TBNRD 2023 Robust Review

May 14, 2024

Tri Basin Natural Resources District

NEBRASKA DEPT. OF NATURAL RESOURCES

Presentation Overview

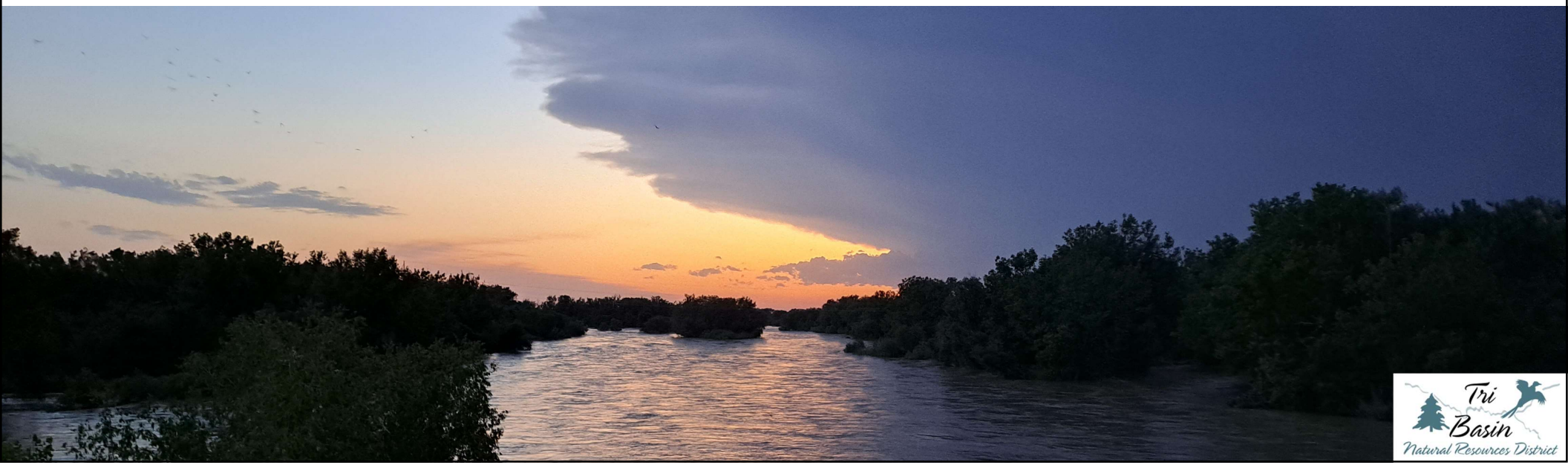
- Integrated Water Management Overview
- Robust Review Analysis
  - Introduction
  - Updates to Model
  - TBNRD Inputs
  - TBNRD Results
- Path Forward

Tri Basin Natural Resources District

Integrated Water Management Overview

IWM – Overview Statutes

- *Nebraska Revised Statute* § 46-713(3): A river basin, subbasin, or reach shall be deemed fully appropriated if
  - Current uses of hydrologically connected surface water and ground water… will in the reasonably foreseeable future cause
    - (a) Existing surface water appropriations
    - (b) Dependent wells, or
    - (c) Noncompliance with an interstate compact, decree, agreement, or applicable state or federal laws



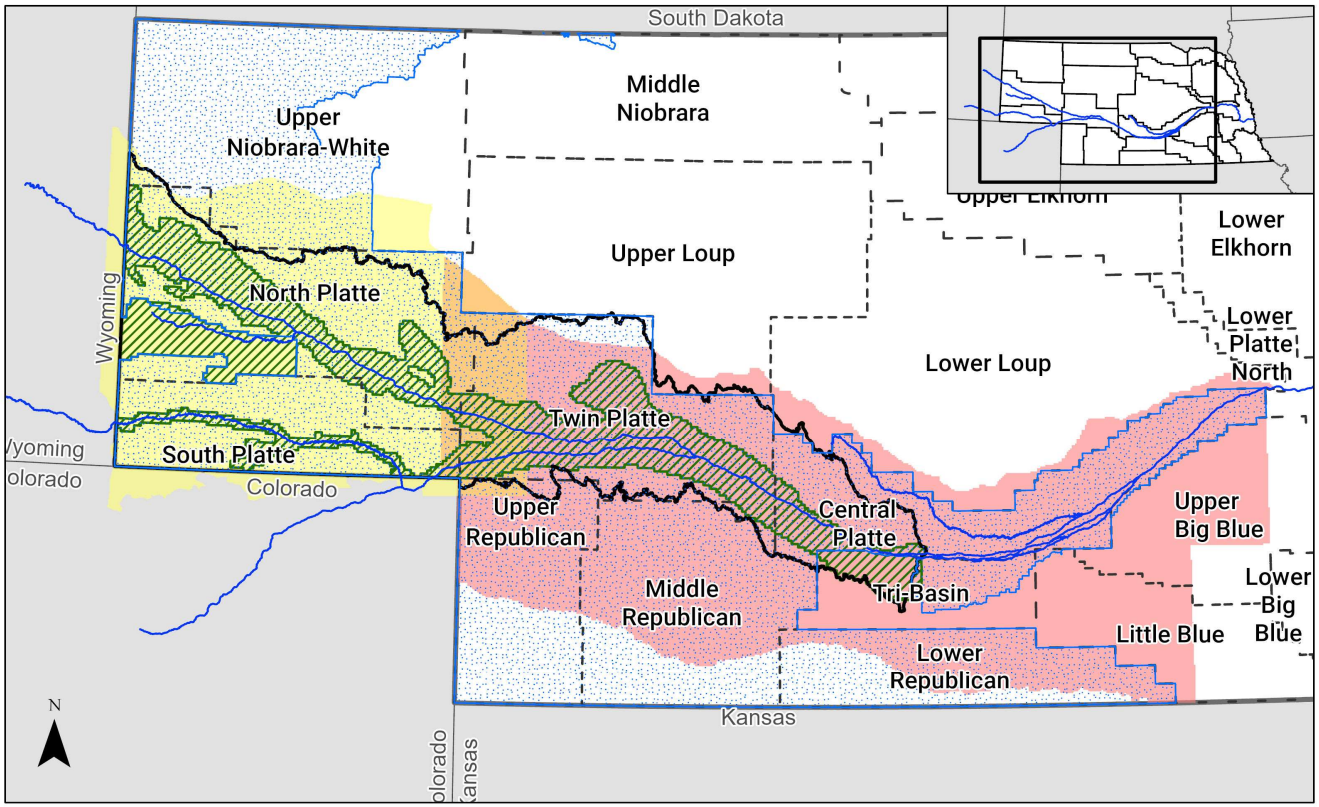
IWM – Overview Statutes

- *Nebraska Revised Statute* § 46-713(4)(a): A river basin, subbasin, or reach shall be deemed overappropriated if
  - On July 16, 2004, subject to an interstate cooperative agreement
  - and, the NeDNR has declared a moratorium on new surface water appropriations
  - and has requested each NRD
    - To close the issuance of additional water well permits

      Or to temporarily suspend the drilling of new water wells

IWM – Overview

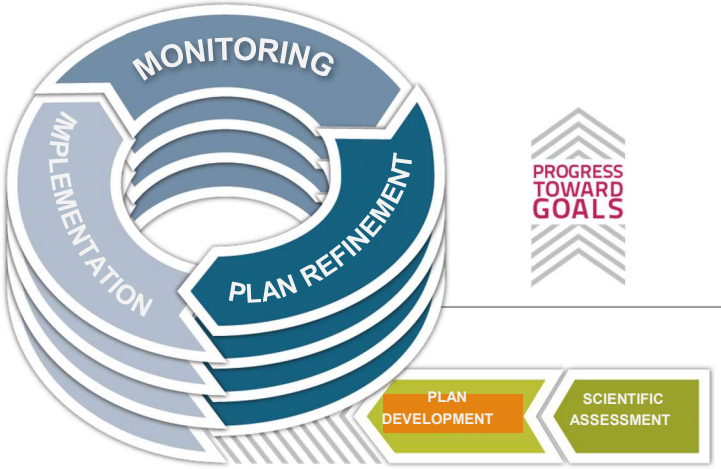
Fully and Overappropriated Areas within Model Area



Upper Platte River Model Areas

IWM – Overview Statutes

- *Nebraska Revised Statute* § 46-715(5):
  - ✓IMPs
  - ✓Basin-wide Plan
  - ✓Use Consultation & Collaboration Process w/ Stakeholders
  - ✓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 Timeline & Process

1st Increment

Overappropriated designation Sept. 2004

End of 1st ten-year increment Sept. 2019

Develop | Implement

LB 962 April 2004

Adopted Sept. 2009

First Robust Review

2nd Increment

2023 Robust Review

2027 Robust Review

Develop | Implement

Effective Sept. 2019

End of 2nd ten-year increment Sept. 2029

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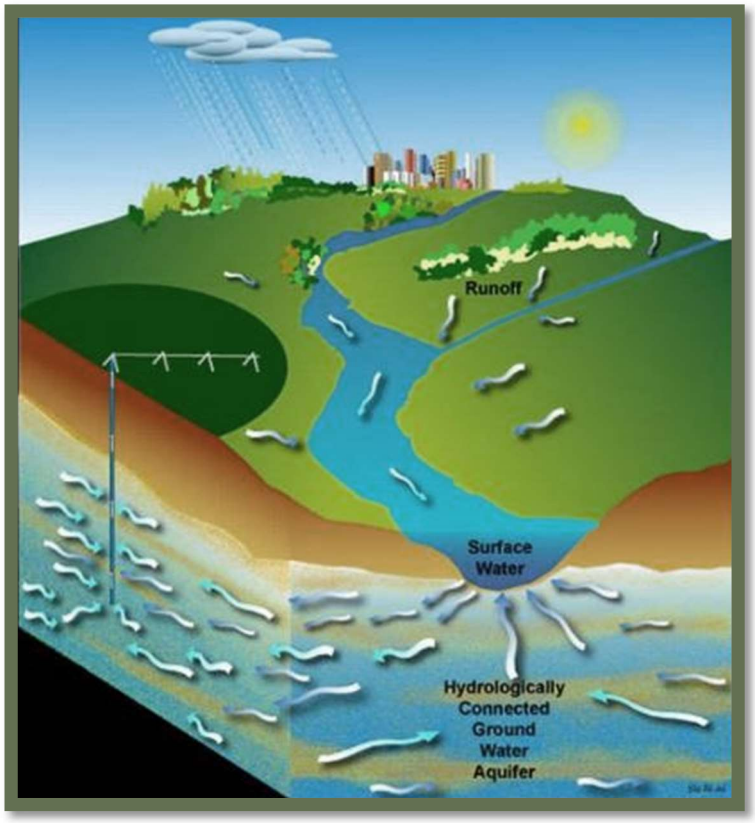
IWM – Overview
Surface & Ground Water Authorities



Surface Water

- Regulated by NeDNR
- Prior appropriations
- First in time is first in right

Integrated water management

Groundwater

- Regulated by NRDs
- Correlative rights
- Share and share alike

- 46-715(1)(a): …jointly develop an IMP….
- 46-719: IWRB, resolving disputes between NRDs and NeDNR

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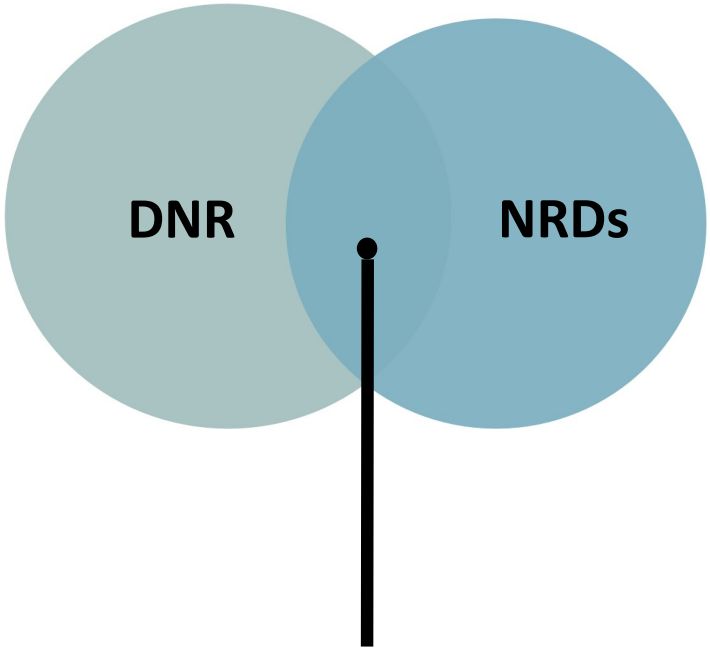
IWM – Overview
Roles and Responsibilities

DNR'S INDIVIDUAL ROLES:

- Implement and enforce surface water controls
- Provide reports on new water use and permitting activities to the NRD
- Implement surface water monitoring and data collection activities



NRD'S INDIVIDUAL ROLES:

- Implement and enforce groundwater controls
- Provide reports on new water use and permitting activities to DNR
- Implement groundwater monitoring or data collection activities

JOINT DNR/NRD ROLES:

- Coordinate on joint implementation aspects of the plan
- Review annual reports and data that is collected
- Conduct Robust Review and other IMP required analyses
- Keep stakeholders informed on progress towards fulfilling plan goals

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IWM – Overview
Goals and Objectives

- Clear Goals & Objectives of BWPs & IMPs § 46-715(2)(a)
  - Protect existing uses from negative impacts of new uses
  - Ensure both the short-term and long-term balance of water supplies and uses to maintain
    - Economic viability
    - Social and environmental health
    - Safety
    - Overall welfare of the basin
  - Meet interstate agreement compliance obligation

IWM – Overview
Interstate Compliance

Platte River Recovery Implementation Program (PRRIP) & Nebraska New Depletion Plan (NNDP)

- The Extended First Increment ends December 2032
- Associated Habitat Reach: Platte River from Lexington to Chapman, NE
- PRRIP Water Action Plan projects can be used to meet post-1997 offset requirements towards fully appropriated
- Prevent streamflow depletions that would cause non-compliance
- The Basin-wide Plan and IMPs have goals, objectives and action items to ensure compliance with the Program
- Requires annual reporting of new or expanded uses

✓ Requires basin-wide inventory/analysis of depletions and accretions from post-1997 new and expanded development every 5 years (Robust Review)

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IWM – Overview
Relationship between Basin and NRD Plans

BWP	IMP
All basin NRDs and NeDNR	1 NRD and NeDNR
Overappropriated Area	Overappropriated and Fully appropriated areas
Goals, objectives, and controls: ◦ Focus on regional, cross-boundary issues and opportunities ◦ Consistency and collaboration among basin NRDs ◦ A broad framework used for basin IMPs	Goals, objectives, and Controls: ◦ Specific to the one NRD ◦ Tailored to local issues ◦ Specific targets and actions

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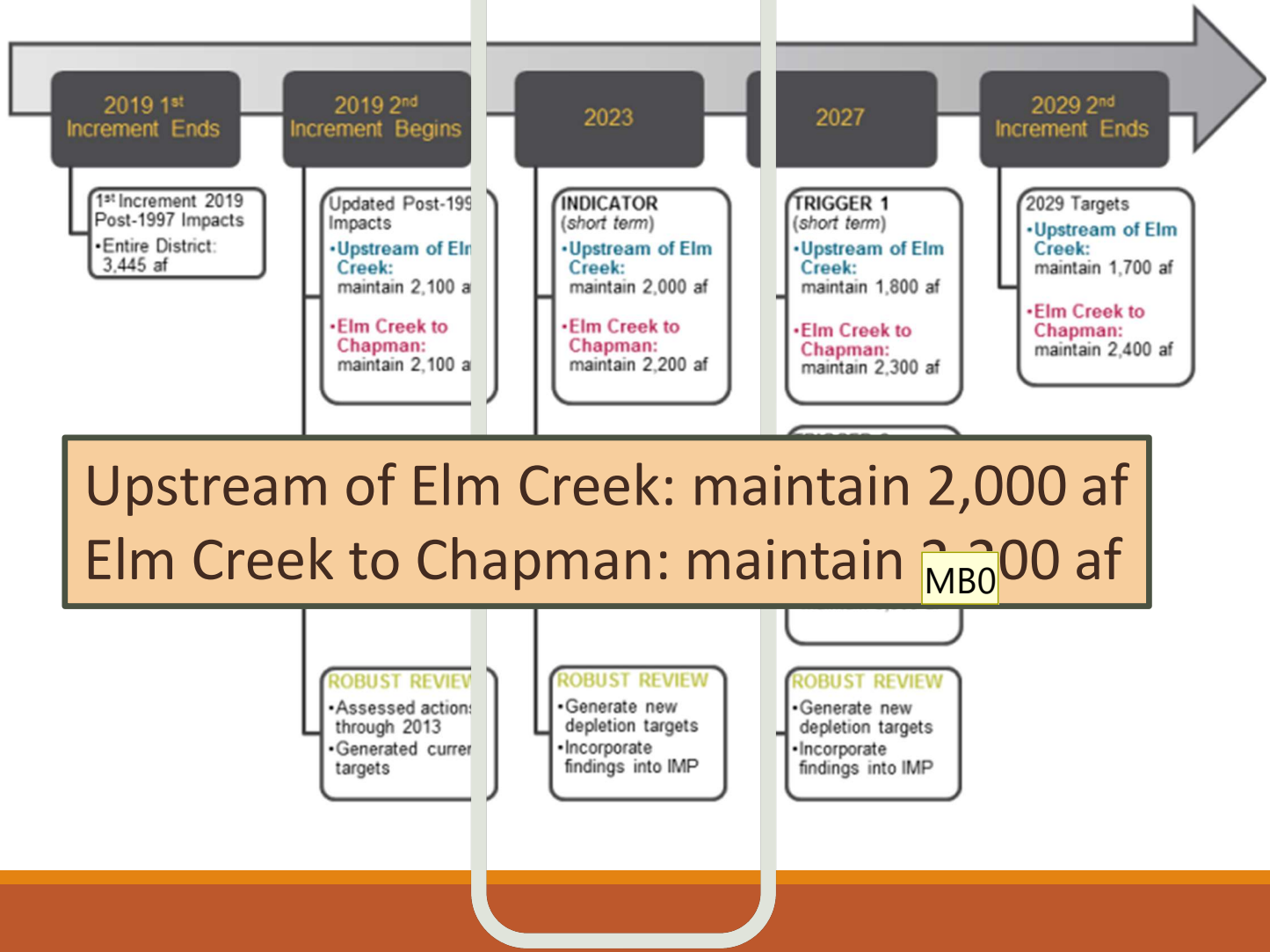
TBNRD IMP Requirements - Triggers



Upstream of Elm Creek: maintain 2,000 af

Elm Creek to Chapman: maintain 2,200 af

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2023 Robust Review Analysis: Introduction

Robust Review Introduction

Goals of Robust Review

- Assess progress on second increment goals and objectives (2023 Indicators)
- Assess compliance with PRRIP and NNDP
- Provide information for decision makers

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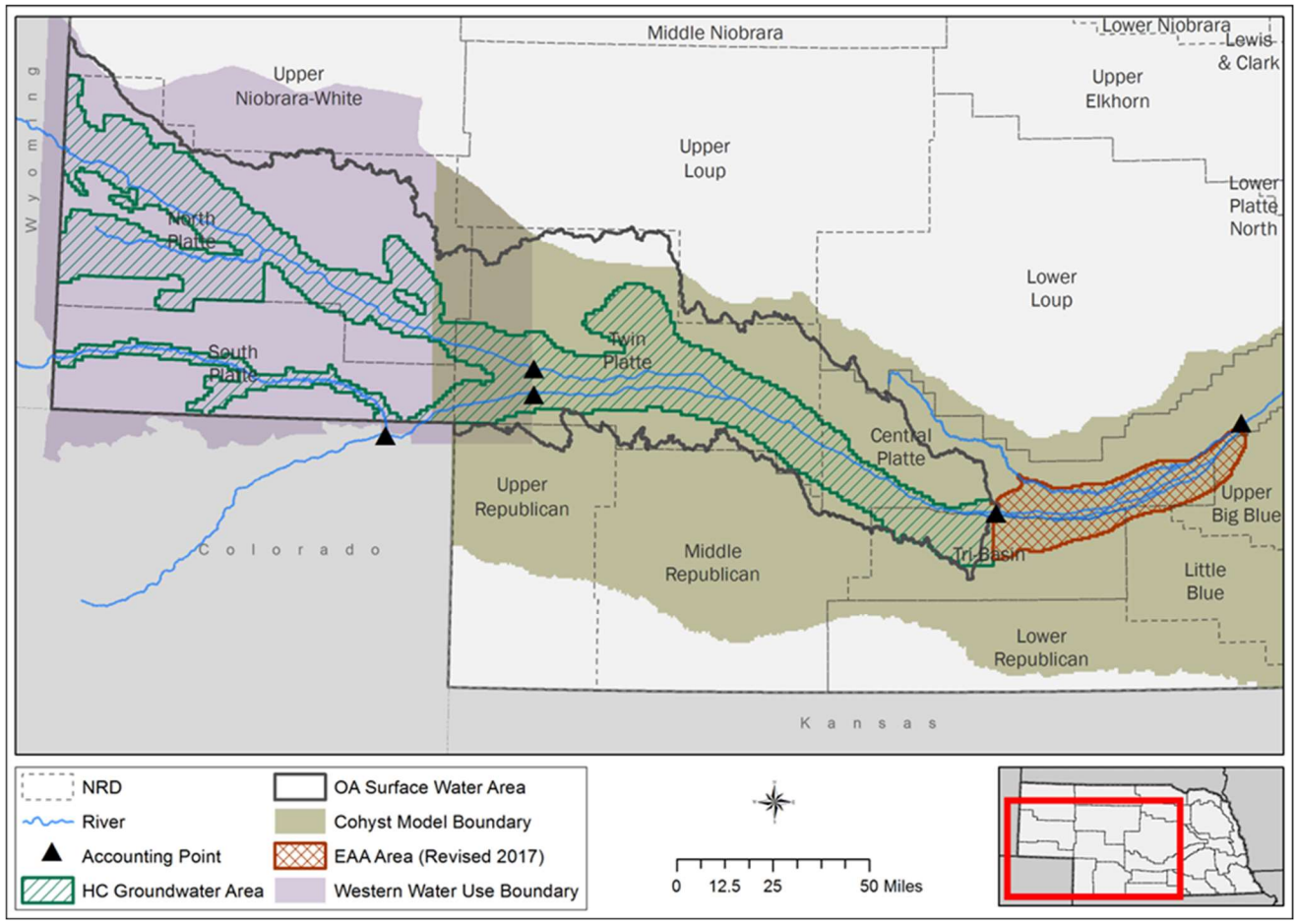
Robust Review Introduction

Analysis Set-Up: Map (Model Area)



