CPNRD 2023 Robust Review

March 28, 2024

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CENTRAL PLATTE
NATURAL RESOURCES DISTRICT

THE FLATWATER GROUP INC.

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Presentation Overview

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

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

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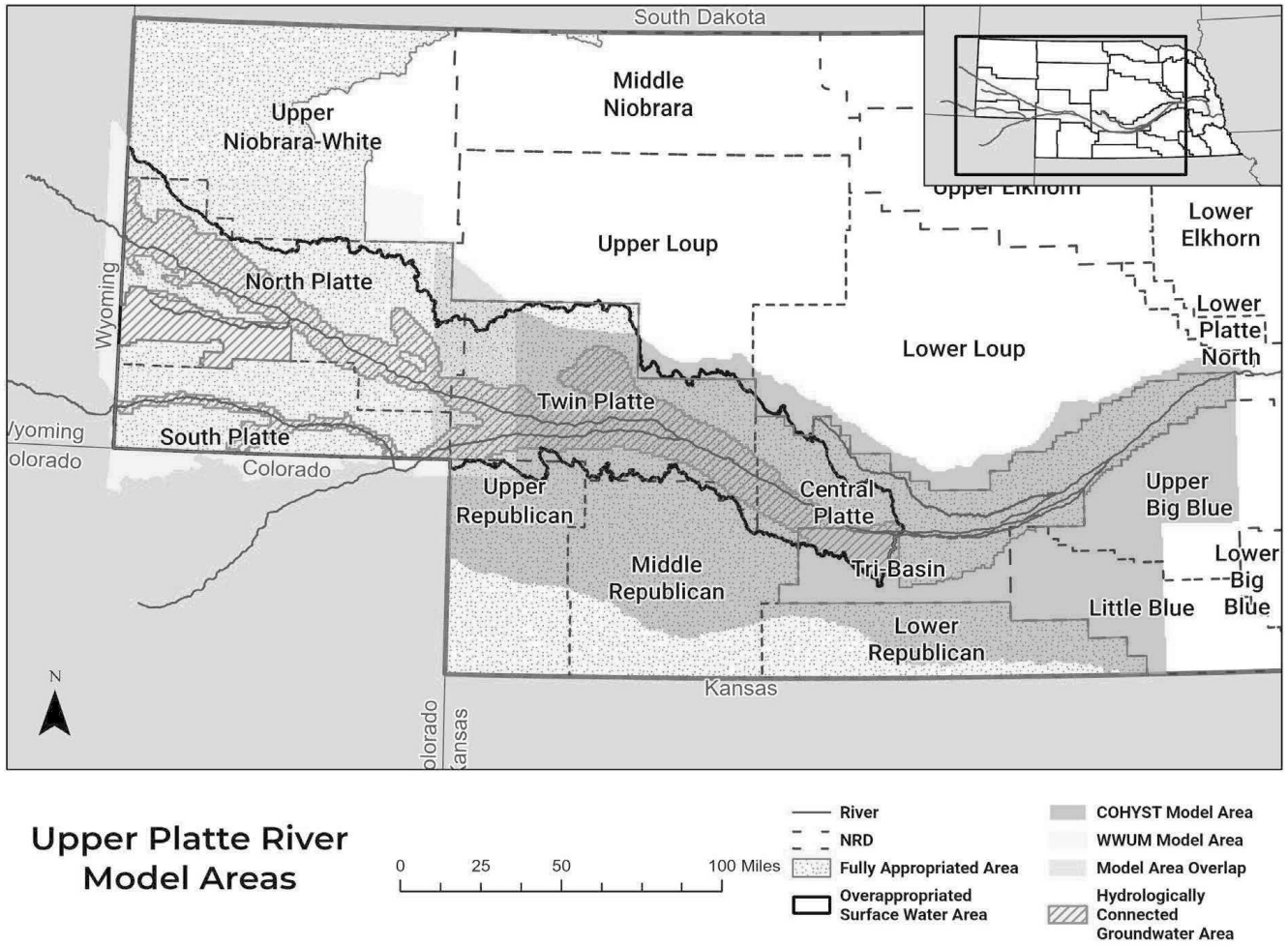
IWM – Overview Statutes

- *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



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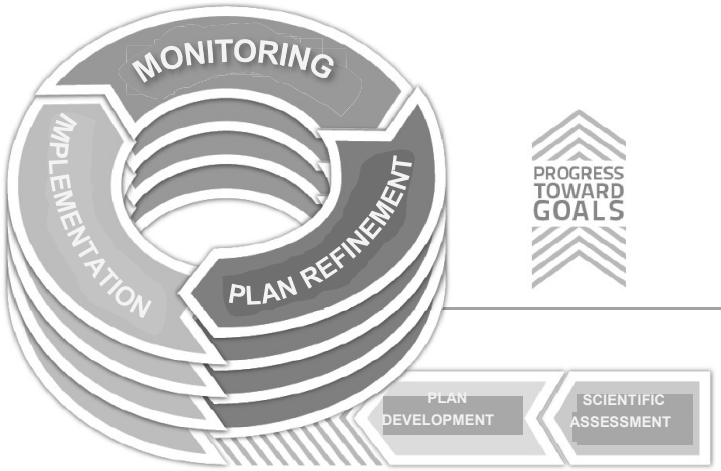
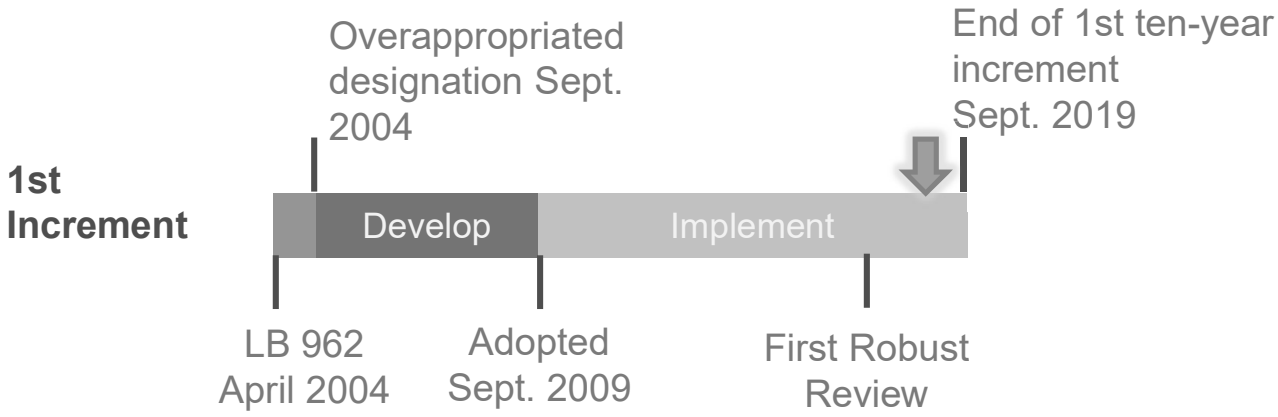
IWM – Overview
Statutes

- *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



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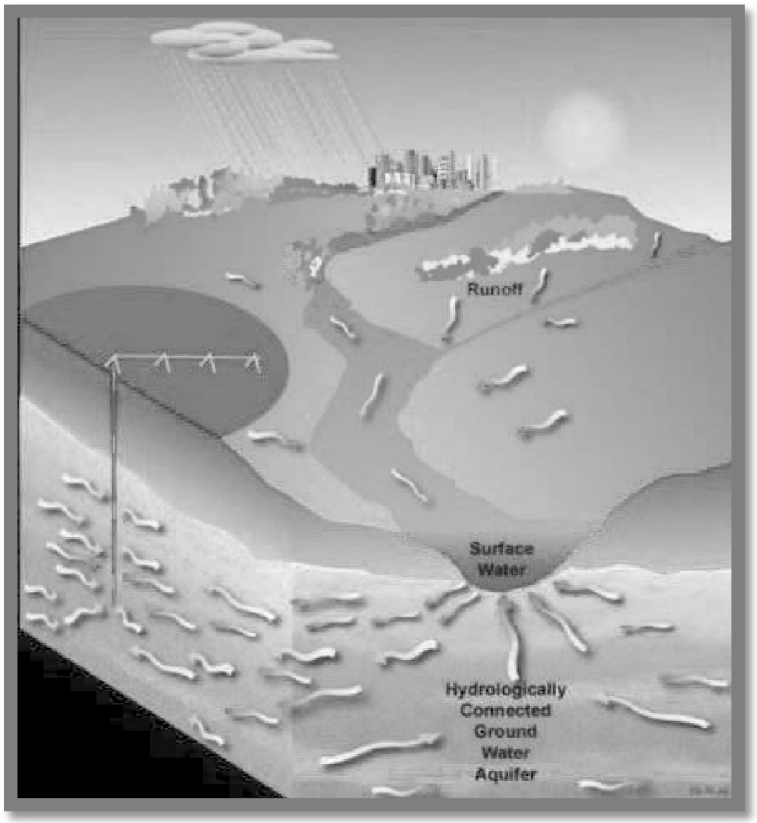
IWM – Overview
Surface & Ground Water Authorities



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

Integrated water management

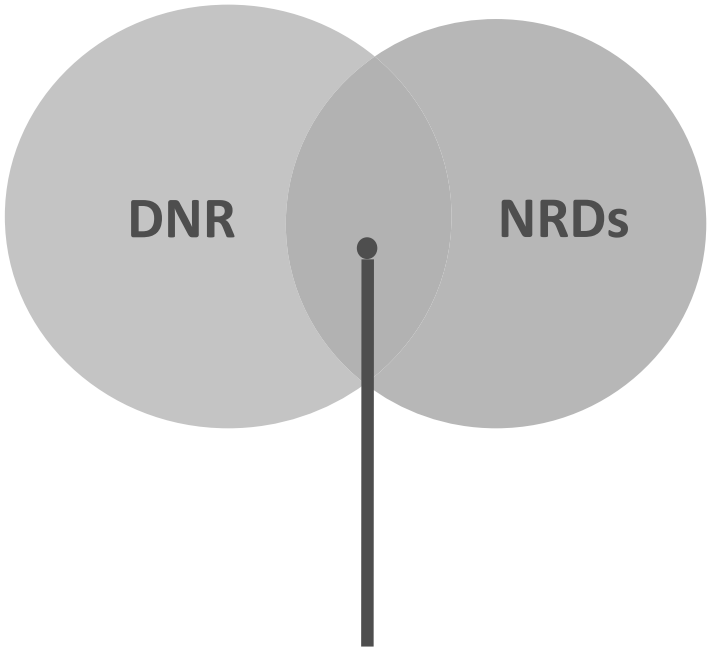
Groundwater
- Regulated by NRDs
- Correlative rights
- Share and share alike

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

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

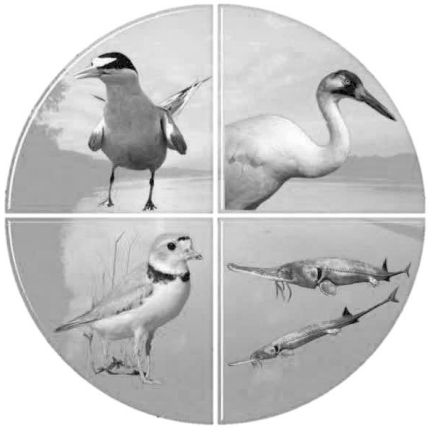
JOINT DNR/NRD ROLES:

