

Target Comparison: North Platte River



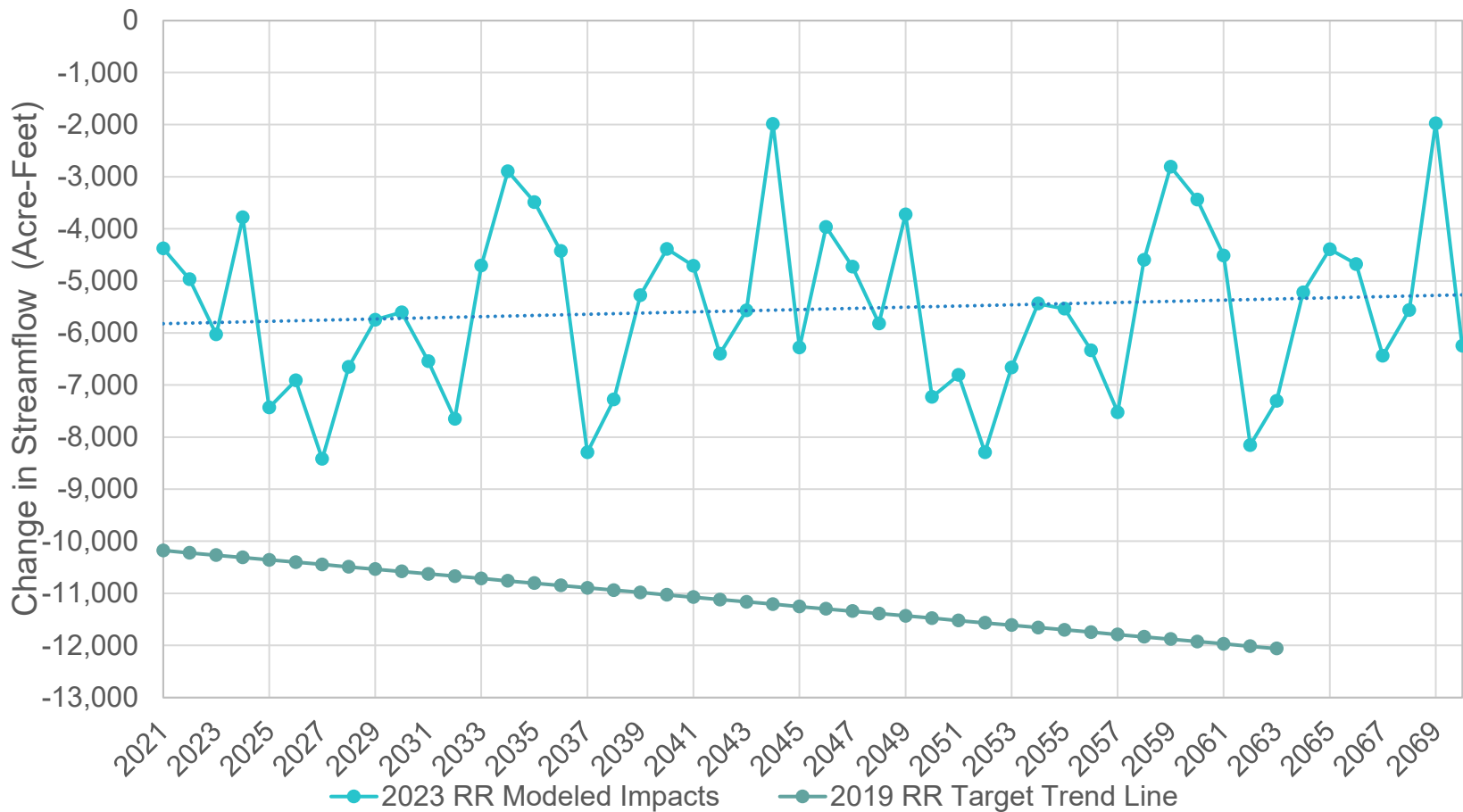
TPNRD Results

Target Comparison: South Platte River



TPNRD Results

Target Comparison: Confluence to Elm Creek



TBNRD Results

Target Comparison: Elm Creek to Chapman