Robust Review Introduction

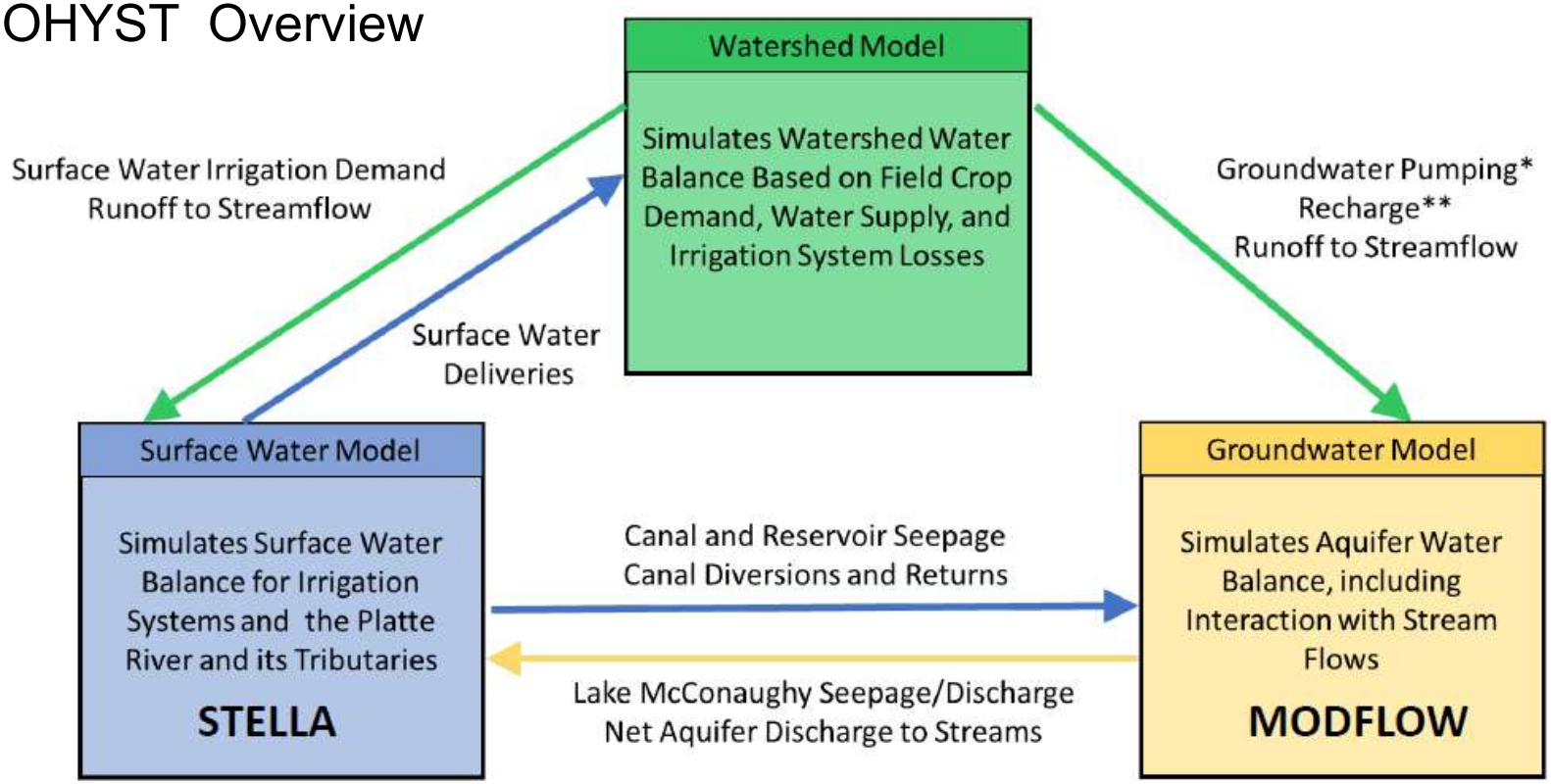
Simulation Set-Up

- Used version 29f of the groundwater model and version 29 of the watershed model
- Model is simulated from 1950 – 2070
- Climate repeats 1996 – 2020 twice for projection period
- Historical groundwater-irrigated acres and crops are used in the historical simulation, and the 1997 level of groundwater-irrigated acres and crops are used in the “1997” simulation
- Surface water and commingled acres remain constant in the baseline and 1997 simulations to cancel out surface water and commingled effects
- Results are summarized for the areas of TBNRD upstream of Elm Creek and from Elm Creek to Chapman

2023 Robust Review: Updates to Model Since 2019

Robust Review Analysis Updates to Model

COHYST Overview



*Includes Irrigation and M&I Pumping, ** Includes Deep Percolation and Lateral Seepage

Robust Review Analysis Updates to Model

Major Differences from 2019 Robust Review

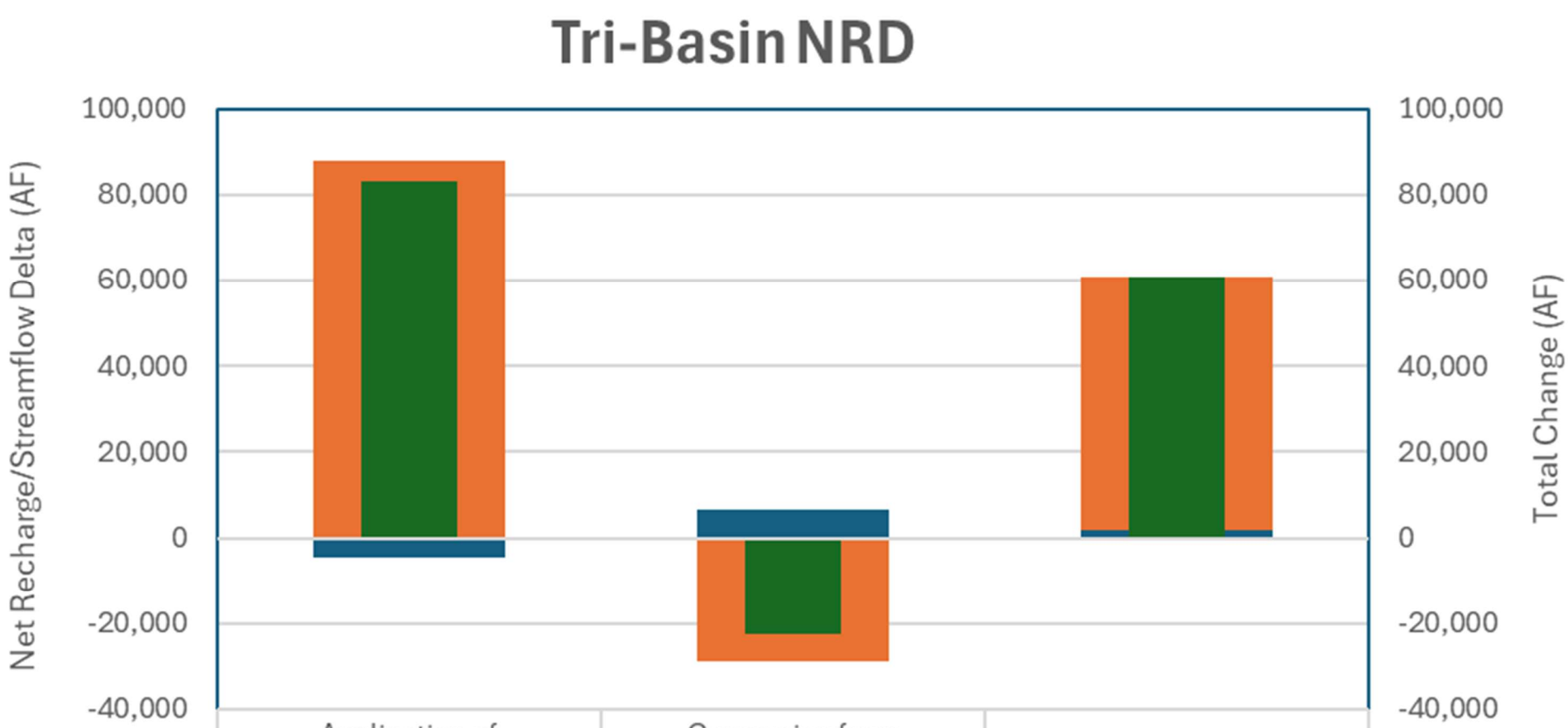
- Update input data 2014 through 2020
  - Climate data
  - Land Use (2012-2020)
  - Excess Flow
  - Crops
  - Municipal and Industrial Pumping
- Update Watershed Model
  - Incorporated Conservation Study results
  - Modified crop growth specifications
  - Updated crop mixture (increased prevalence corn/soybean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

Robust Review Analysis Updates to Model

Impacts to Water Budget (COHYST)

- Climate Data Updates
  - **Net increase** in Water Budget – Increased precipitation/ET/field recharge & decreased pumping and field runoff
    - Replaced weather station with gridded PRISM data
- Groundwater Model Updates
  - **Net decrease** in water budget across model domain
    - Recalibration to address model updates
    - Largest change near Elwood Reservoir / Plum Creek (TBNRD)
- Watershed Model updates appear to have net effect of increased recharge
  - Updated Producer Practices
    - Tillage Practices
      - **Net increase** in WB due to increased storage, decreased pumping
      - Larger impact in Eastern portion of model area due to higher precipitation
    - Adjusted Planting Dates, Growing Degree Days
      - **Net increase** in WB
    - Adjusted Crop Mix – increased prevalence corn/soybean rotation
      - **Net decrease** in WB due to decreased soybean/increased corn acres in projection period

Net Water Balance Impact of Post-1997 Changes in Production Practices & New Irrigated Lands

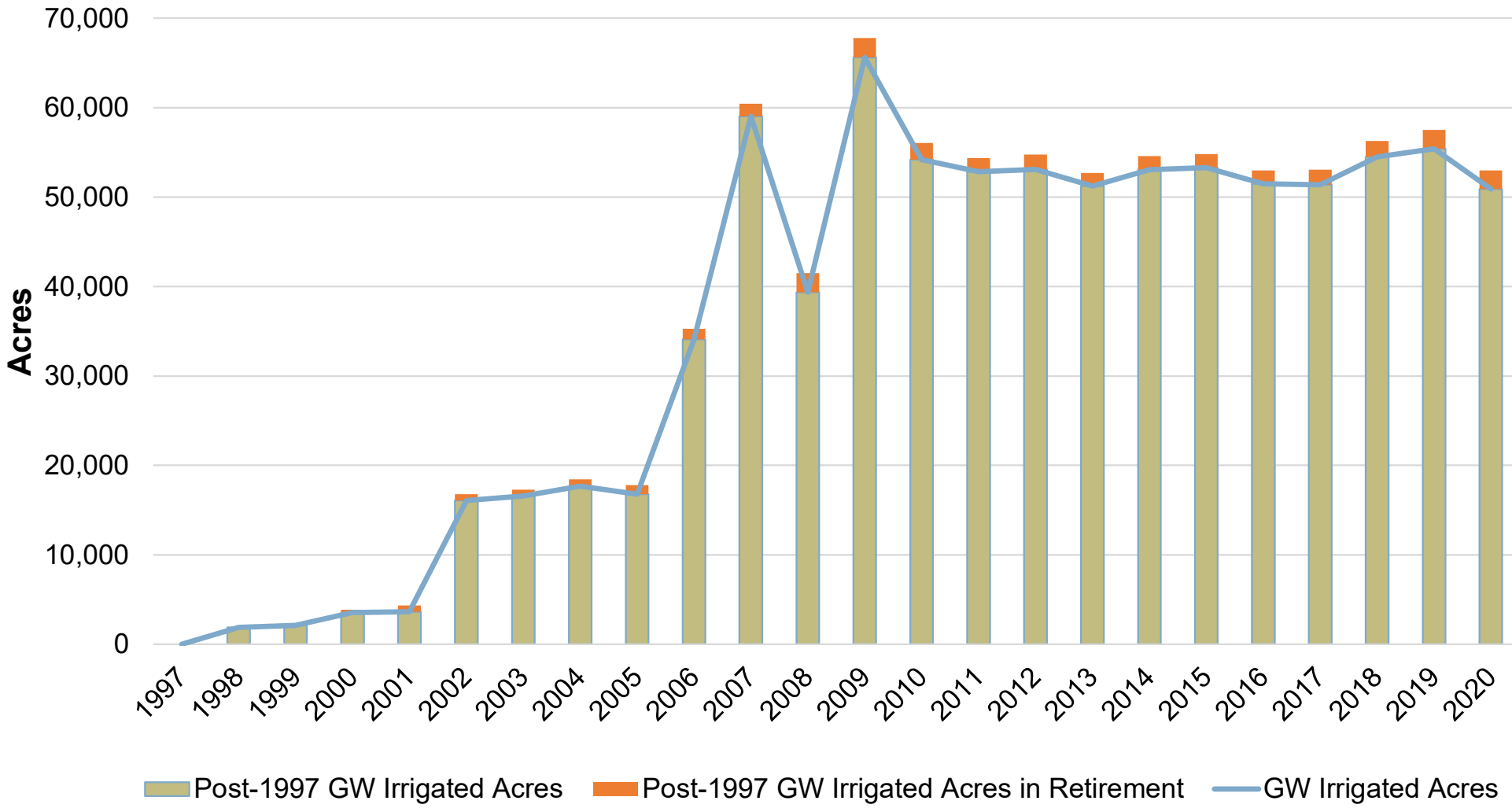


	Application of Updated Production Practices	Conversion from Dryland to Irrigated Land Use	Net Effect
Net Recharge Delta	87,775	-28,924	58,851
Runoff to SF Delta	-4,633	6,416	1,783
Total Change	83,142	-22,508	60,634

2023 Robust Review: Management Actions & Model Inputs

Management Action & Model Input:

Net Change in Groundwater-Only Irrigated Acres from 1997 to 2020



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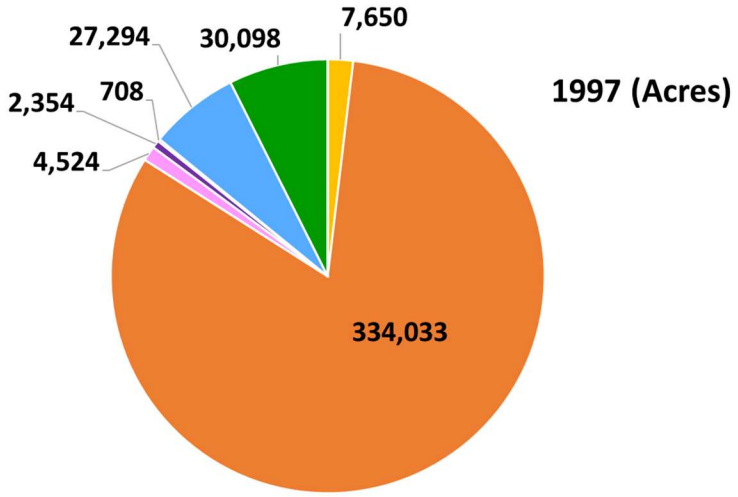
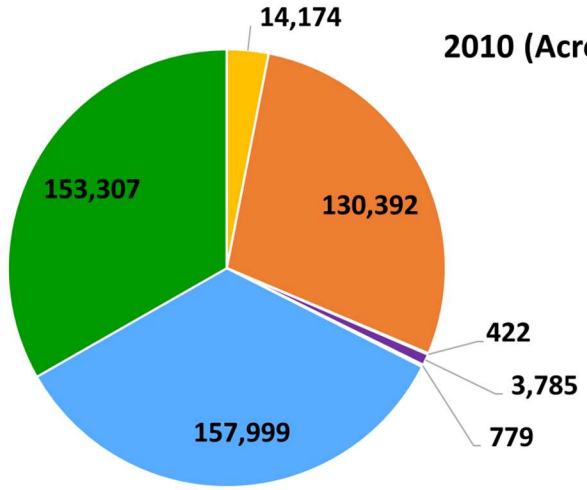
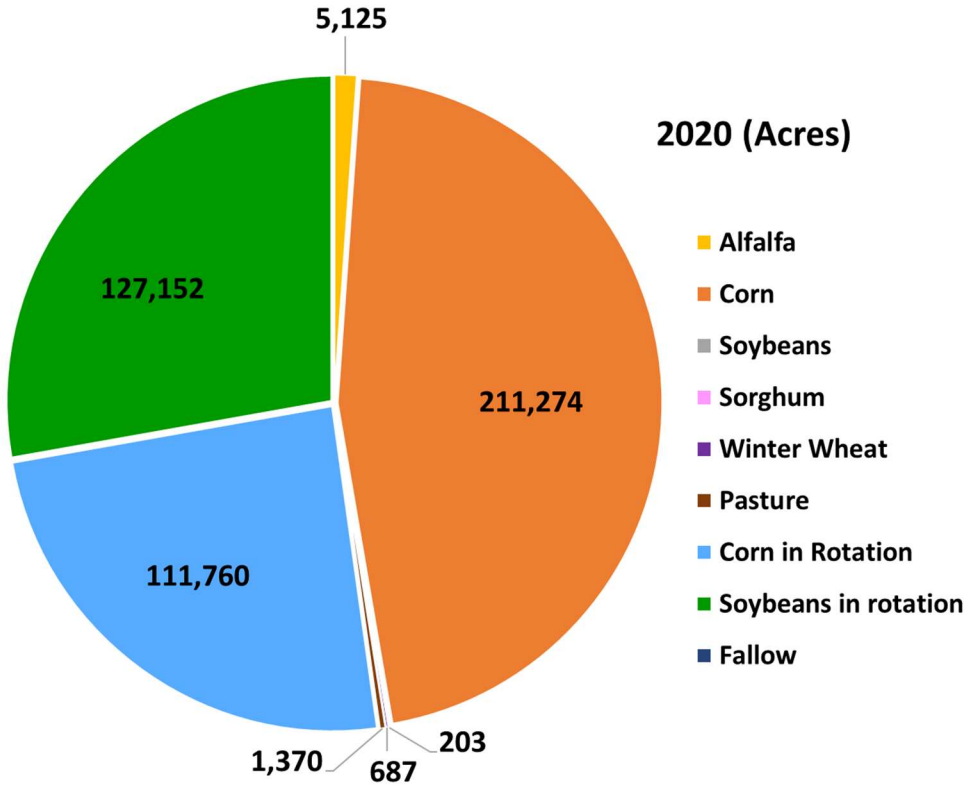
Management Action & Model Input:

Change in Groundwater-Only Irrigated Crop Type

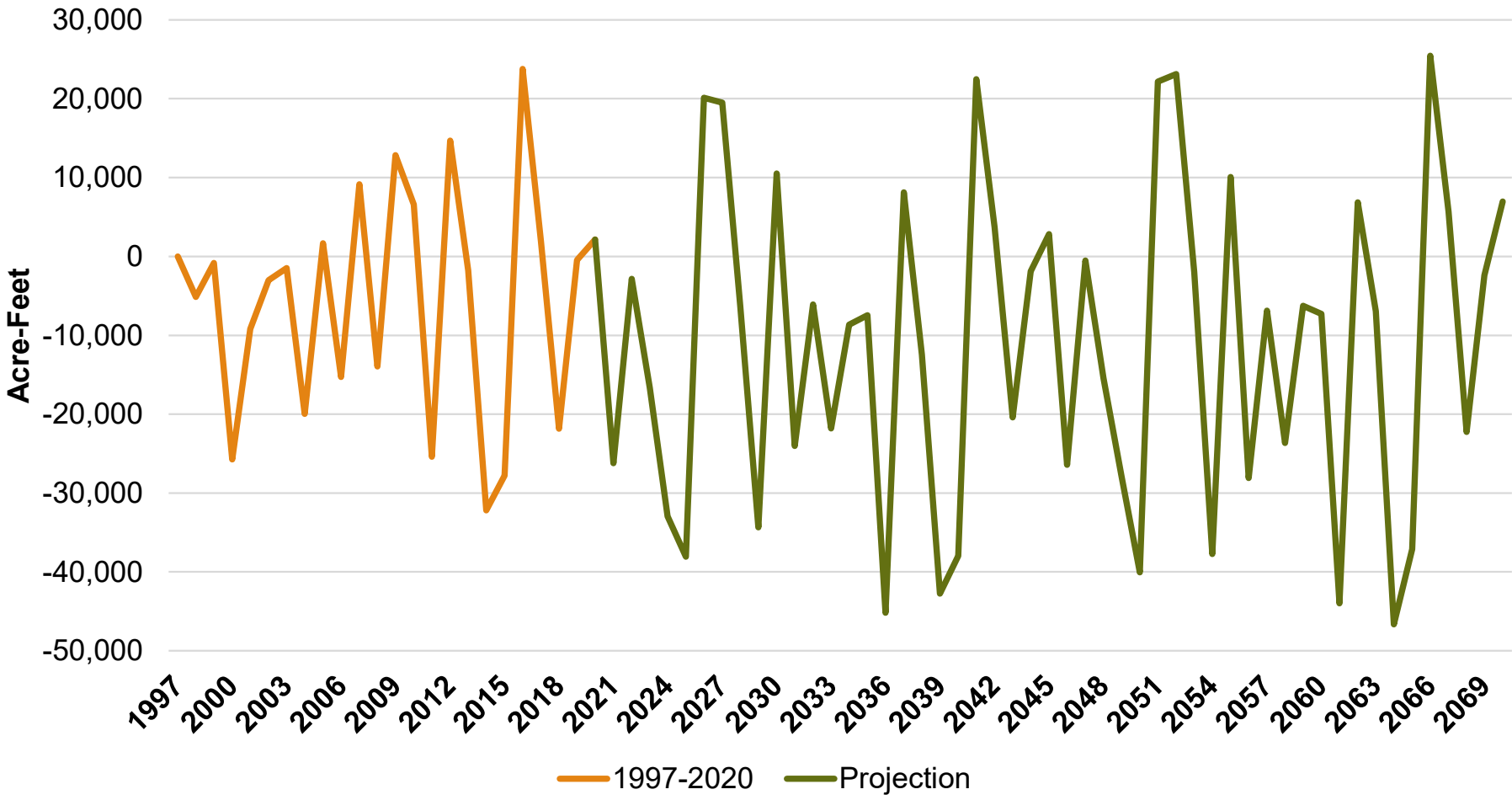






Management Action & Model Input:

Change in Post-1997 Groundwater-Only Irrigation Pumping



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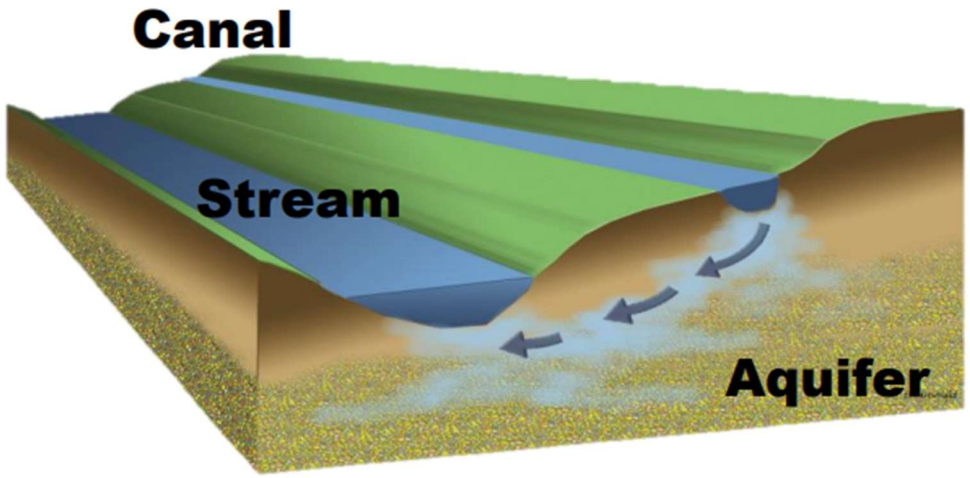
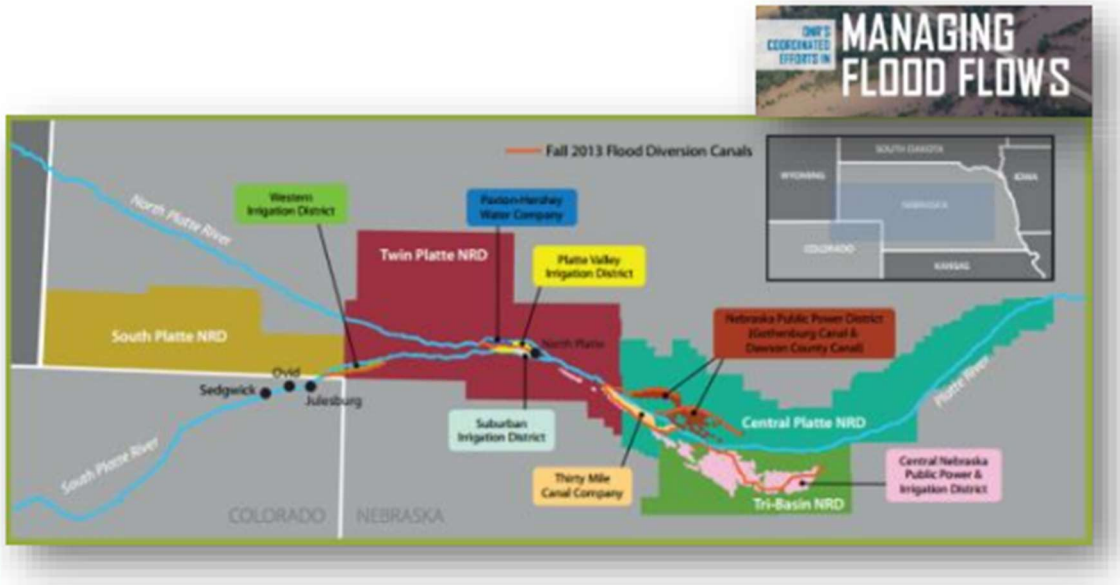
Management Action: Conjunctive Water Management (CWM)



Conjunctive Water Management is an *adaptive process* that utilizes the *connection* between surface water and groundwater to *maximize water use*, while *minimizing impacts* to streamflow and groundwater levels in an effort to increase the overall water supply of a region and improve the reliability of that supply.