- 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

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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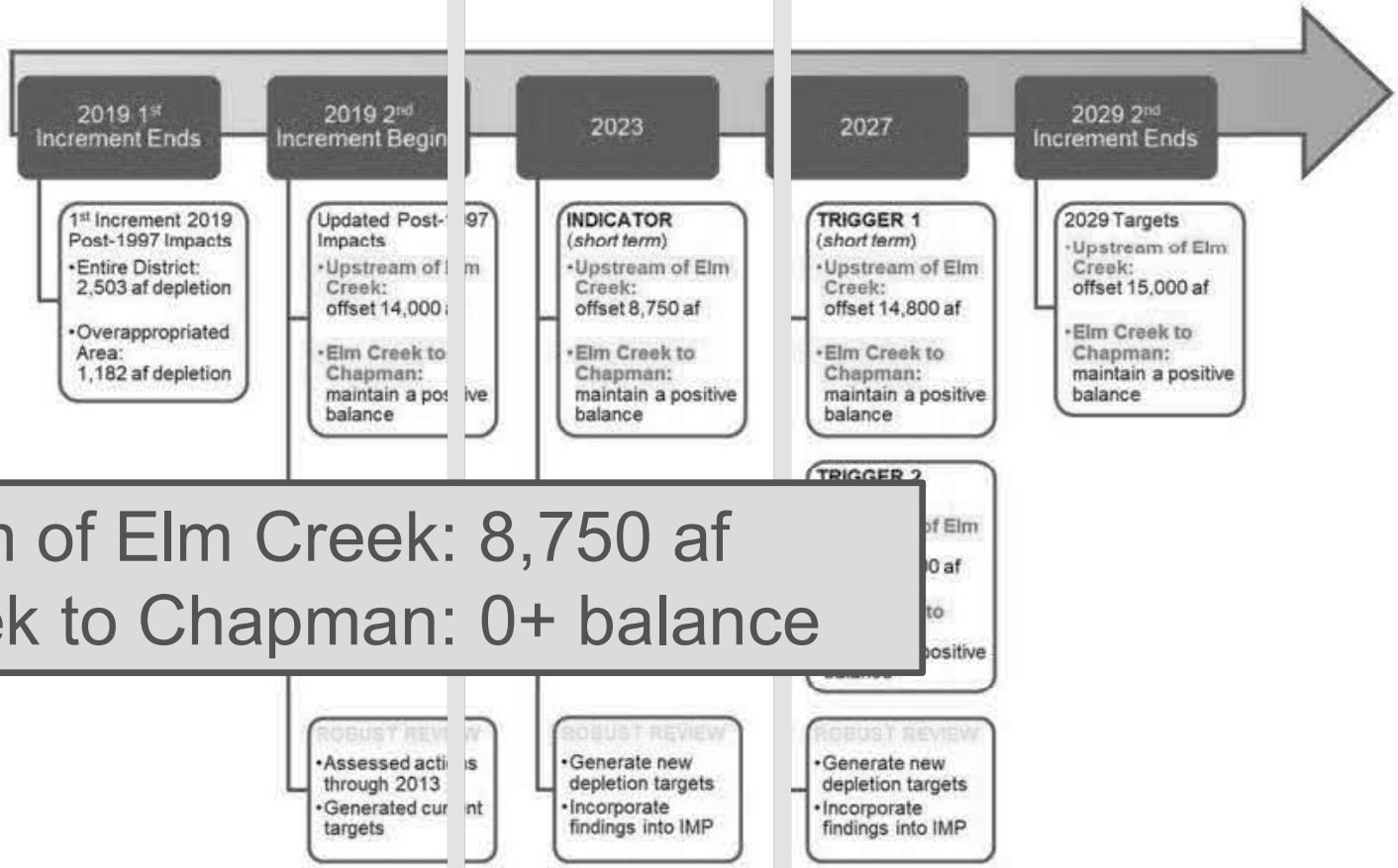
IWM – Overview
Relationship between Basin and NRD Plans

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

CPNRD IMP Requirements - Indicators



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

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2023 Robust Review Analysis: Introduction

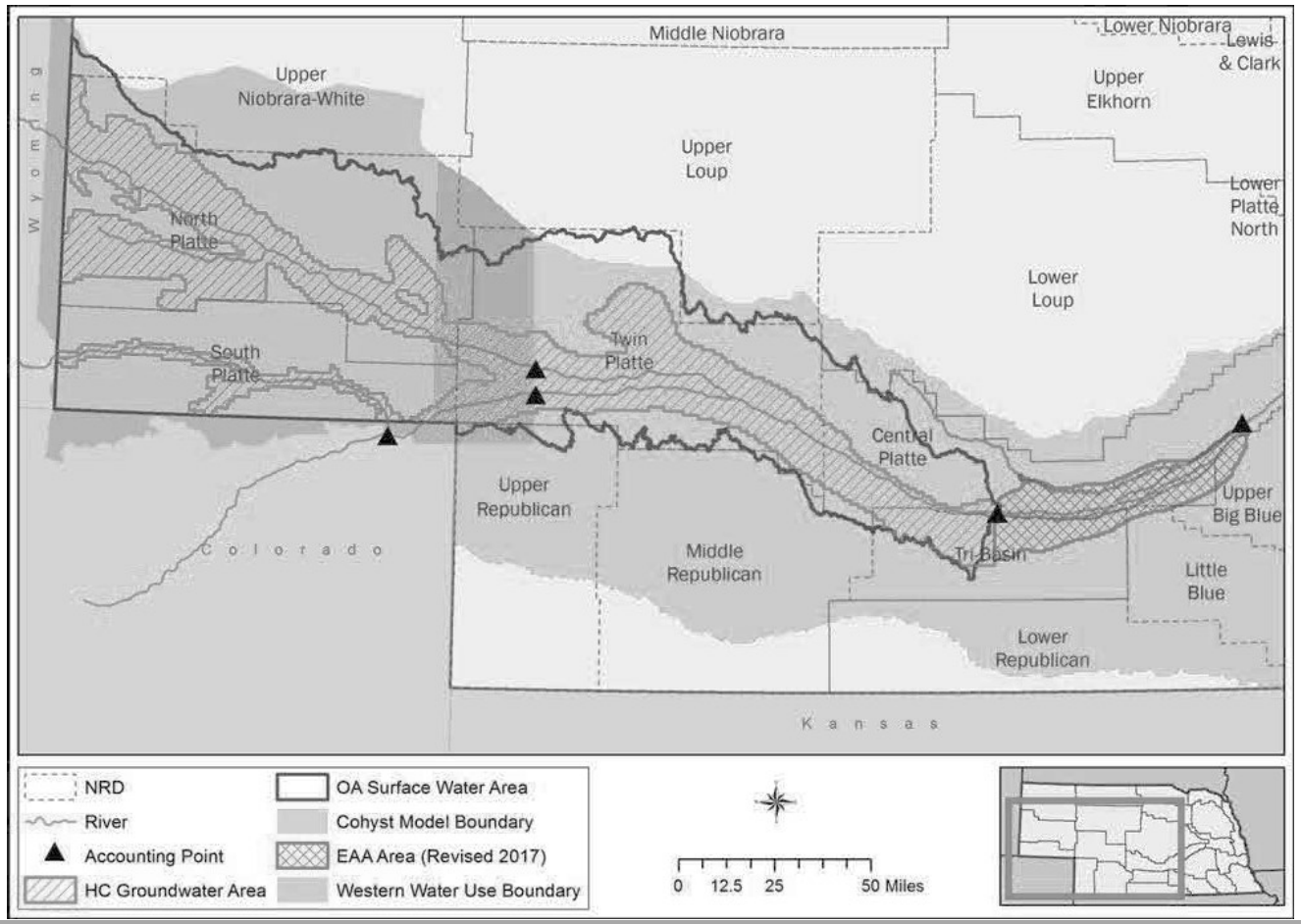
Robust Review Introduction

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

Robust Review Introduction

Analysis Set-Up: Map (Model Area)



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Robust Review Introduction

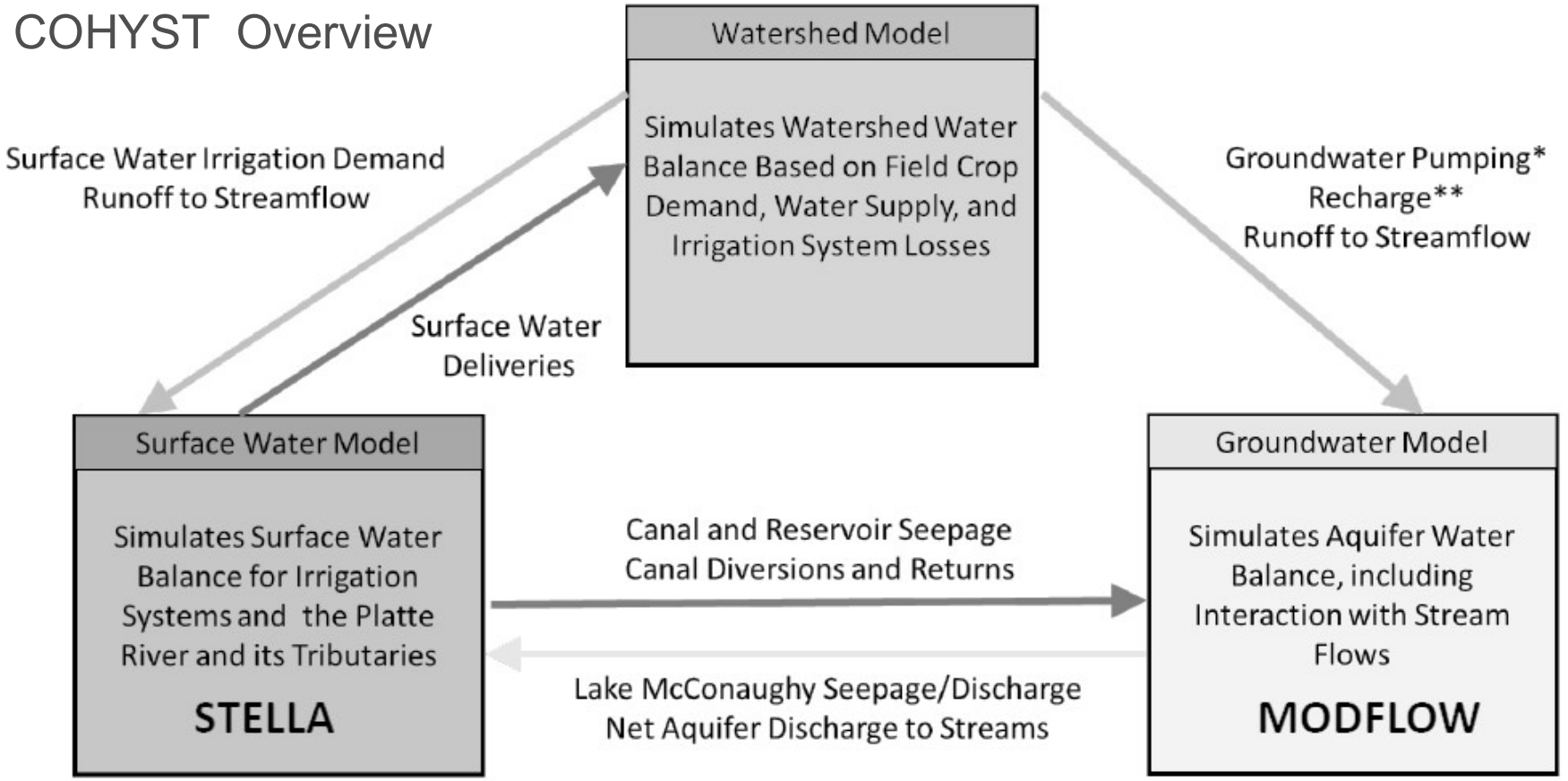
Simulation Set-Up

- 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 CPNRD 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