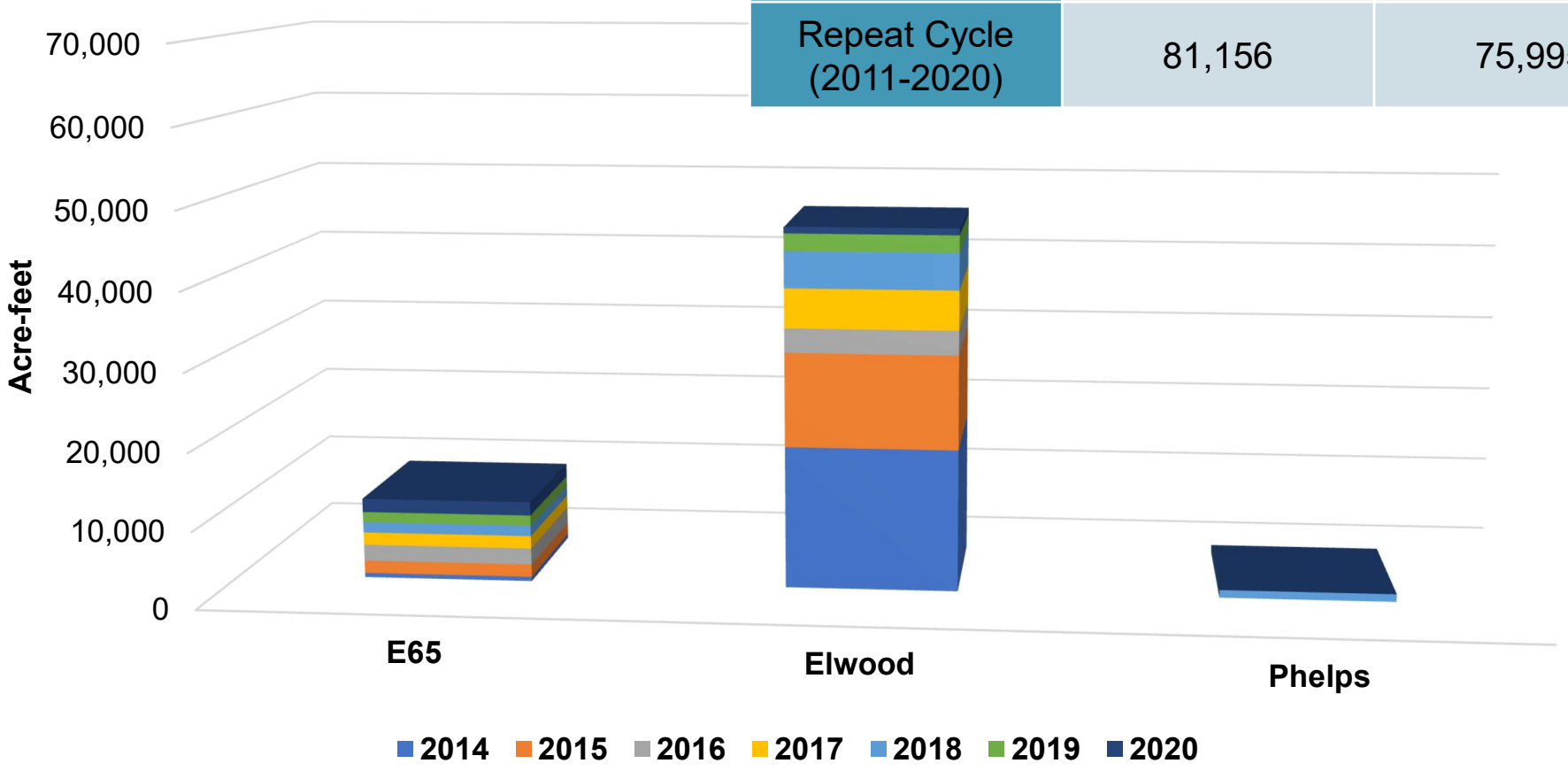
- Excess flow capture
- Augmentation
- Water leasing
- Water transfers
- Canal refurbishment



Management Action: CWM / Excess Flows

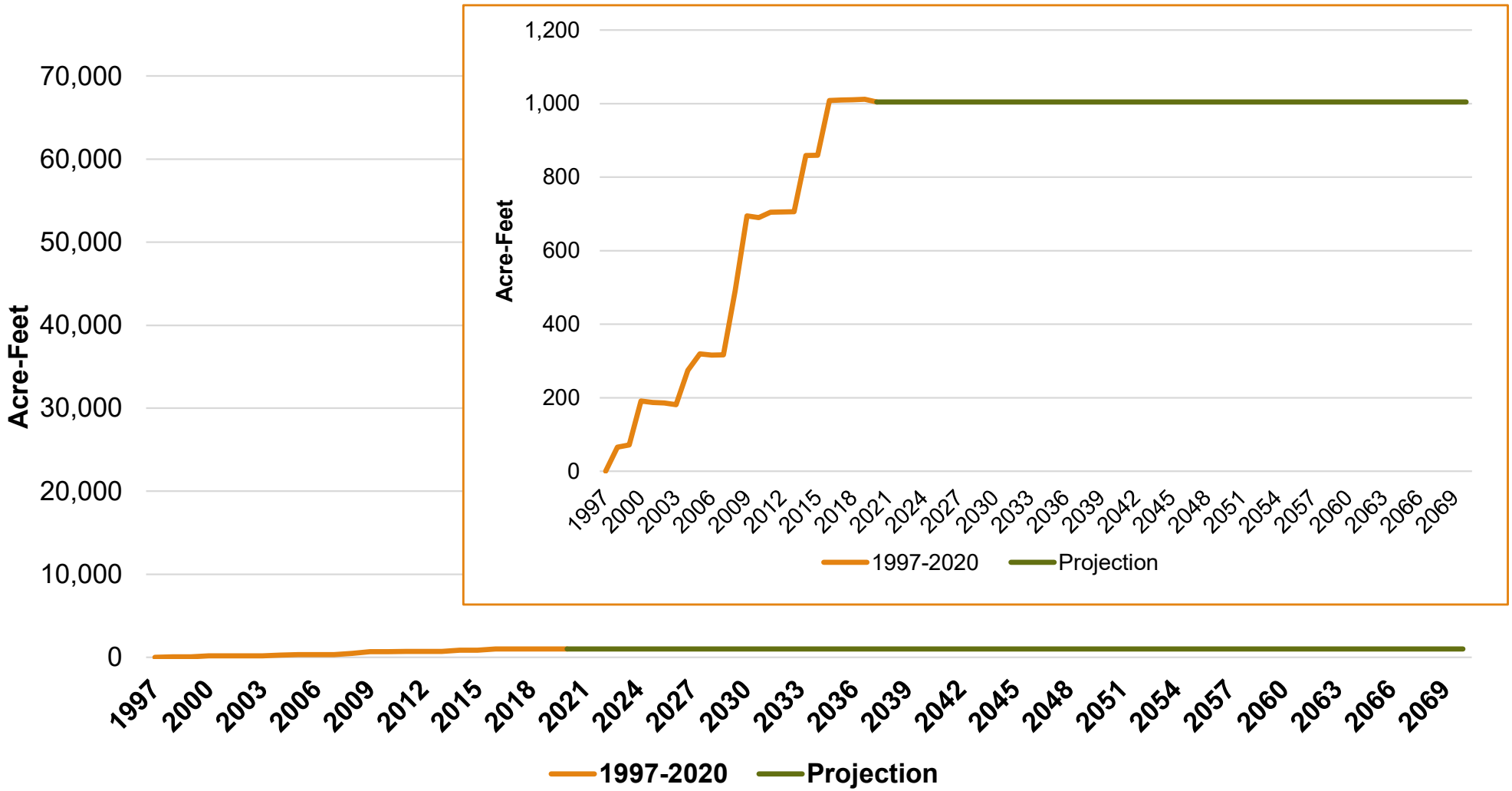
Excess Flow Recharge

TBNRD	Acre-Feet of Excess Flow	
	Diversion	Recharge
2014-2020	61,731	61,257
Repeat Cycle (2011-2020)	81,156	75,995



Management Action & Model Input:

Change in Municipal and Industrial Pumping from 1997



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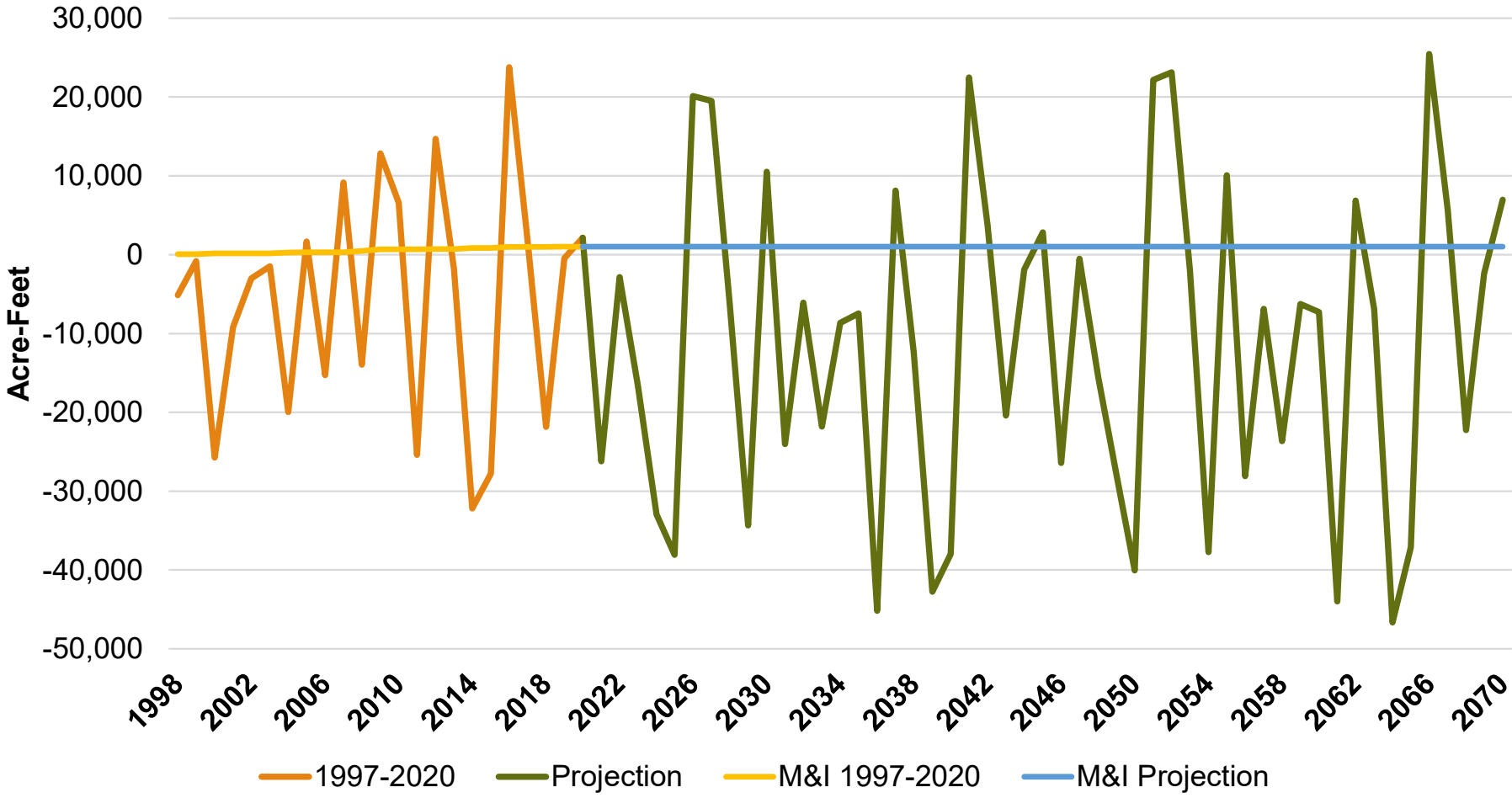
Management Action & Model Input:

Change in Post-1997 Groundwater-Only Irrigation Pumping with Historical and Projected M&I Pumping for Comparison



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2023 Robust Review: Analysis – TBNRD Results

Robust Review Analyses

- Post-1997 Analysis
  - Post-1997 Groundwater Only Irrigated Acres Development
  - Post-1997 Municipal and Industrial Pumping Development
  - Excess Flow
  - Total Flow Analyses
  - Groundwater Only Irrigation Retirements