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Robust Review Analysis Updates to Model

Major Differences from 2019 Robust Review

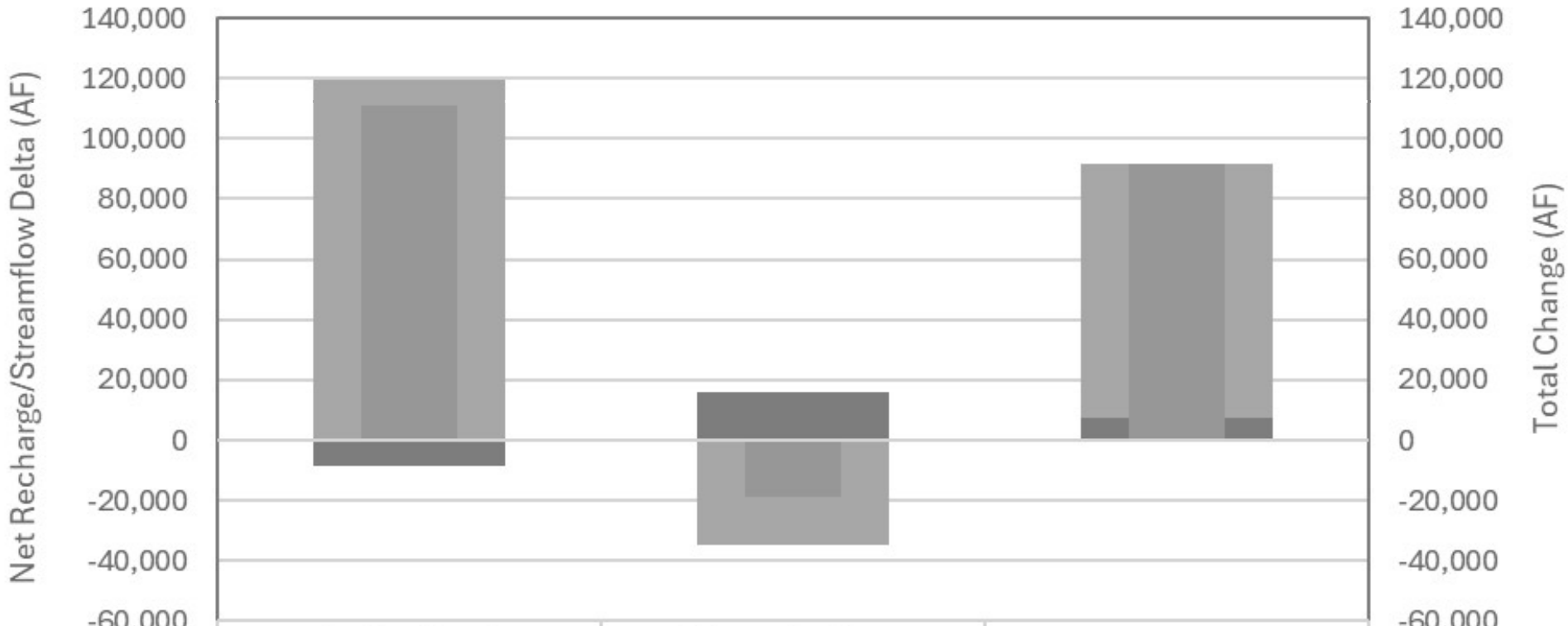
- Update input data 2014 through 2020
  - Climate data
  - Land Use (2012-2020)
  - Excess Flow
  - Crops
  - Municipal and Industrial Pumping
- Update Watershed Model
  - Incorporated Conservation Study results
  - Modified crop growth specifications
  - Updated crop mixture (increased prevalence corn/soybean 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	119,286	-34,619	84,667
Runoff to SF Delta	-8,442	15,660	7,218
Total Change	110,844	-18,959	91,885

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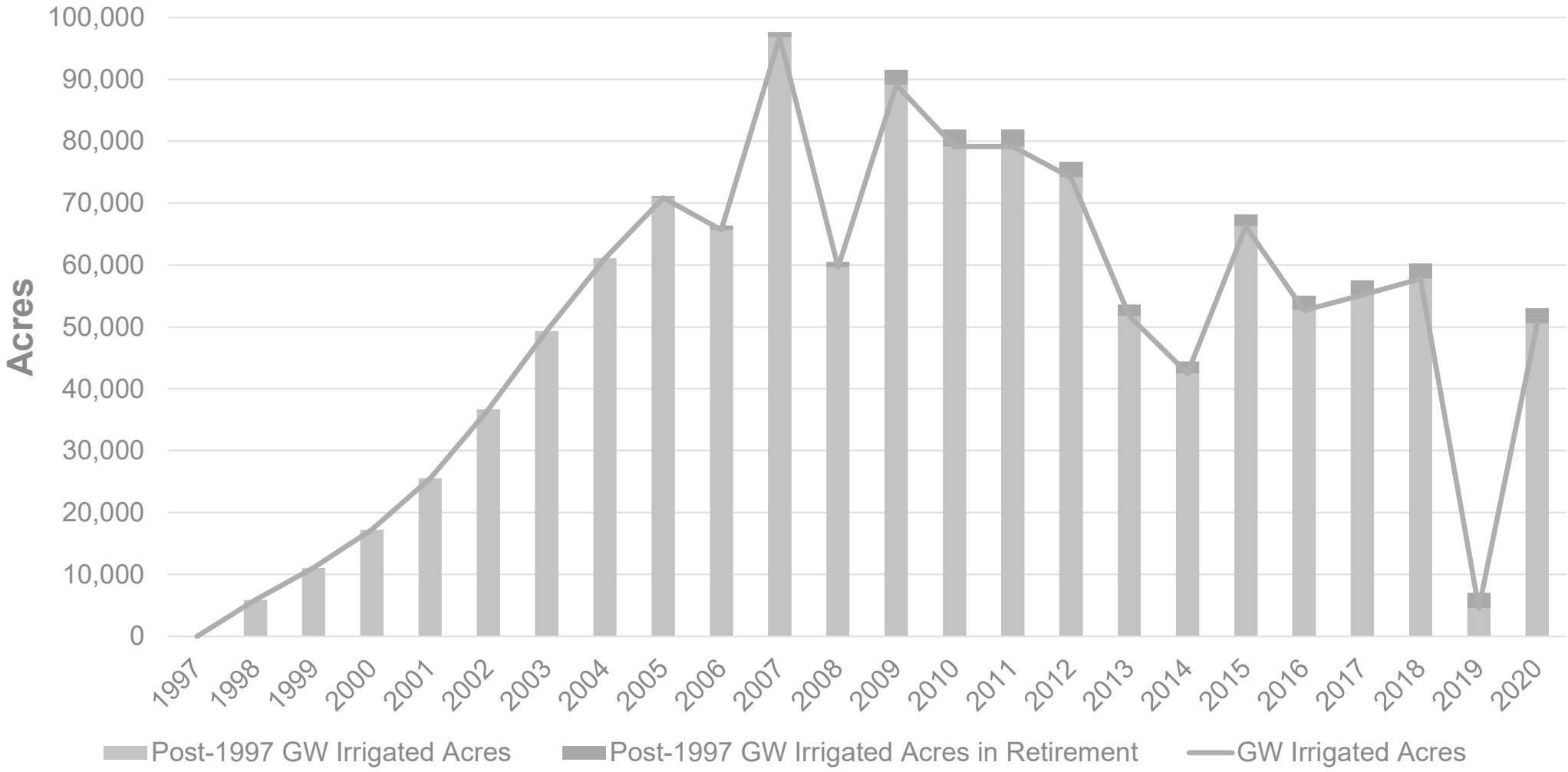
2023 Robust Review: Management Actions & Model Inputs

Management Action & Model Input:

Net Change in Groundwater-Only Irrigated Acres 1997 to 2020



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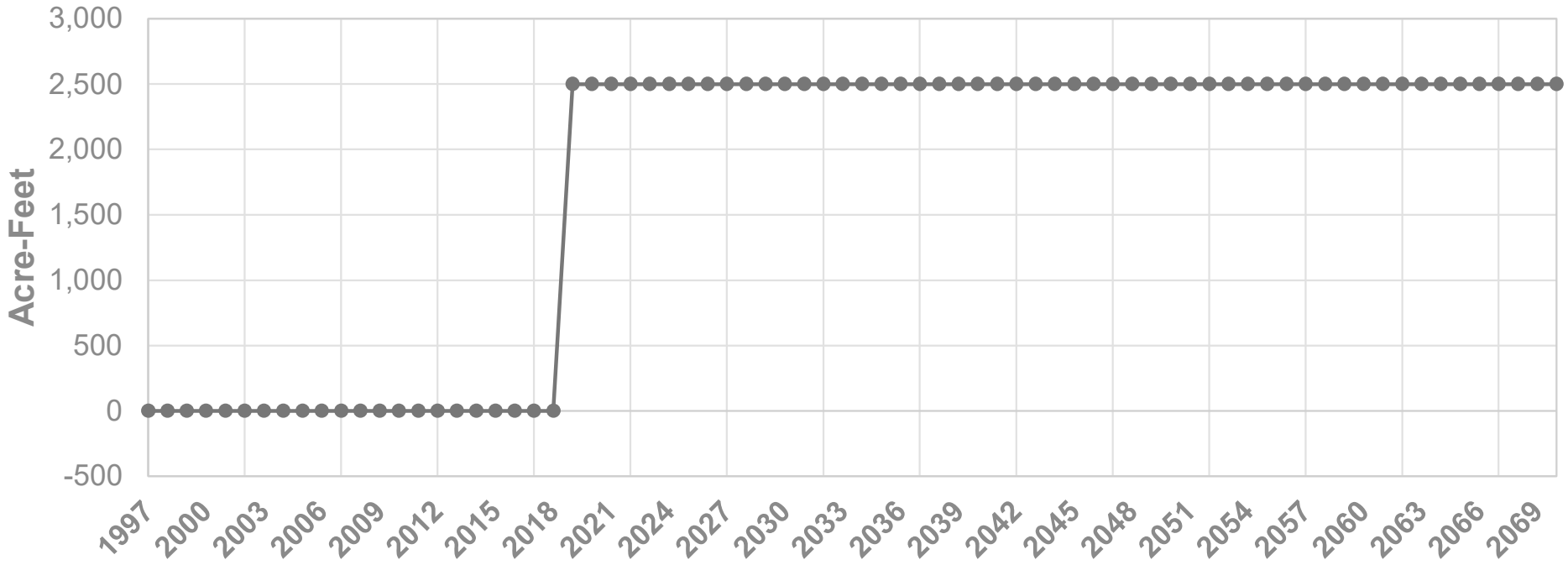
Management Action & Model Input:

Credits from Surface Water Decertification

CPNRD	Acres	Benefit (acre-feet)
Total Change 1997 – 2019	**2,272.5**	**2,500**



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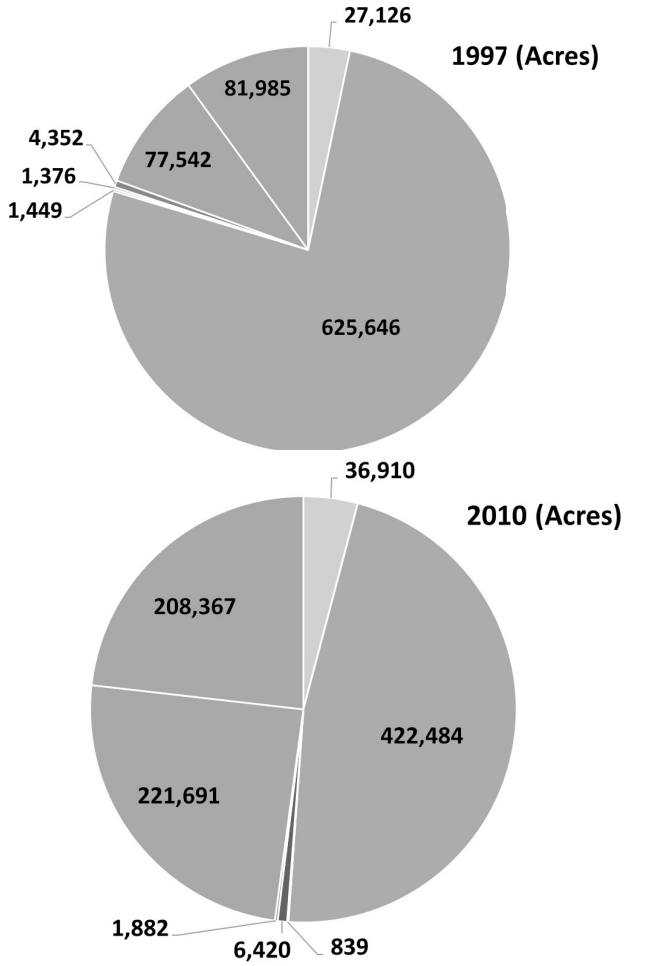
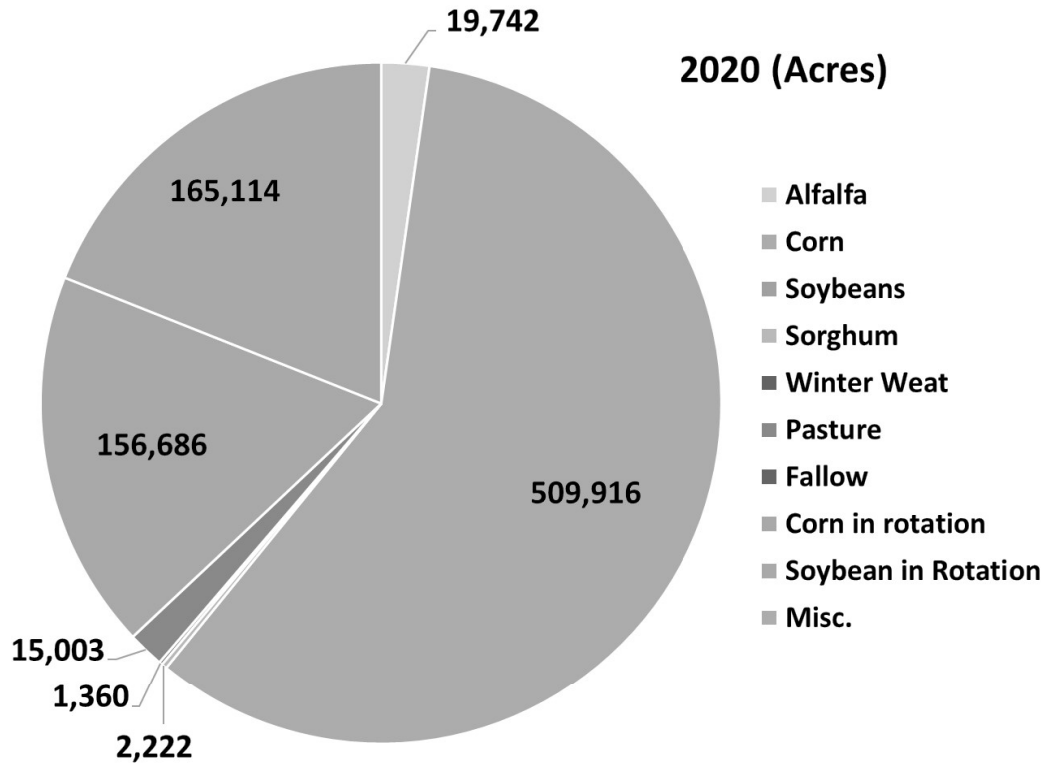
Management Action & Model Input:

Change in Groundwater-Only Irrigated Crop Types





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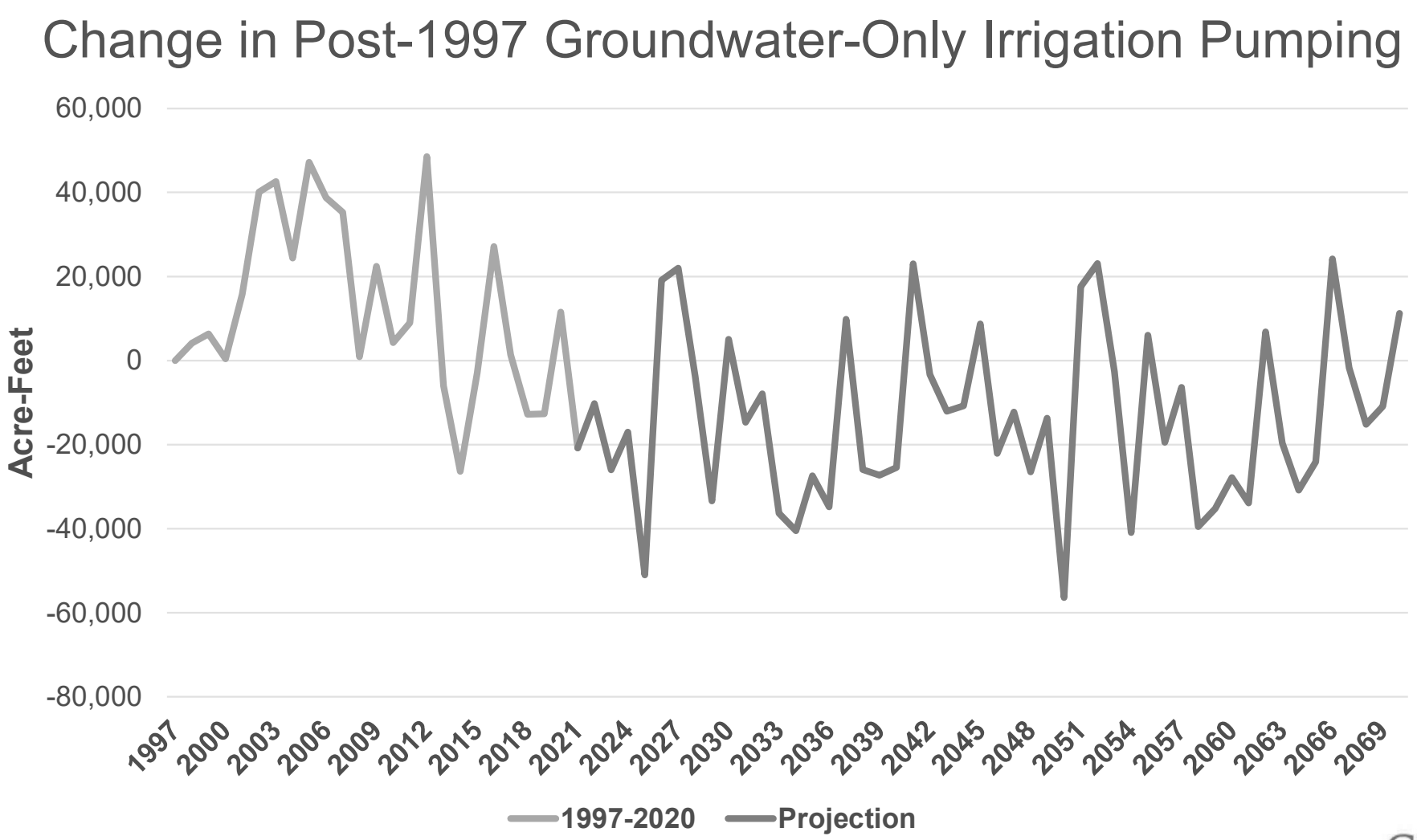
Management Action & Model Input:



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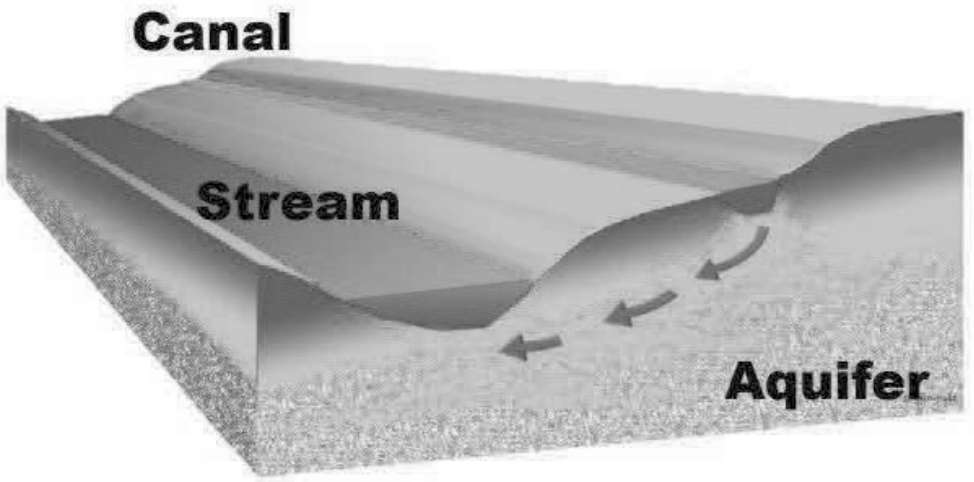
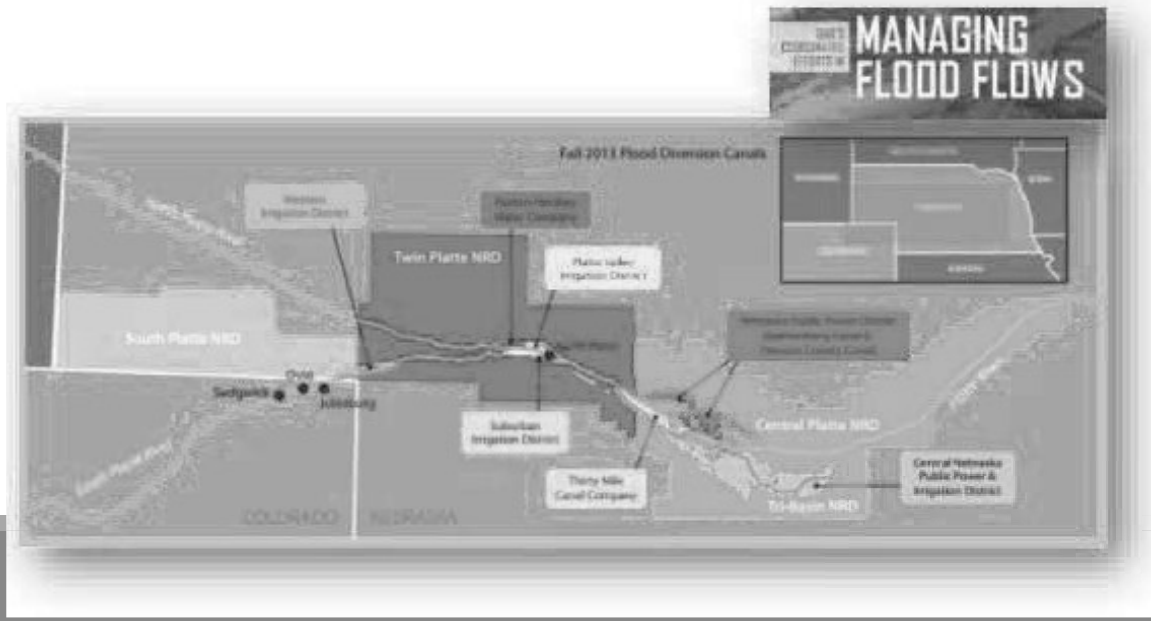
Management Action: Conjunctive Water Management (CWM)



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.