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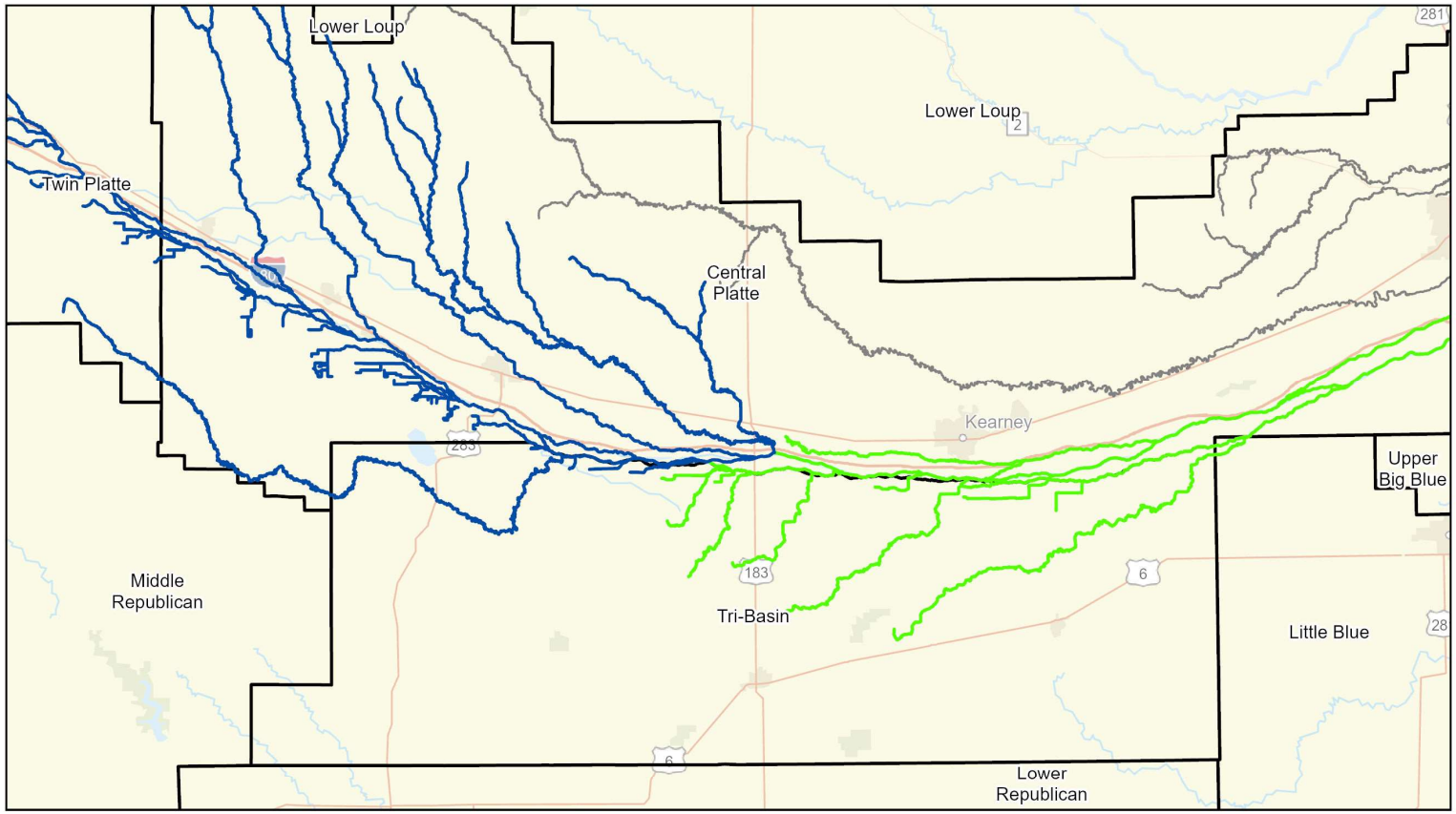
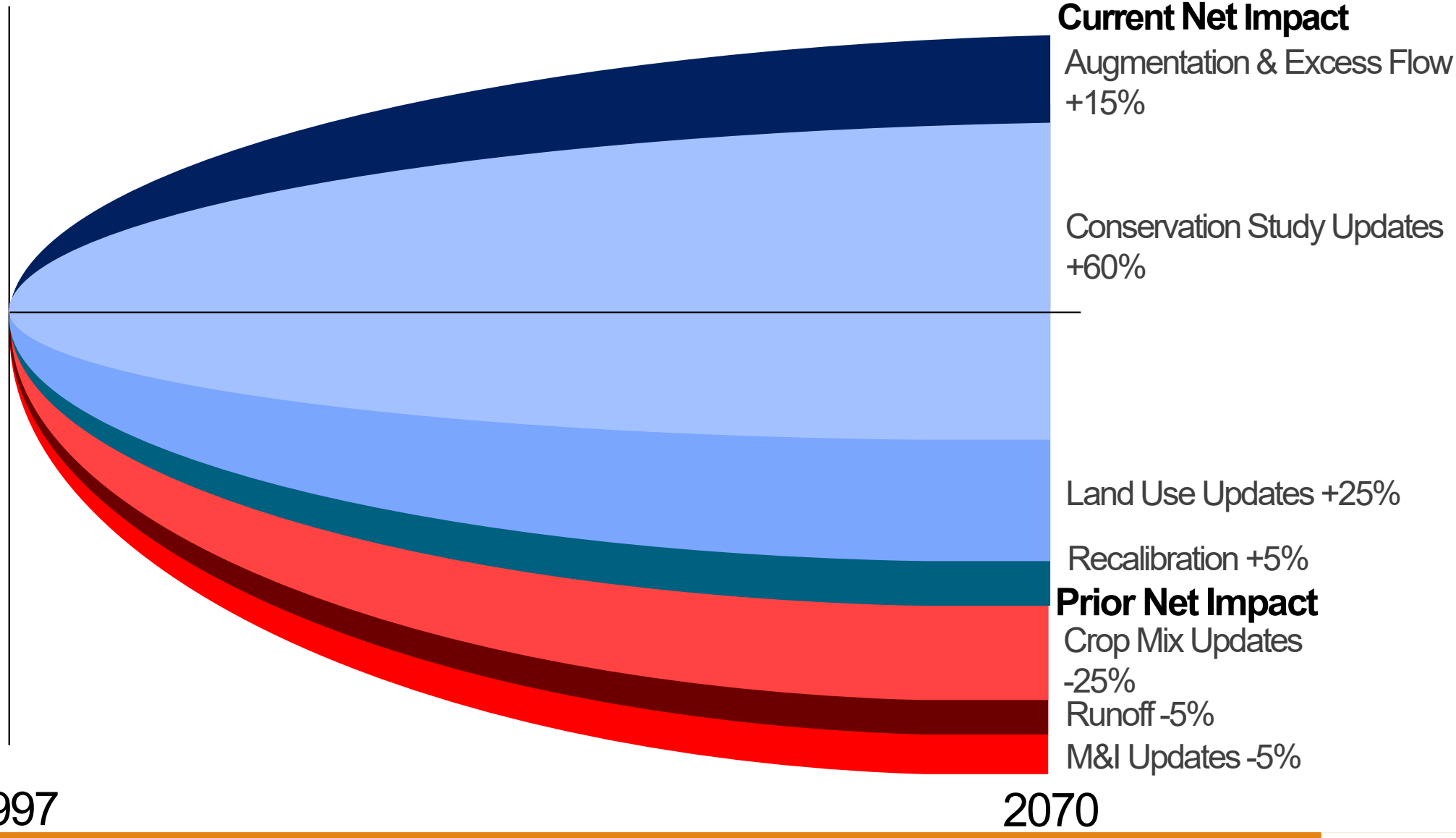
Tri-Basin Accounting points



Combined CP/TB/TPNRD Upstream Elm Creek

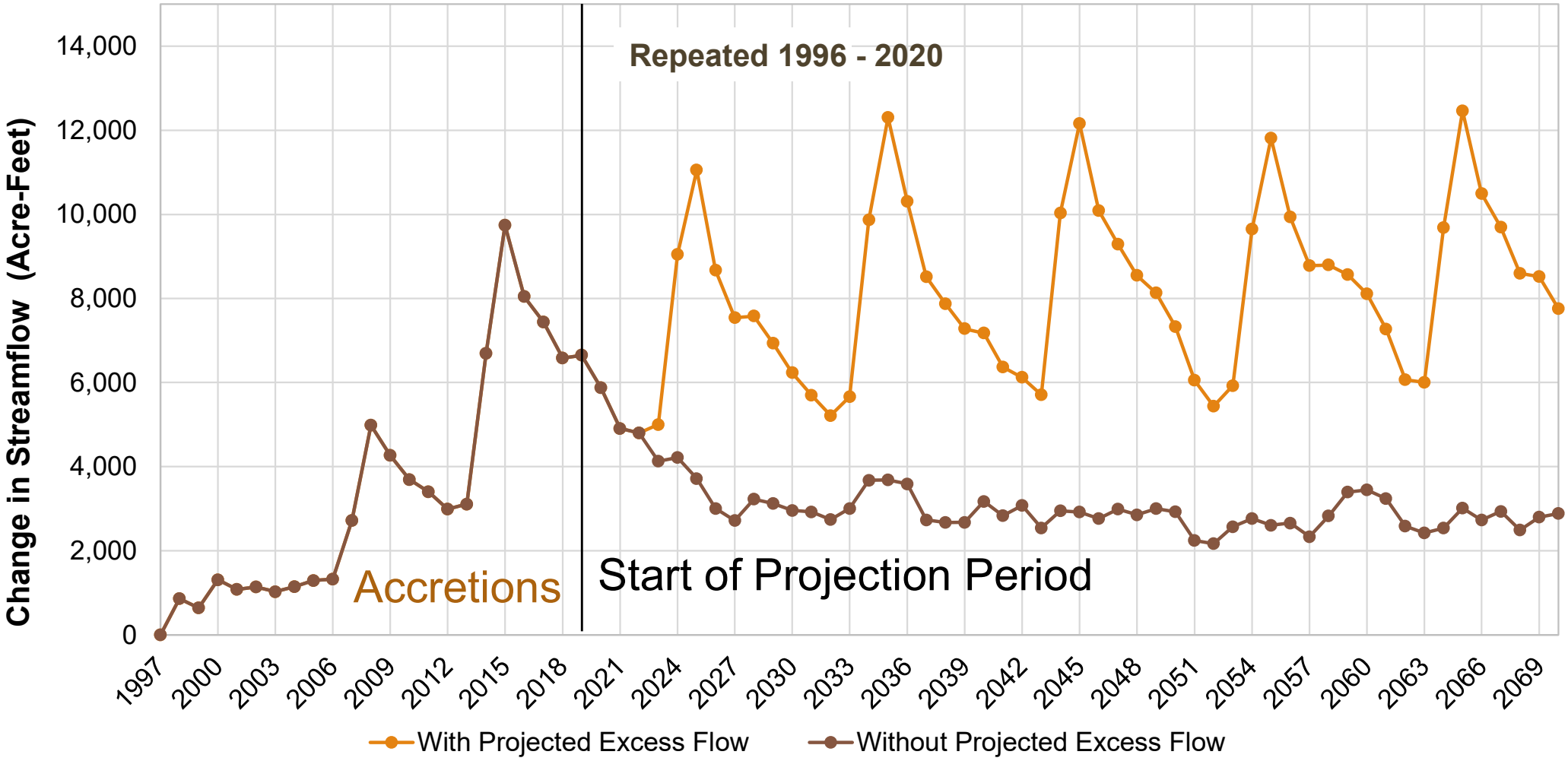
Impact of Updates Relative to Prior Robust Review



Upstream of Elm Creek

TBNRD Results Upstream of Elm Creek

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



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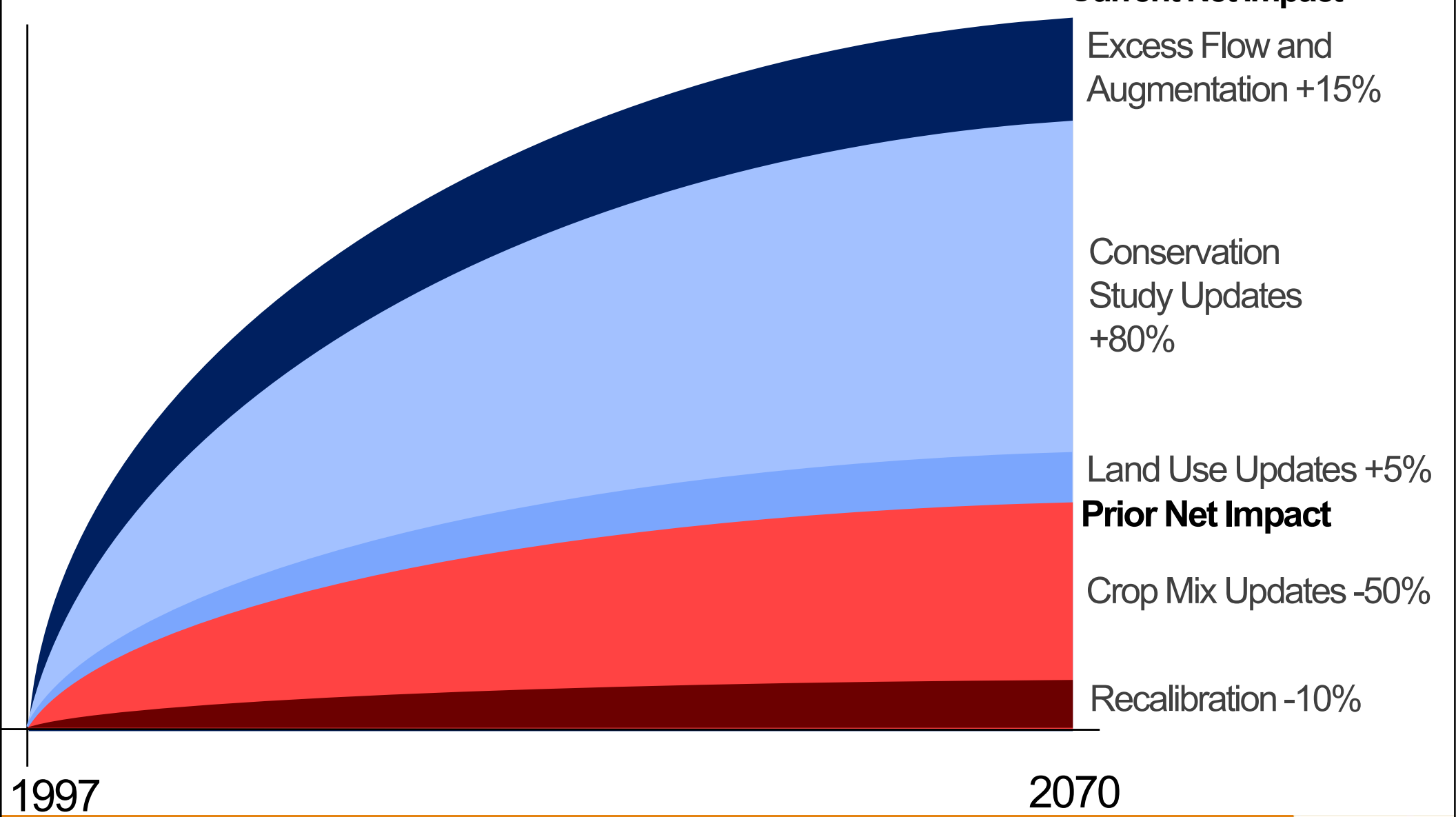
TBNRD Upstream of Elm Creek