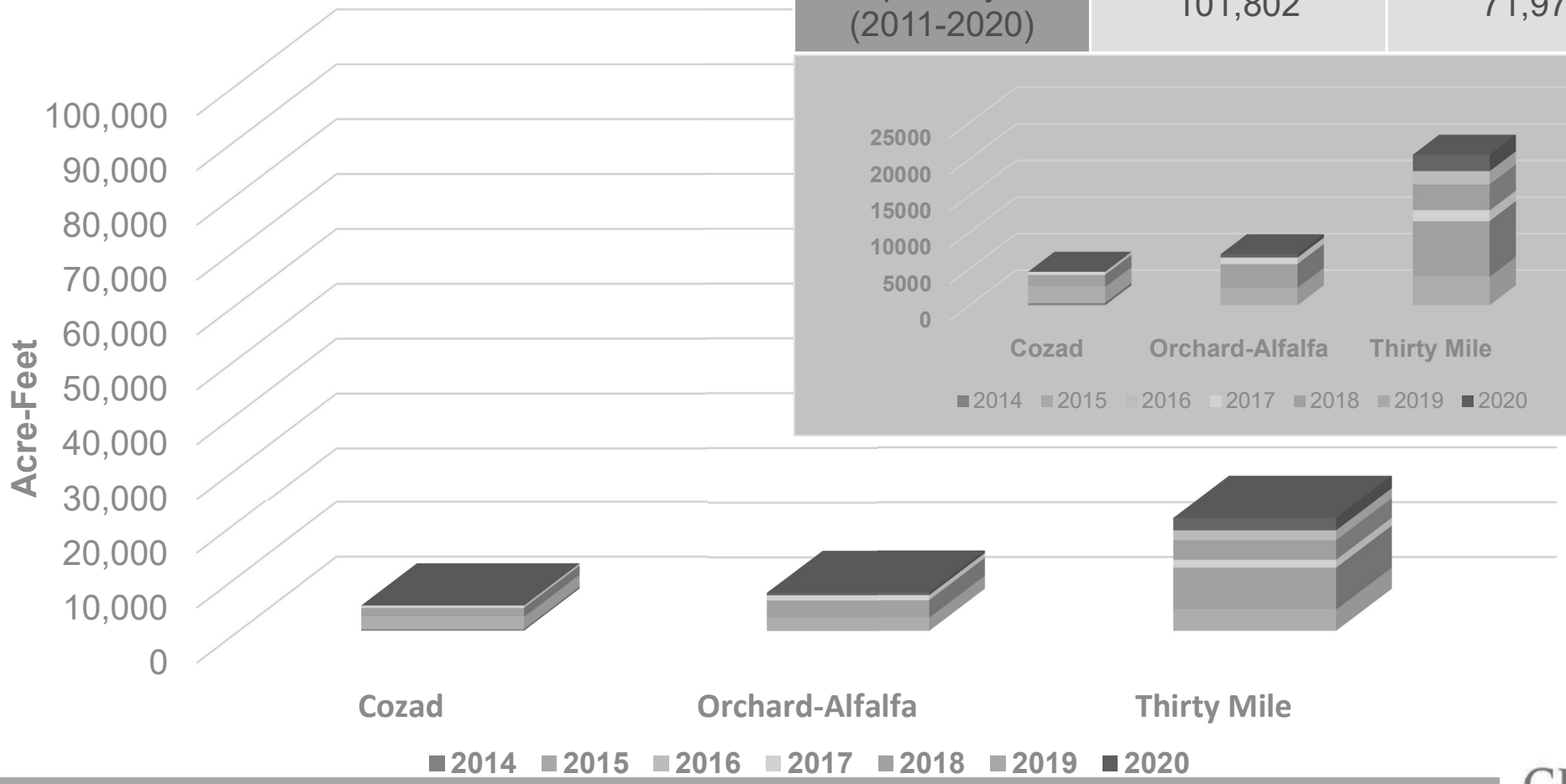
- Excess flow capture
- Augmentation
- Water leasing
- Water transfers
- Canal refurbishment



Management Action: CWM / Excess Flows

CPNRD	Acre-Feet of Excess Flow	
	Diversion	Recharge
2014-2020	50,805	32,119
Repeat Cycle (2011-2020)	101,802	71,973

Excess Flow Recharge



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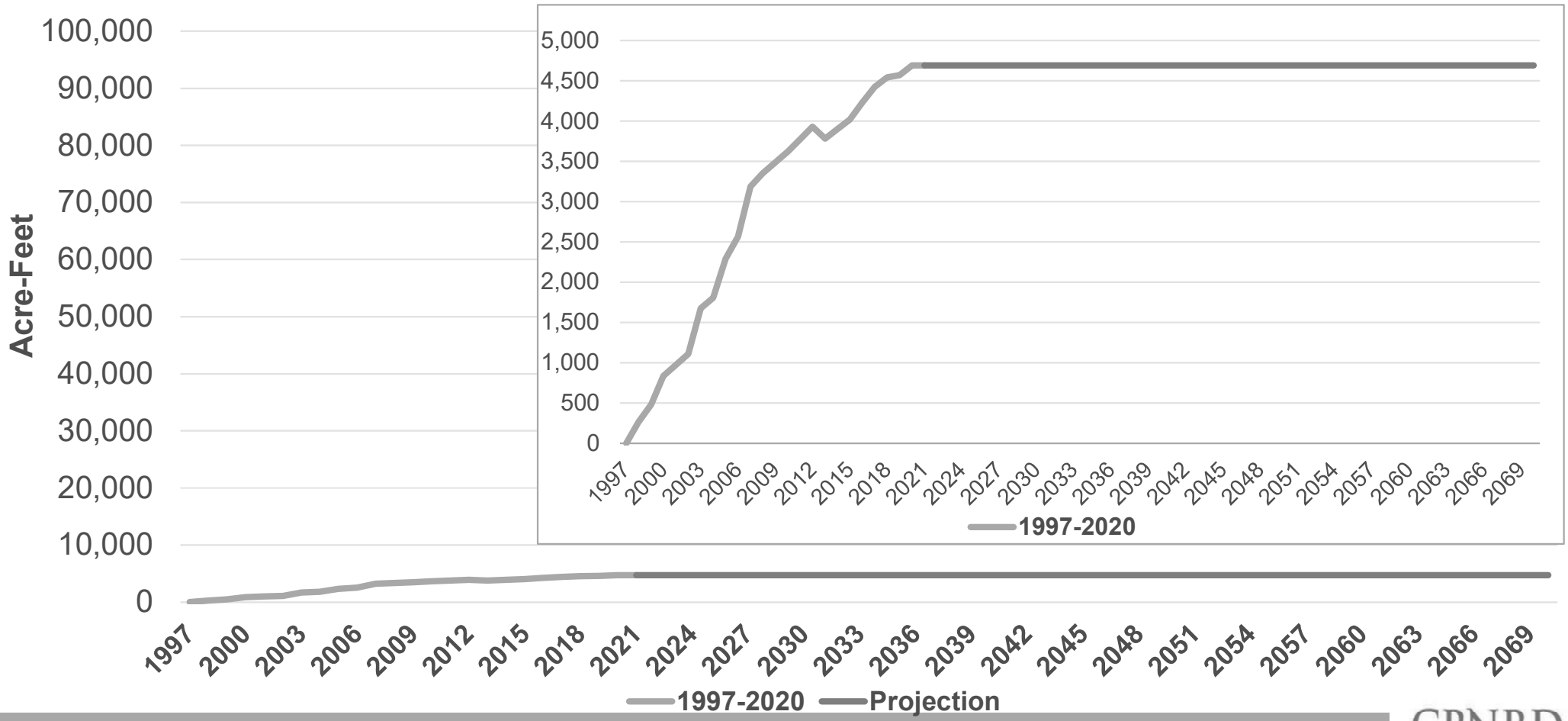
Management Action & Model Input:

Change in Municipal and Industrial Pumping from 1997



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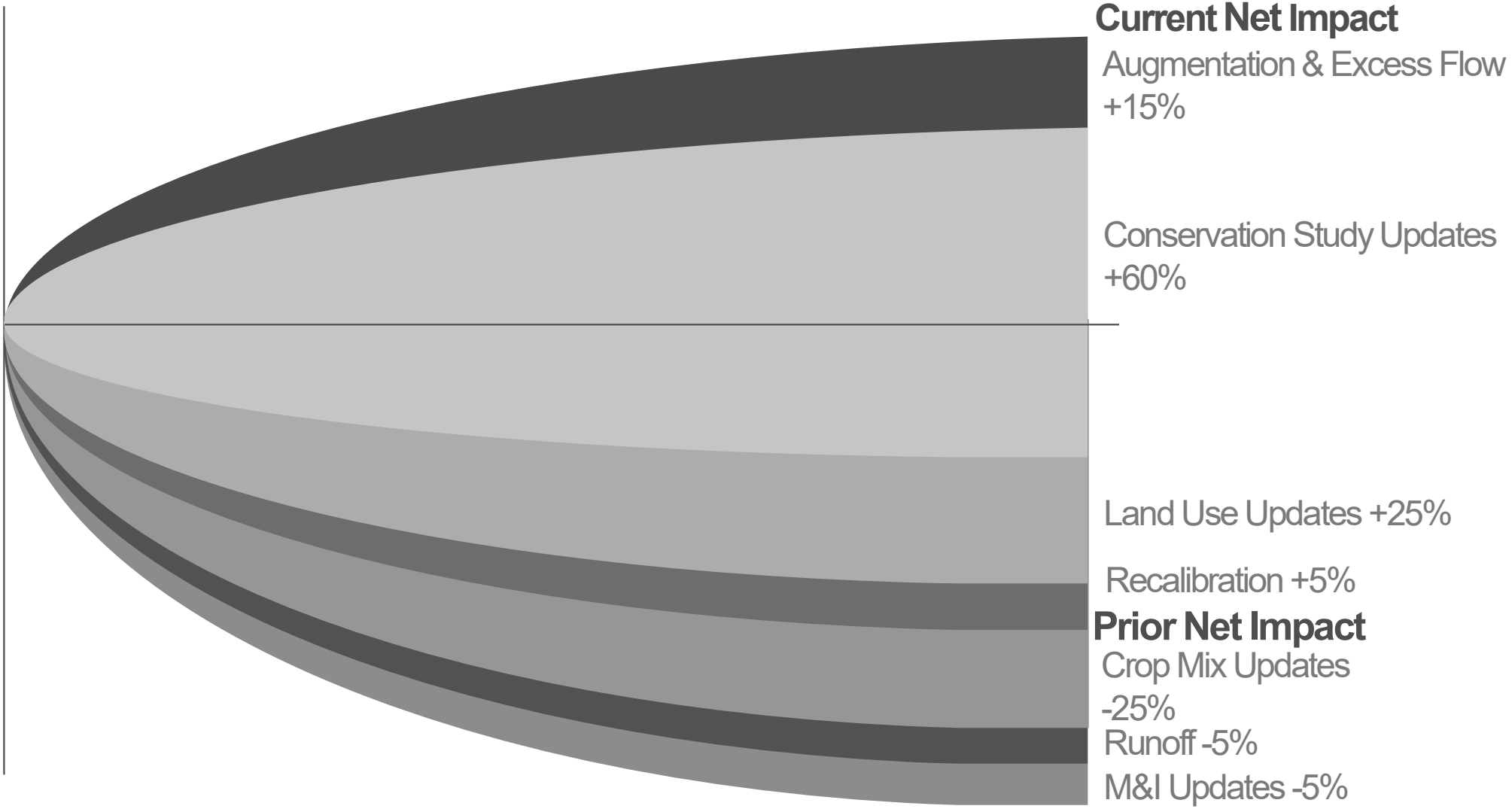
2023 Robust Review: Analysis – CPNRD Results

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

Combined CP/TB/TPNRD Upstream Elm Creek

Impact of Updates Relative to Prior Robust Review



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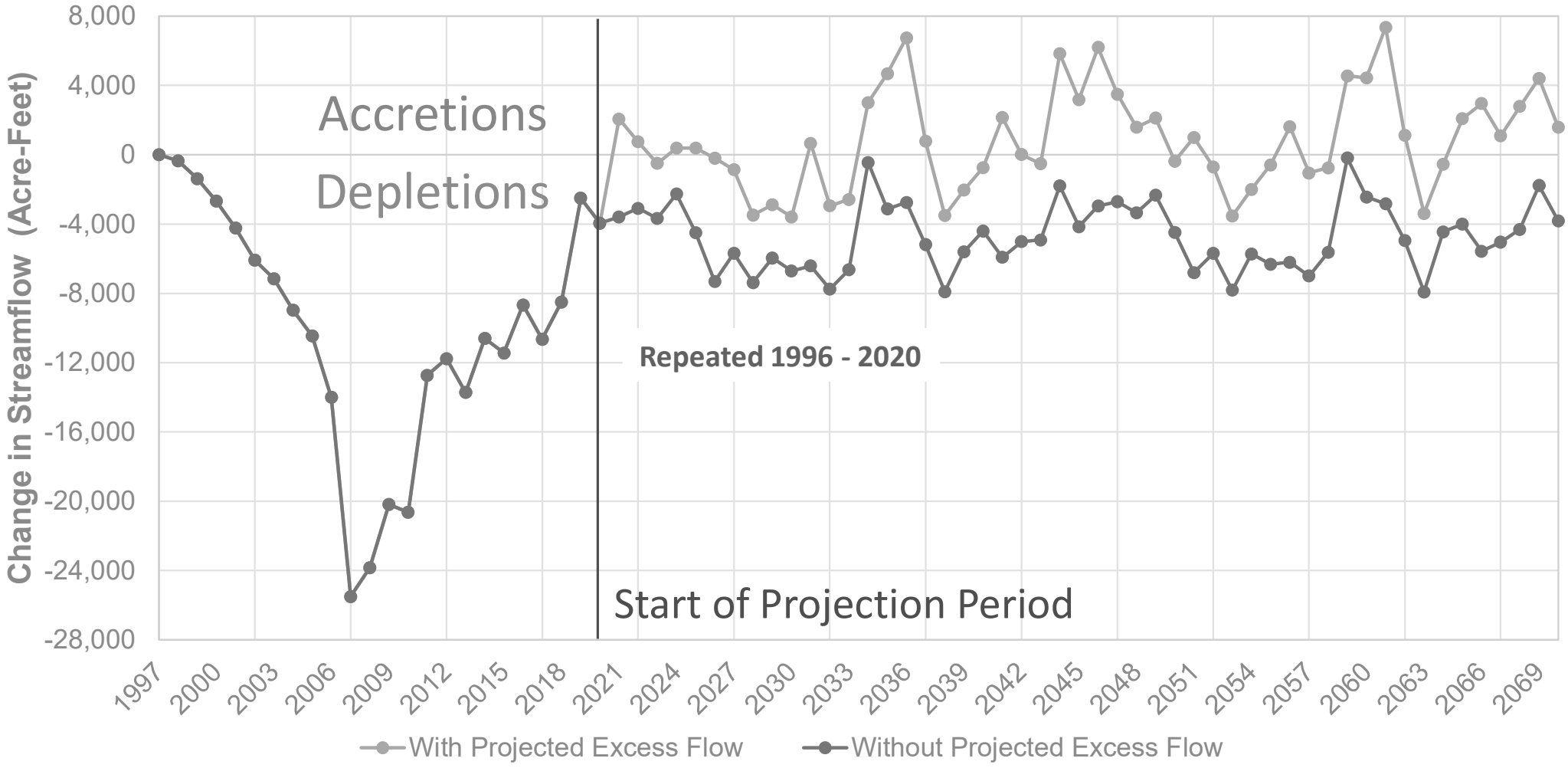
Upstream of Elm Creek

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)



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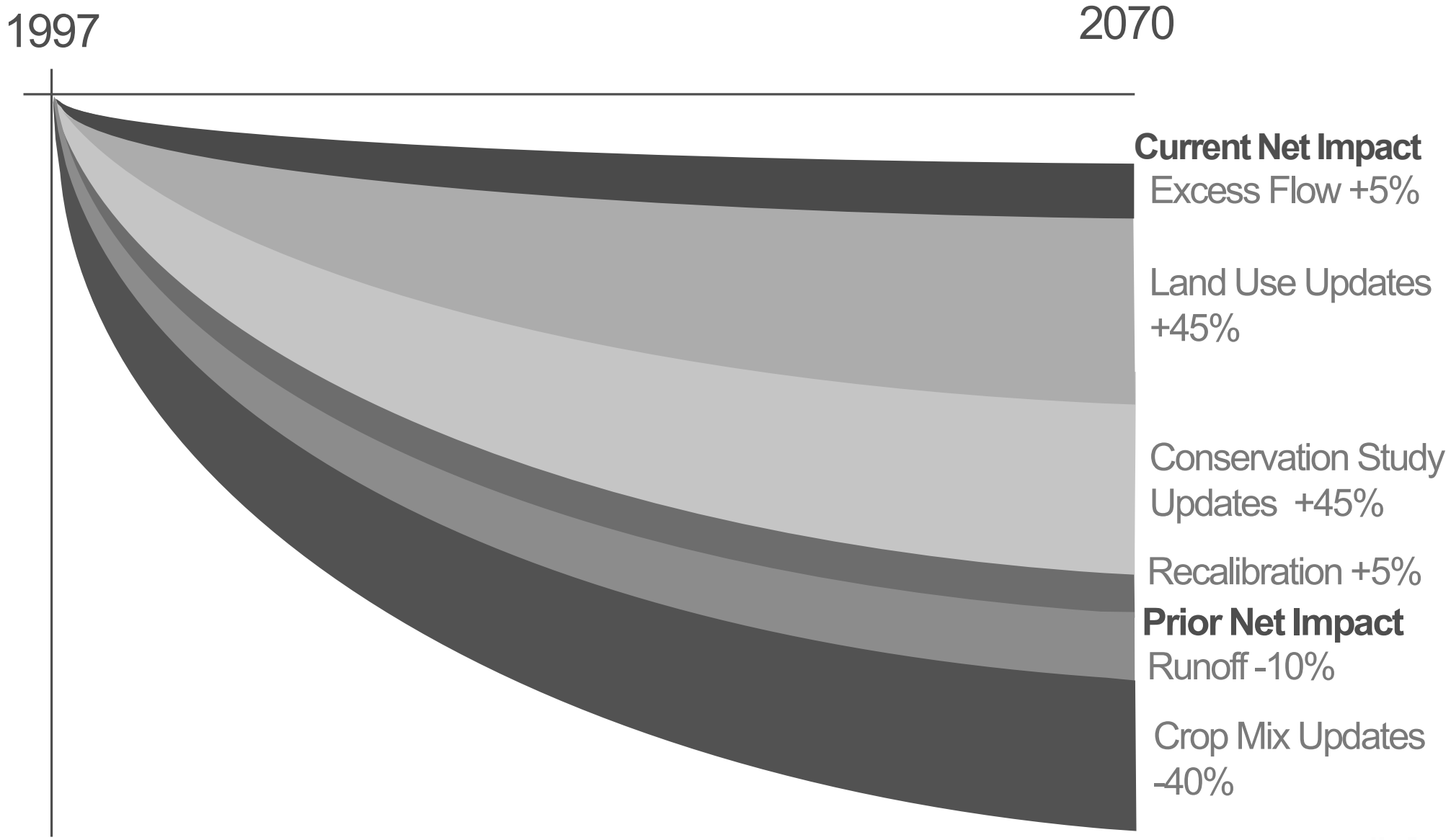
CPNRD Upstream of Elm Creek