Impact of Updates Relative to Prior Robust Review



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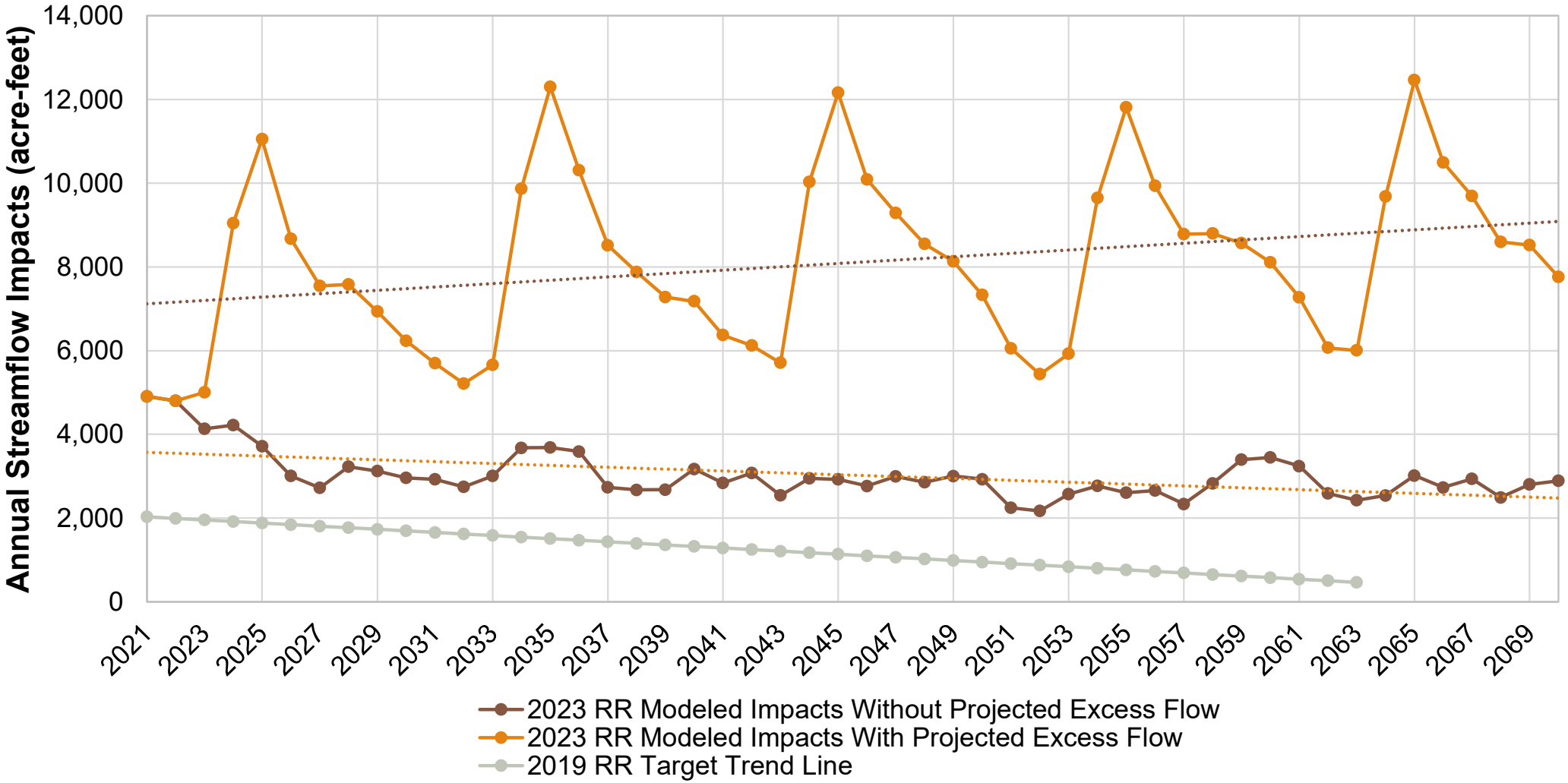
TBNRD Results

Target Comparison: Upstream of Elm Creek



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TBNRD Results

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
2023*	2,000	3,500	7,200
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

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Elm Creek to Chapman

TBNRD Results Elm Creek to Chapman

Robust Review Analysis Results: Post-1997 Analysis, includes M&I, Decertifications, and Recharge Projects

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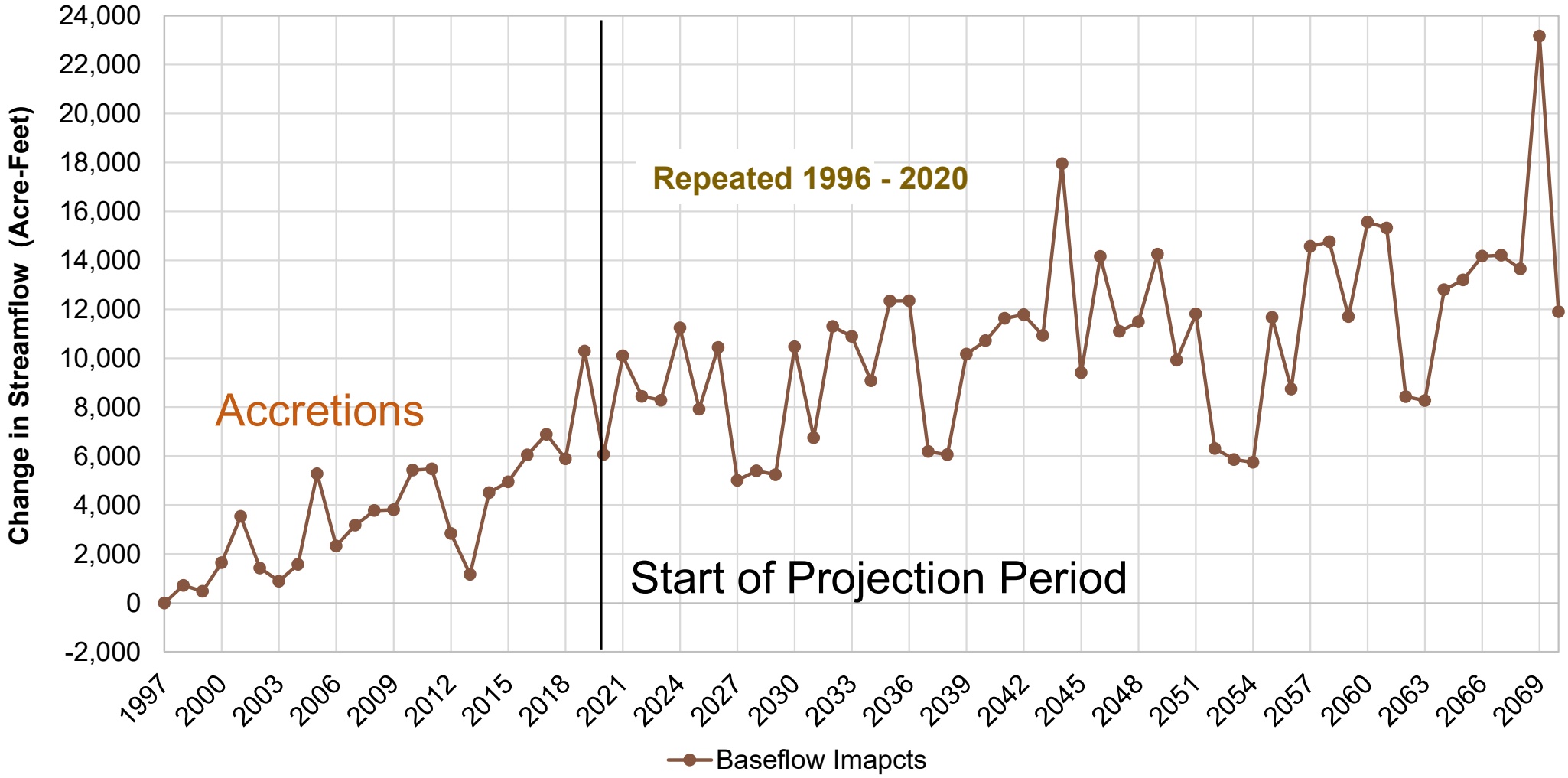

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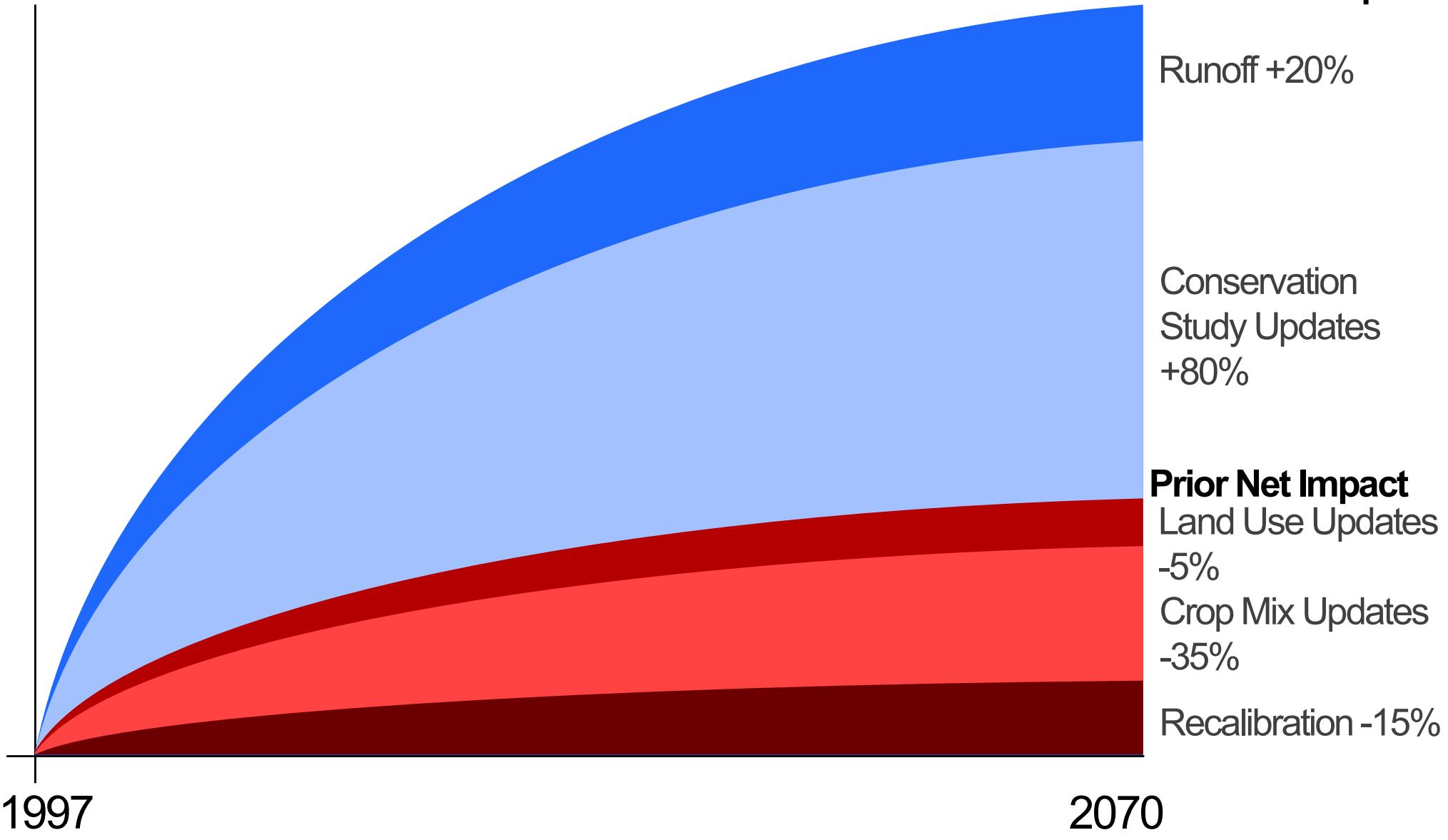
TBNRD Elm Creek to Chapman