Impact of Updates Relative to Prior Robust Review



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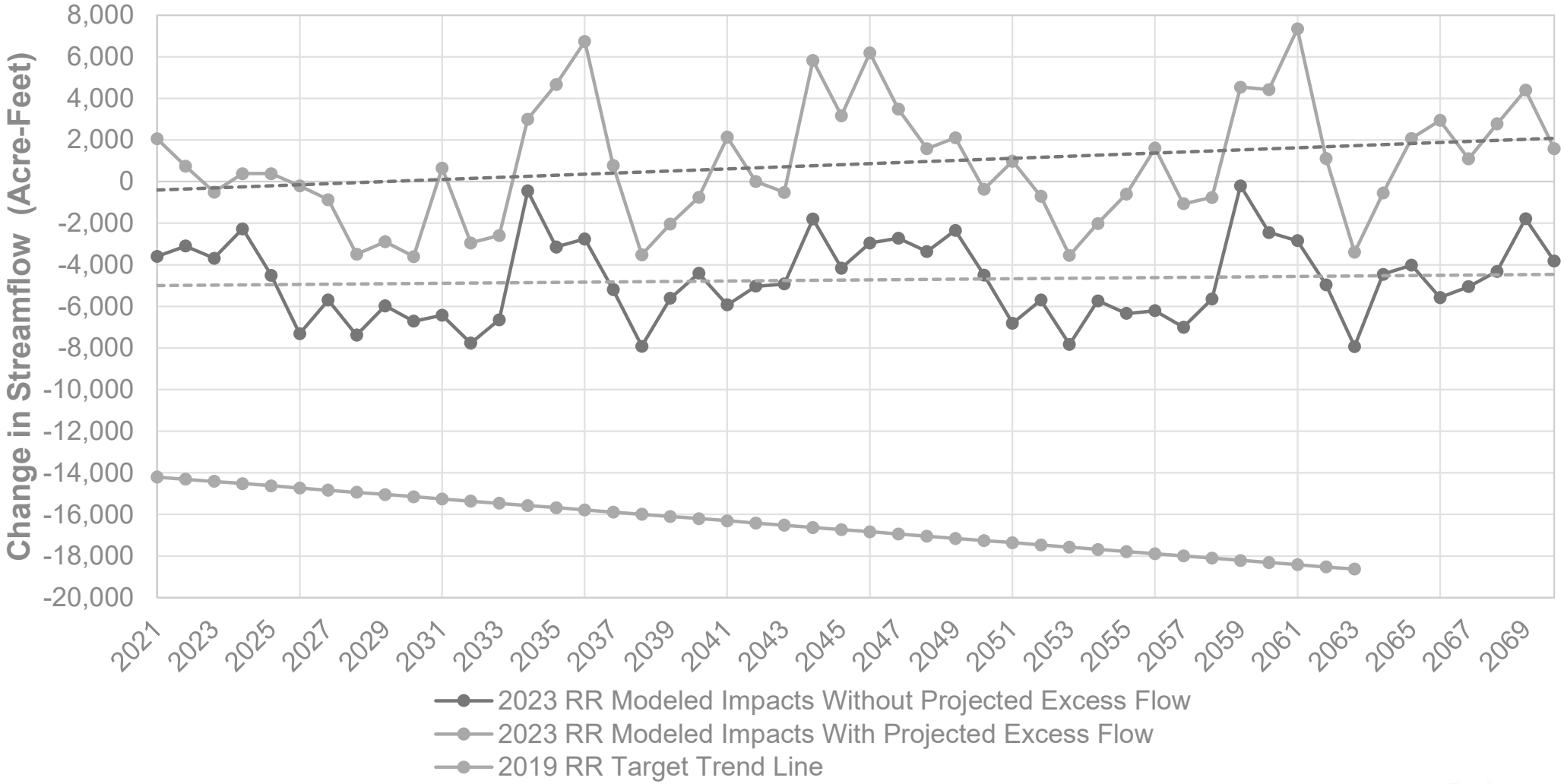
CPNRD Results

Target Comparison: Upstream of Elm Creek



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CPNRD Results

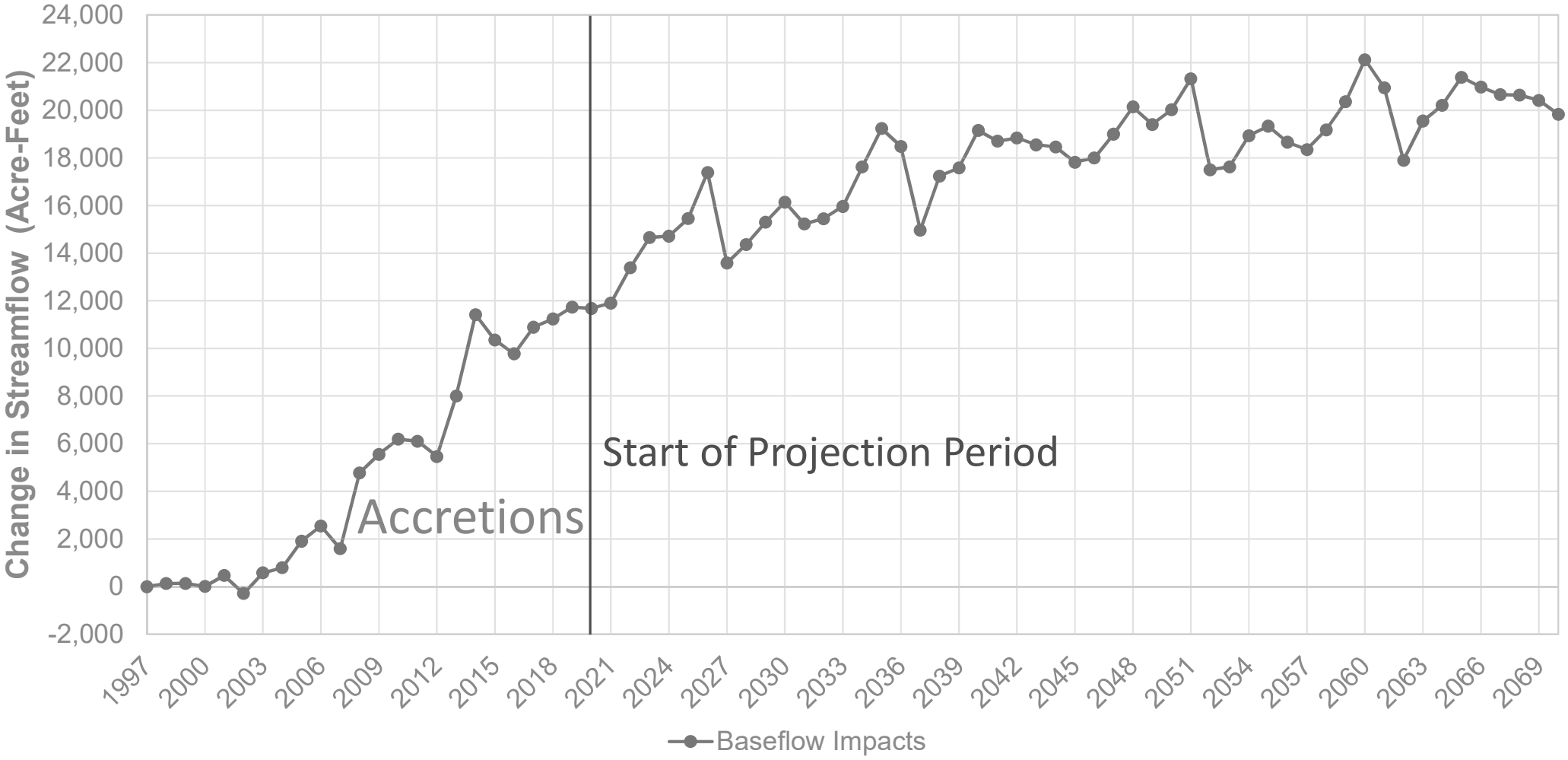
Indicator* Review: Upstream of Elm Creek

Year	Current IMP Targets (Indicator)	2023 Robust Review Results (Without Projected Excess Flow)	2023 Robust Review Results (With Projected Excess Flow)
2019	-14,000	-5,000	200
2020	-14,100	-5,000	200
2021	-14,200	-5,000	300
2022	-14,300	-5,000	300
2023*	**-14,400 (8750)**	**-5,000**	**+400**
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

Elm Creek to Chapman

CPNRD Results Elm Creek to Chapman

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



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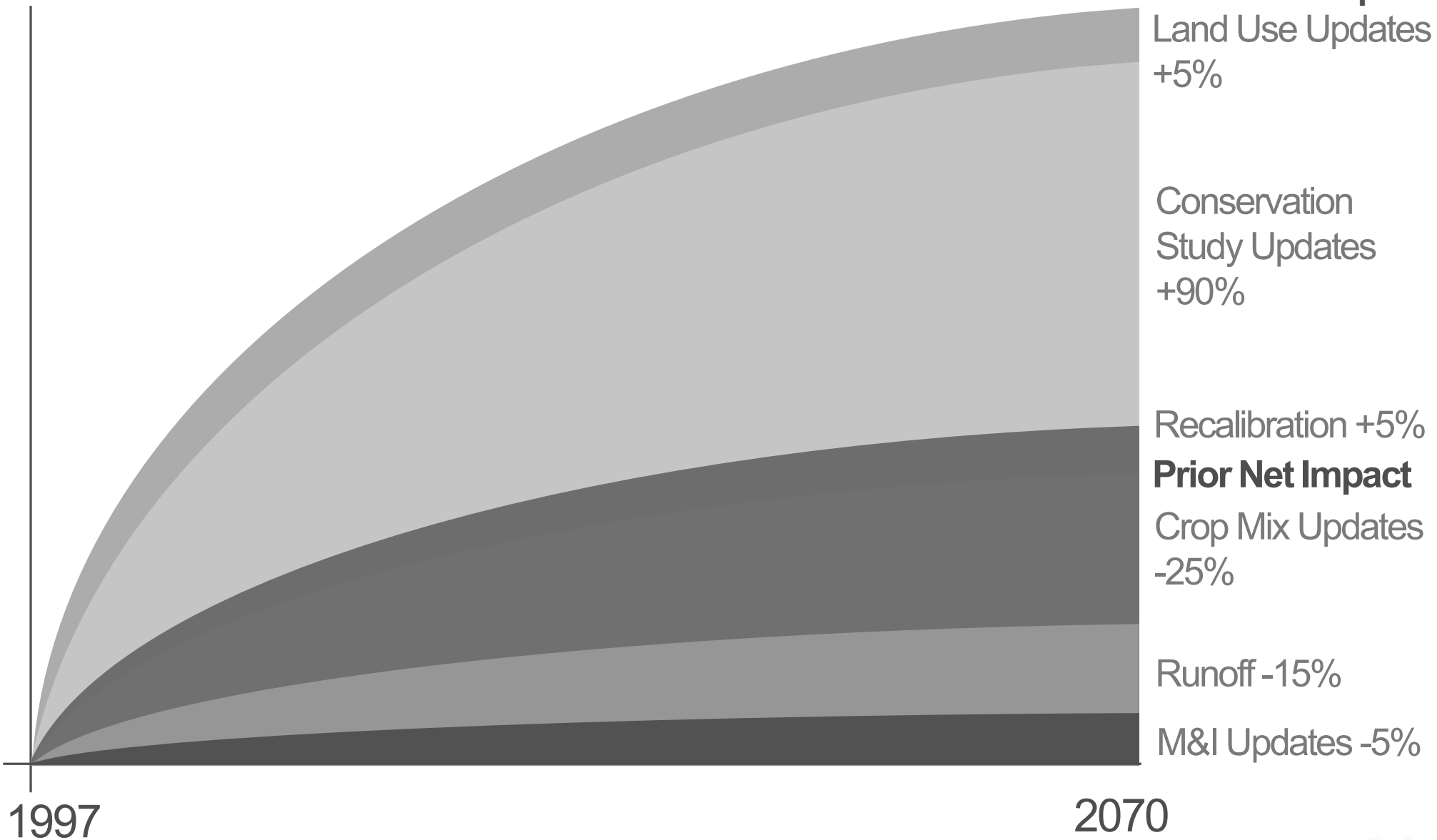
CPNRD Elm Creek to Chapman