Impact of Updates Relative to Prior Robust Review



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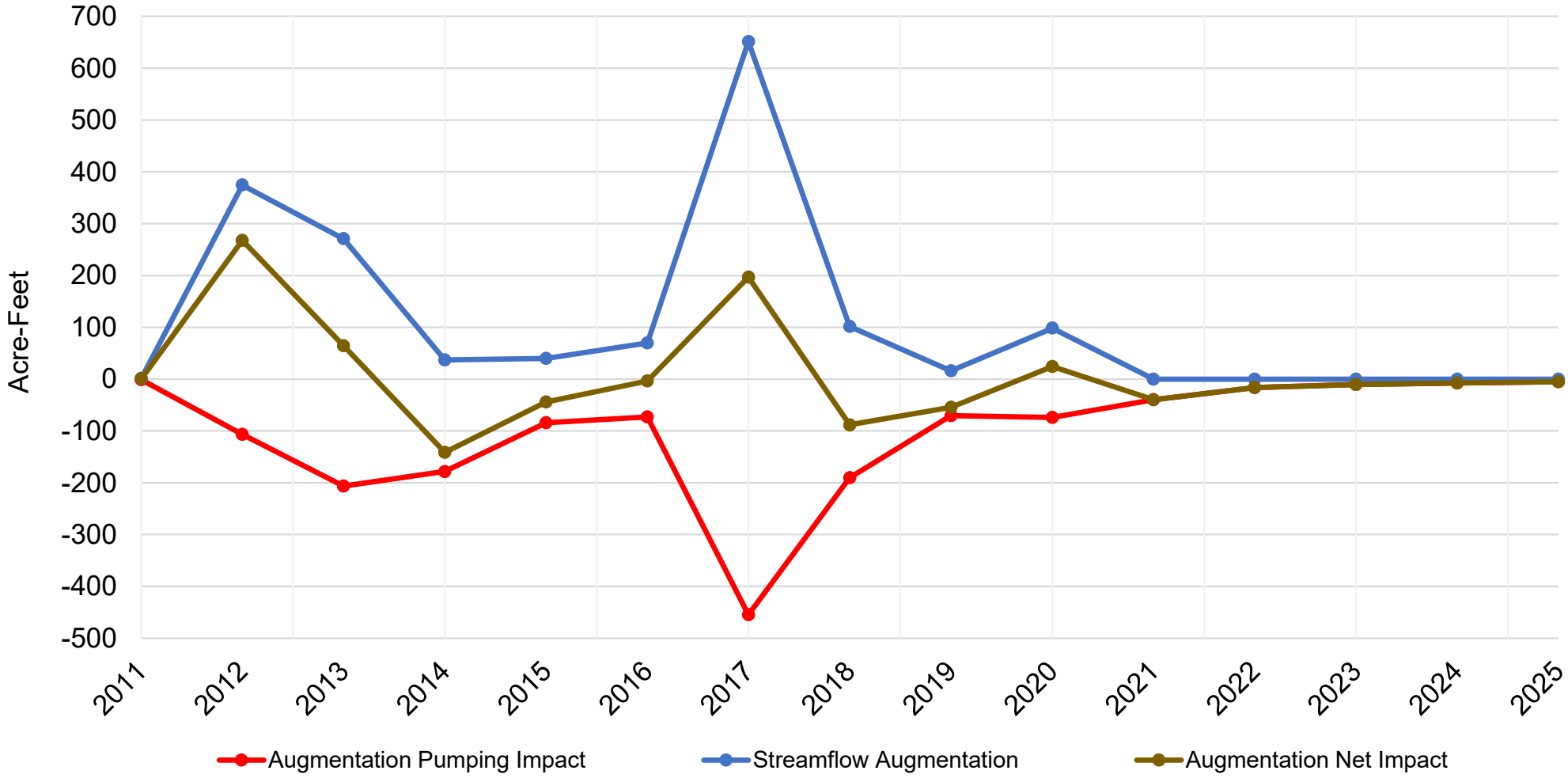
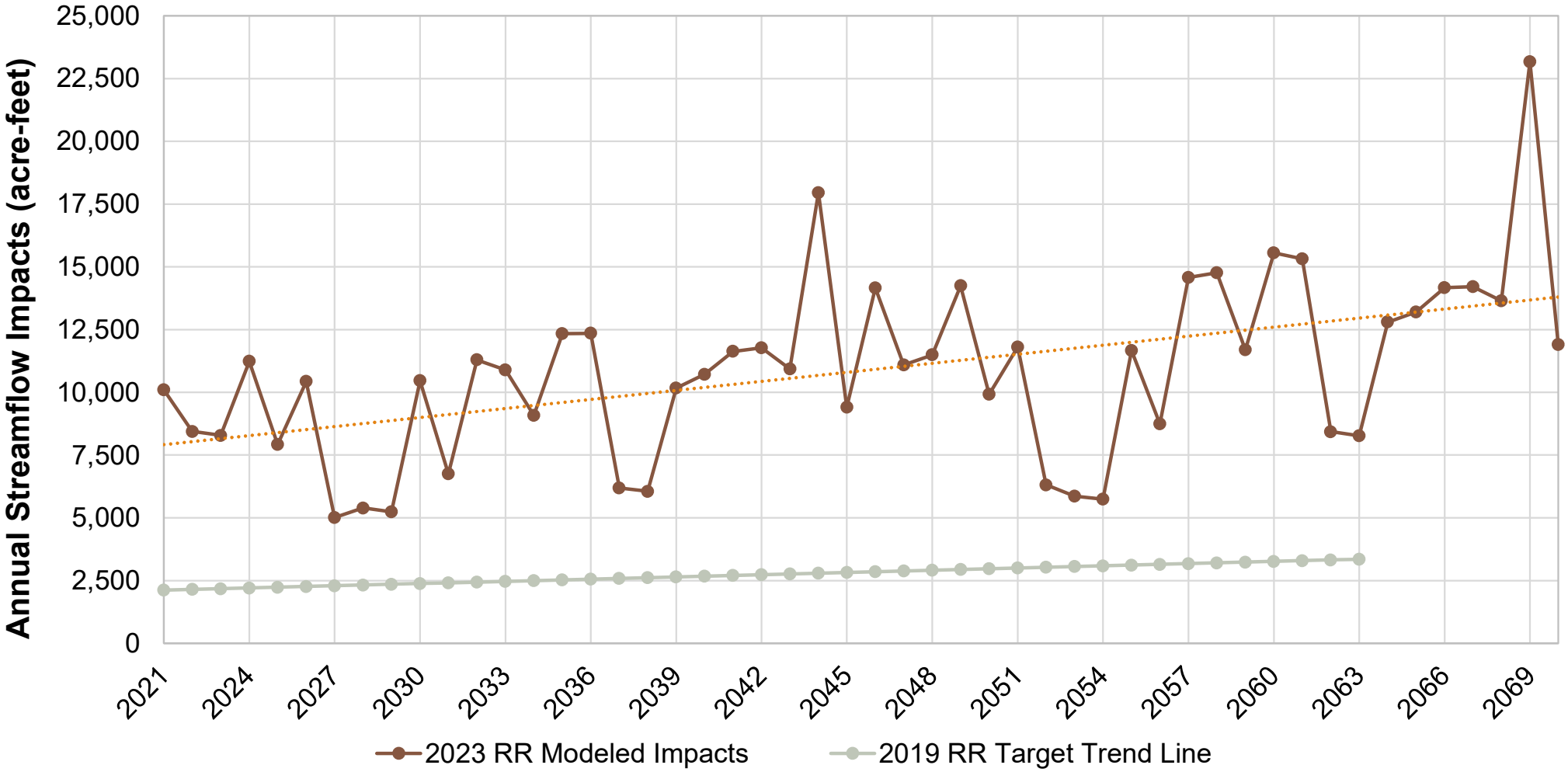
TPNRD Results Elm Creek to Chapman–Management Actions

Impacts from Augmentation Elm Creek to Chapman



TBNRD Results

Target Comparison: Elm Creek to Chapman



TBNRD Results

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
2023*	2,200	8,200
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

Tri Basin Natural Resources District

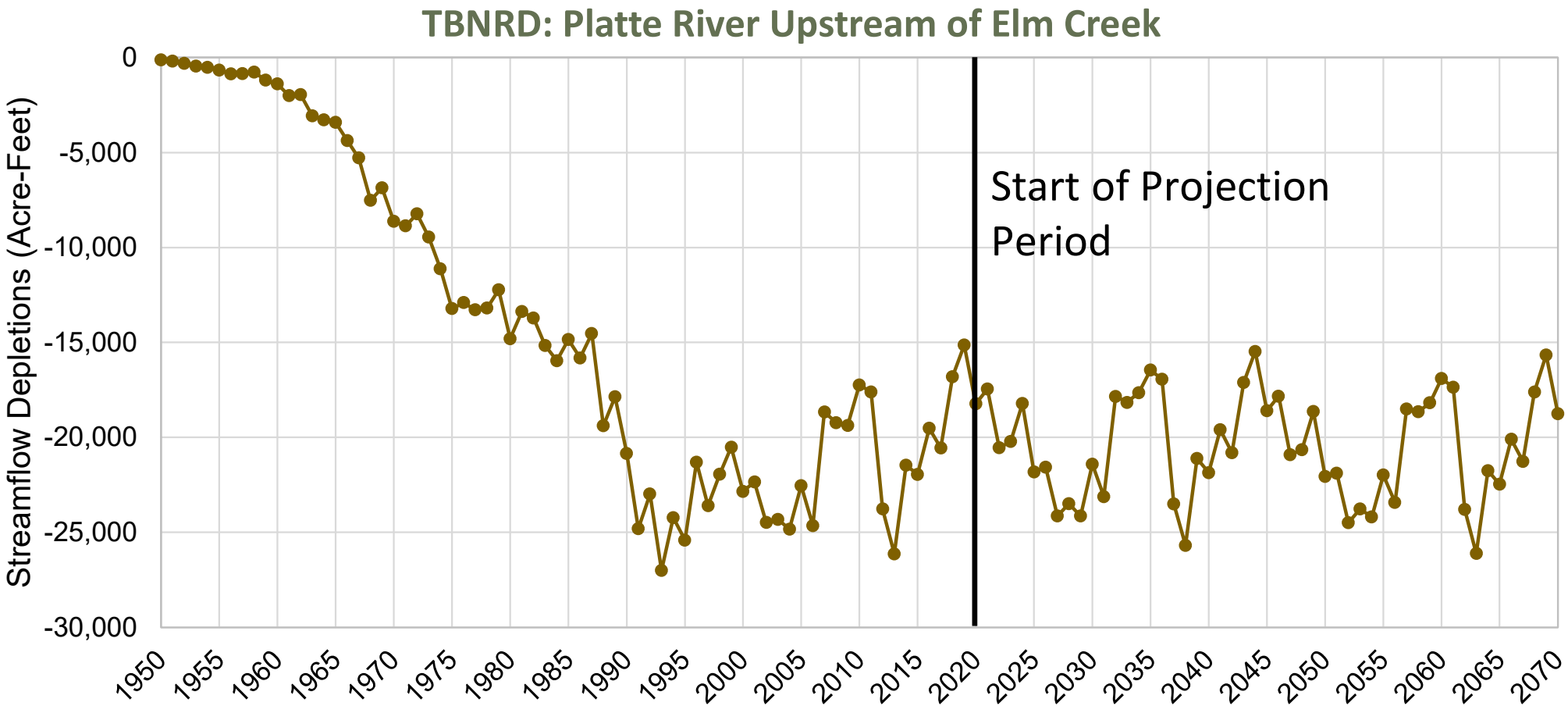
IMP Target Summary

- **Upstream of Elm Creek:**
  - Positive balance maintained, therefore no further action necessary at this time
- **Elm Creek to Chapman:**
  - Positive balance maintained, therefore no further action necessary at this time

Total Depletions Results

TBNRD Results – Total Depletions

Impacts from all Groundwater Only and M&I Pumping



Path Forward

Path Forward / Next Steps

- Finish Documentation of Models and Analyses
- Present Results during May PRRIP meeting
- Present Results during August 1st BWP Stakeholder meeting
- IMP Update MB0
- Prepare for 2027 Robust Review in this Increment
  - Update input data for models
- Develop Basin-Wide and NRD drought plans
  - UPRDCP to be in place by end of 2024
- Changes to Municipal and Industrial offset requirements in 2026

Tri Basin Natural Resources District

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Good Life. Great Water.

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THANK YOU

Ryan Kelly, Water Planning, NeDNR

TBNRD Results – Total Depletions

Impacts from all Groundwater Only and M&I Pumping