Impact of Updates Relative to Prior Robust Review



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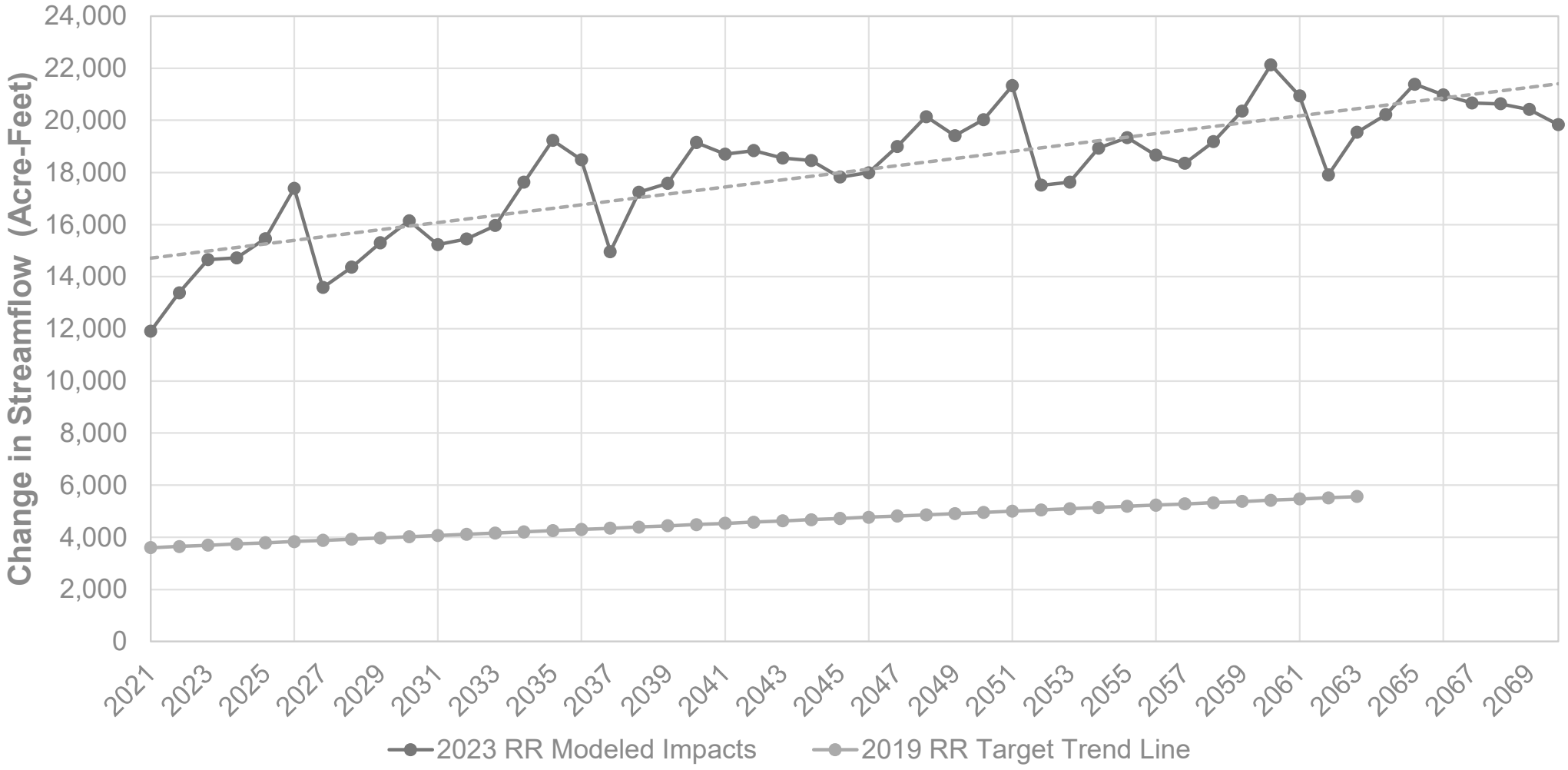
CPNRD Results

Target Comparison: Elm Creek to Chapman



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CPNRD Results

Indicator* Review: Elm Creek to Chapman

Year	Current IMP Targets (Indicator)	2023 Robust Review Results
2019	3,500	14,500
2020	3,600	14,600
2021	3,600	14,700
2022	3,600	14,800
2023*	**3,700 (0+)**	**15,000**
2024	3,700	15,100
2025	3,800	15,300
2026	3,800	15,400
2027	3,900	15,500
2028	3,900	15,700
2029	4,000	15,800

IMP Target Summary

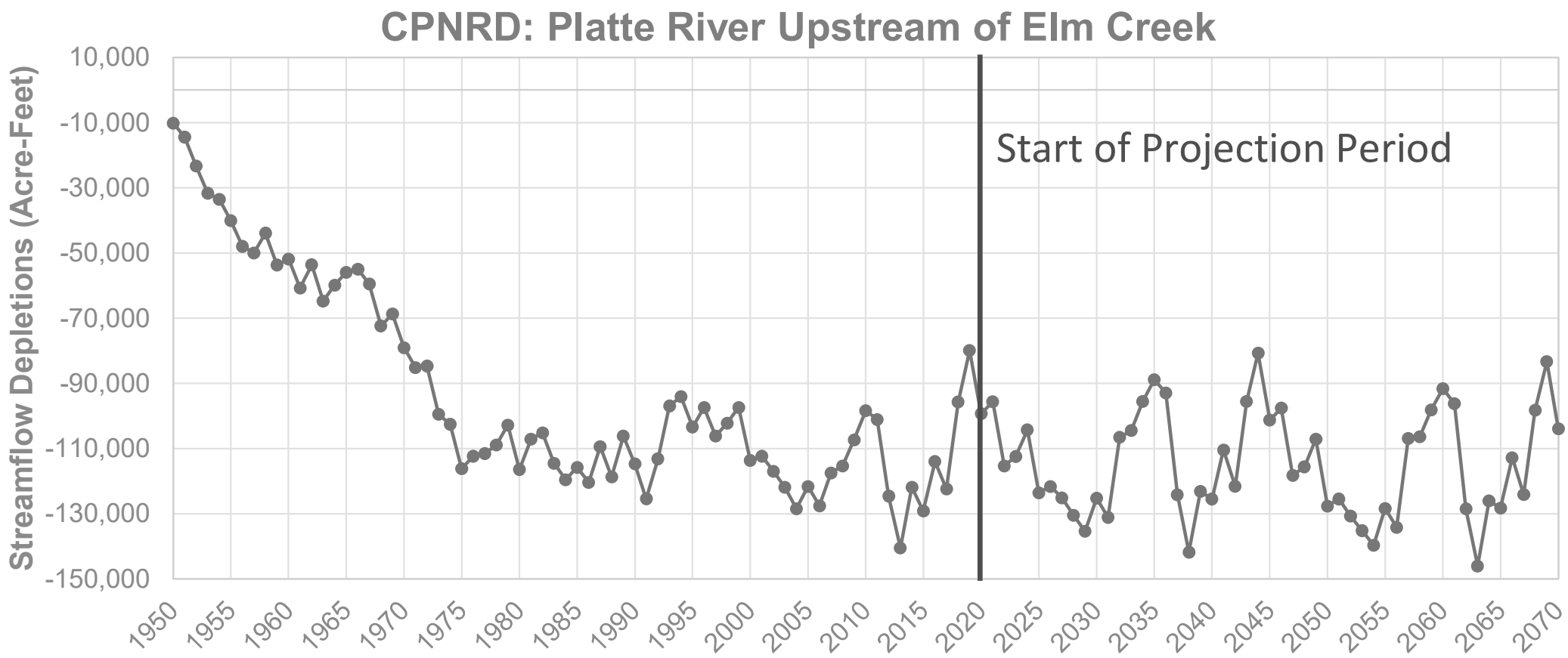
- **Upstream of Elm Creek:**
  - Post-1997 level of development reached with ongoing excess flow diversions
  - Maintain current management actions
  - No regulatory action required

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

Total Depletions Results

CPNRD Results – Total Depletions

Impacts from all Groundwater Only and M&I Pumping



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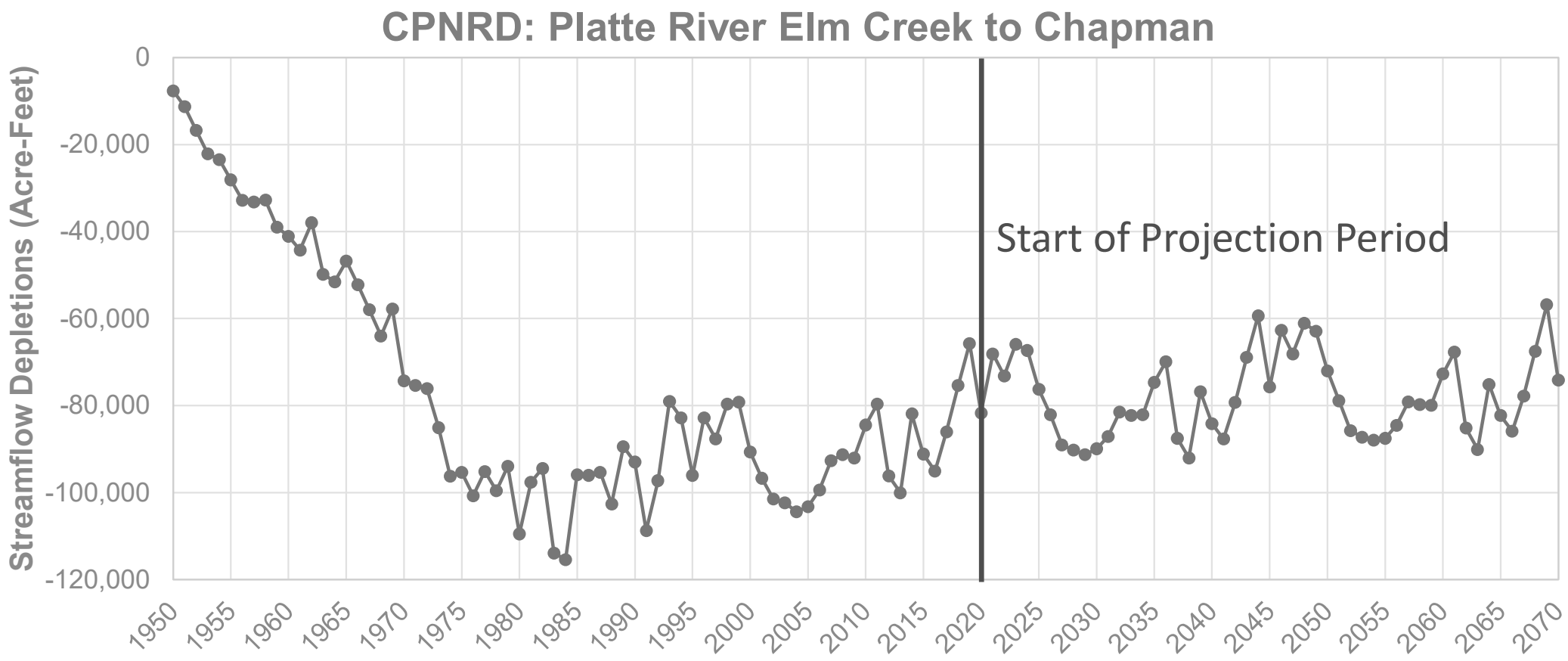
CPNRD Results – Total Depletions

Impacts from all Groundwater Only and M&I Pumping



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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
- 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

CPNRD

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THANK YOU

Jennifer J. Schellpeper, Water Planning, NeDNR